FOR CONTRACT NO: 04-2640L4
PROJECT ID: 0412000337

INFORMATION HANDOUT

WATER QUALITY

SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD
401 DATABASE NO. 02-21-C0814

PERMITS

UNITED STATES ARMY CORPS OF ENGINEERS
NON-REPORTING NATIONWIDE 404 PERMIT

AGREEMENTS

RAILROAD RELATIONS AND INSURANCE REQUIREMENTS

UNITED STATES FISH AND WILDLIFE SERVICE

MATERIALS INFORMATION

FOUNDATION REPORT MSN-A3-NB HOV LAND WIDENING PROJECT NORTH NOVATO OVERHEAD WIDEN (BRIDGE NO. 27-0094R), NOVATO, MARIN COUNTY, CALIFORNIA
DATED JUNE 2012

FOUNDATION REPORT MSN-A3-NB HOV LAND WIDENING PROJECT NORTH NOVATO OVERHEAD WIDEN (BRIDGE NO. 27-0094R), NOVATO, MARIN COUNTY, CALIFORNIA
DATED APRIL 2012

DRAINAGE REPORT

STORM WATER INFORMATION HANDOUT

LIMITED ASBESTOS AND DETERIORATED LEAD CONTAINING PAINT SURVEY REPORT – NORTH NOVATO OVERHEAD (27-0094R), 04-MRN-101, POST MILE 22.30 MARIN COUNY, CALIFORNIA

PRELIMINARY SITE INVESTIGATION REPORT – US-101 MARIN-SONOMA NARROWS – SEGEMENT A3, MARIN COUNTY, CALIFORNIA

GEOTECHNICAL DESIGN AND MATERIALS REPORT

ROUTE: 04-Mrn-101-R22.2/24.3

June 1, 2012
CIWQS Place No. 781608
401 Database No.: 02-21-C0814

Sent via electronic mail--no hard copy to follow

California Department of Transportation
Attn: Ms. Betcy Joseph
Betcy_Joseph@dot.ca.gov
111 Grand Ave.
Oakland, CA 94612-3717

Subject: Water Quality Certification for the Marin Sonoma Narrows Widening Project, Contract A3, City of Novato, Marin County

Department Project No.: EA 04-2640L1

Dear Ms. Joseph:

We have reviewed and hereby issue water quality certification to the California Department of Transportation (Department) for the Marin Sonoma Narrows Widening Project, Contract A3 (Project). The Department is seeking an Individual Permit for the Project from the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act (33 U.S.C. § 1344). As such, the Department has applied to the San Francisco Bay Regional Water Quality Control Board (Water Board) for a Clean Water Act Section 401 water quality certification that the Project will not violate State water quality standards.

Project: The Department is proposing to widen United States Highway 101 (US 101) between Marin County US 101 post-miles 22.2 and 24.1 through the city of Novato as a component of the Marin-Sonoma Narrows HOV Widening Project (MSN). The Department has divided the overall MSN project into at least seven individual contracts:

- A1, from State Route 37 to just north of Atherton Avenue in Novato. A 401 certification was issued for this project on July 22, 2010;
- A2, in Novato, between US 101 northbound post-miles 20.5 and 20.9. A 401 certification application was submitted to the Water Board on May 4, 2012;
- A3, the subject of this certification;

- B-1, between Marin County US 101 post-miles 23.3 and 27.6 in the vicinity of Old Redwood Landfill Road. A 401 certification was issued for the project on March 26, 2012;
- B-3, in the vicinity of San Antonio Creek between Marin County US 101 post-miles 27.0 and 27.6, and Sonoma County US 101 post-miles 0.0 and 2.5. The Department intends to submit a 401 certification application in 2013;
- B-2/B-4, between Sonoma County US 101 post-miles 3.4 and 4.1, from the Petaluma Bridge south to the vicinity of Cloud Lane. A 401 certification was issued for the project on March 26, 2012; and
- C-3, between just north of the Petaluma River Bridge and approximately 0.2 miles north of Caulfield Lane, in the City of Petaluma, between US 101 Sonoma post-miles 3.4 and 4.1. A 401 certification was issued for the project on May 17, 2012.

This certification addresses proposed widening of northbound US 101 and the North Novato US 101 Overhead Bridge. A new high-occupancy-vehicle lane would be added in the northbound direction. Ten-foot road shoulders would be added adjacent the inside and outside lanes. The North Novato Overhead Bridge would require construction of a new foundation and columns to accommodate widening. Three existing cross culverts would be replaced with box culverts to meet current and stormwater runoff volumes anticipated from the future southbound US 101 widening.

The Project area drains to tributaries of Rush Creek. Construction is estimated to start in November 2012, and last approximately one year.

Wetland and Water Impacts: Project implementation would result in the permanent fill of approximately 0.024 acres of jurisdictional seasonal freshwater wetlands and approximately 469 linear feet (0.050 acres) of jurisdictional waters.

Construction access would result in temporary impacts to approximately 0.041 acres of jurisdictional seasonal freshwater wetlands and waters.

Roadway Pollutant Impacts: Project implementation would result in approximately 3.99 acres of new and 3.36 acres of reworked impervious area. Stormwater runoff from impervious areas may contain hydrocarbons, metals, volatile organic compounds, trash, and sediment at levels that may significantly impact jurisdictional waters if left untreated.

Hydromodification Impacts: Added impervious areas may result in alterations to existing hydrologic regimes, resulting in erosion and/or changes of sediment transport in receiving waters (hydromodification). Because this Project discharges to tidally-influenced receiving waters, potential hydromodification impacts would be insignificant and mitigation is not required.

Avoidance and Minimization: The Department has avoided and minimized impacts to wetland and waters by utilizing steepened roadside embankments and by selecting a project alternative with fewer impacts to wetlands and trees.

Mitigation: The Department purchased 0.3 acres of wetland mitigation bank credits from Burdell Ranch Wetland Conservation Bank on December 15, 2010, to mitigate for permanent impacts to approximately 0.226 acres of jurisdictional seasonal freshwater wetlands associated with the MSN C3 project. The Department will utilize the 0.074 acre mitigation credit surplus to mitigate for permanent impacts to 0.024 acres of seasonal freshwater wetlands.

To mitigate for permanent impacts to 469 linear feet of jurisdictional waters, the Department shall reconstruct no less than 500 linear feet of jurisdictional waters onsite (see Condition No. 2).

To mitigate for 0.041 acres of temporarily impacted wetlands and waters, the Department shall restore those areas to their original or improved conditions (see condition no. 5).

Roadway Pollutant Mitigation: As mitigation for increased pollutant loads associated with impervious areas, the Department shall provide treatment of stormwater runoff from no less than 7.54 acres of impervious area using nine bioretention swales and three biofiltration strips (see Table 3 below, for swale and strip information).

Table 1: Stormwater Treatment BMP Summary

BMP Type	Location	NB US 101 Post Mile Location	From US 101 NB Station	To US 101 NB Station	Treatment BMP Size (acres)	Treated Impervious Area (acres)
Biofiltration Swale	Median	22.36	402+50	406+00	0.032	0.45
Biofiltration Swale	Median	22.43	406+03	411+00	0.046	0.60
Biofiltration Strip	Outside Shoulder northbound (NB) 101	22.52	411+05	422+50	0.386	1.84
Biofiltration Swale	Outside Shoulder southbound (SB) 101	22.75	423+00	429+00	0.055	0.76
Biofiltration Swale	Outside Shoulder SB 101	22.87	429+03	435+26	0.057	0.66

Table 1: Stormwater Treatment BMP Summary (continued)

BMP Type	Location	NB US 101 Post Mile Location	From US 101 NB Station	To US 101 NB Station	Treatment BMP Size (acres)	Treated Impervious Area (acres)
Biofiltration Swale	Outside Shoulder SB 101	22.98	435+29	438+91	0.033	0.41
Biofiltration Swale	Outside Shoulder SB 101	23.05	438+94	443+97	0.045	0.52
Biofiltration Swale	Outside Shoulder SB 101	23.25	449+25	446+00	0.030	0.28
Biofiltration Swale	Outside Shoulder SB 101	23.64	459+70	449+28	0.095	0.80
Biofiltration Swale	Outside Shoulder SB 101	23.64	459+70	467+50	0.071	0.60
Biofiltration Strip	Outside Shoulder NB 101	24.15	486+61	491+29	0.161	0.35
Biofiltration Strip	Outside Shoulder NB 101	24.24	491+29	494+86	0.123	0.27
					total:	7.54

CEQA Compliance: The Department prepared and approved an Environmental Impact Report for this Project pursuant to the provisions of the California Environmental Quality Act. The Department filed a Notice of Determination on July 27, 2009 (SCH No. 2001042115).

California Wetlands Portal: It has been determined through regional, state, and national studies that mitigation/restoration project tracking must be improved to better assess their performance over several years of monitoring. Additionally, the State needs to closely track wetland losses, gains, and mitigation/restoration project success to effectively carry out the State's wetland No Net Loss Policy. Therefore, we require the Department use the California Wetlands Standard Form to provide Project impact information and mitigation/restoration measures (see Condition No. 4 of this certification). An electronic copy of the form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml

Project information concerning impacts and mitigation/restoration will be made available at the web link: http://www.californiawetlands.net.

Certification: I hereby issue an order certifying that any discharge from the referenced project will comply with the applicable provisions of sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003 - 0017 – DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification" which requires compliance with all conditions of this Water Quality Certification. The following conditions are associated with this certification:

1. As mitigation for increased pollutant loads associated with impervious areas, the Department shall provide treatment of stormwater runoff from no less than 7.54 acres of impervious area using three biofiltration strips and nine biofiltration swales. The swales shall be installed consistent with the swale summary in Table 1 and Attachment A of this certification. The swales shall be prepared per the soil specifications in Attachment A of this certification. Notwithstanding Notes 1 & 2 of Attachment A, sheet ECD-1, any change in swale dimension or placement shall be prohibited without prior acceptance of Water Board staff. The swales shall be maintained regularly to ensure optimal performance;

2. The Department shall submit a Mitigation and Monitoring Plan (MMP) that details:

    a. A proposal to create not less than 500 linear feet (0.050 acres) of jurisdictional waters adjacent northbound US 101 between "J1R Line" stations 416+00 and 421+00;
    b. Hydrology, design and planting plan details;
    c. A plan to submit an as-built report to the Water Board no later than three months from jurisdictional water creation;
    d. Performance criteria; and
    e. Success criteria that meets federal jurisdictional water parameters;
    f. A plan to submit monitoring reports for years 1, 3, and 5 to the Water Board.

    The MMP shall be submitted to and found acceptable to Water Board staff prior to commencement of Project construction;

3. Creation of jurisdictional waters shall be constructed prior to the completion of Project construction. Any delay in mitigation implementation shall be immediately reported to the Water Board and additional mitigation shall be required as appropriate;

4. The Department is required to use the California Wetlands Standard Form to provide project information describing impacts and mitigation/restoration measures within 30 days from the date of this certification. An electronic copy of the form can be

downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed California Wetlands form shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both: 1) The Water Board, 1515 Clay St., Suite 1400, Oakland, CA 94612, to the attention of California Wetlands Portal; and 2) San Francisco Estuary Institute, 4911 Central Ave., Richmond, CA 94804, to the attention of Mike May;

5. The Department shall restore all temporarily impacted jurisdictional wetlands and waters to their pre-project or improved conditions, within the first growing season following cessation of construction activity in those areas. All temporarily disturbed areas shall be re-vegetated using only native plant species. The Department shall not cause, through operation of heavy machinery, or any other construction activity, compaction of wetlands or waters. Any compaction of wetlands or waters shall require mitigation;

6. The Project shall be constructed in conformance with the Project Description described in this certification and certification application materials. Any change in the Project may require modification to the certification and shall be reported to and found acceptable by Water Board staff prior to implementation of the changes;

7. The Department shall adhere to the conditions imposed by the Individual Permit issued to the Department by the U.S. Army Corps of Engineers, to the Streambed Alteration Agreement issued to the Department by the California Department of Fish and Game, the Biological Opinion issued to the Department by the National Marine Fisheries Service on January 26, 2009, and to the Biological Opinion issued to the Department by the U.S. Fish and Wildlife Service on April 1, 2009;

8. Regardless of date, erosion control measures shall be utilized throughout all phases of construction where sediment-laden runoff threatens to enter waters of the State. At no time shall sediment-laden runoff be allowed to enter waters of the State;

9. No fueling, cleaning or maintenance of vehicles or equipment shall take place within jurisdictional waters or within any areas where an accidental discharge to waters of the State may occur;

10. Except as expressly allowed in this Certification, the discharge, or creation of the potential for discharge, to waters of the State of any construction wastes and/or soil materials including cement, fresh concrete, or washings thereof, silts, clay, sand, oil or petroleum products and other organic materials to waters of the State is prohibited;

11. This certification does not allow for the take, or incidental take, of any special status species. The Department shall use the appropriate protocols, as approved by the California Department of Fish and Game and the U.S. Fish and Wildlife Service, to ensure that Project activities do not impact the Beneficial Use of the Preservation of Rare and Endangered Species;

12. The Department shall maintain a copy of this water quality certification at the Project site so as to be available at all times to site operating personnel. It is the responsibility of the Department to assure that all personnel (employees, contractors, and subcontractors) are adequately informed and trained regarding the conditions of this certification;

13. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section 13330 of the California Water Code (CWC) and Section 3867 of Title 23 of the California Code of Regulations(23 CCR);

14. This certification action does not apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license, unless the pertinent certification application was filed pursuant to California Code of Regulations Title 23, Subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought; and

15. Certification is conditioned upon total payment of the full fee required in State regulations (23 CCR Section 3833). Water Board staff received full payment of $2475.00 on April 17, 2012.

We anticipate your cooperation in implementing these conditions. However, please be advised that any violation of water quality certification conditions is a violation of State law and subject to administrative civil liability pursuant to California Water Code (CWC) section 13350. Failure to respond, inadequate response, late response, or failure to meet any condition of this certification may subject you to civil liability imposed by the Water Board to a maximum of $5,000 per day per violation or $10 for each gallon of waste discharged in violation of this certification.

Certification condition numbers 2 and 4 are requirements for information and reports. Any requirement for a report made as a condition to this action is a formal requirement pursuant to CWC section 13267, and failure or refusal to provide, or falsification of such required report is subject to civil liability as described in CWC section 13268.

We anticipate no further action on this request. Should new information come to our attention that indicates a water quality problem with this project, the Water Board may issue Waste Discharge Requirements pursuant to 23 CCR Section 3857.

If you have any question, please contact Brendan Thompson at (510) 622-2506, or via e-mail to BThompson@waterboards.ca.gov.

Sincerely,

Bruce H. Wolfe
Executive Officer

Attachments: A- Biofiltration Swale and Strip Design and Soil Specifications

cc (via e-mail): Mr. Bill Orme SWRCB-DWQ
Ms. Laurie Monarres, USACE
Ms. Jane Hicks, Regulatory Branch, USACE
Ms. Melissa Escaron, CDFG
Ms. Paula Gill, USAC
Mr. Dale Bowyer, Water Board
Mr. Cyrus Vafai, Caltrans
Mr. Hardeep Takhar, Caltrans
Mr. Jason Brush, USEPA

Attachment A

Biofiltration Swale and Strip Design and Soil Specifications

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — 4/16/12 DATE

PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

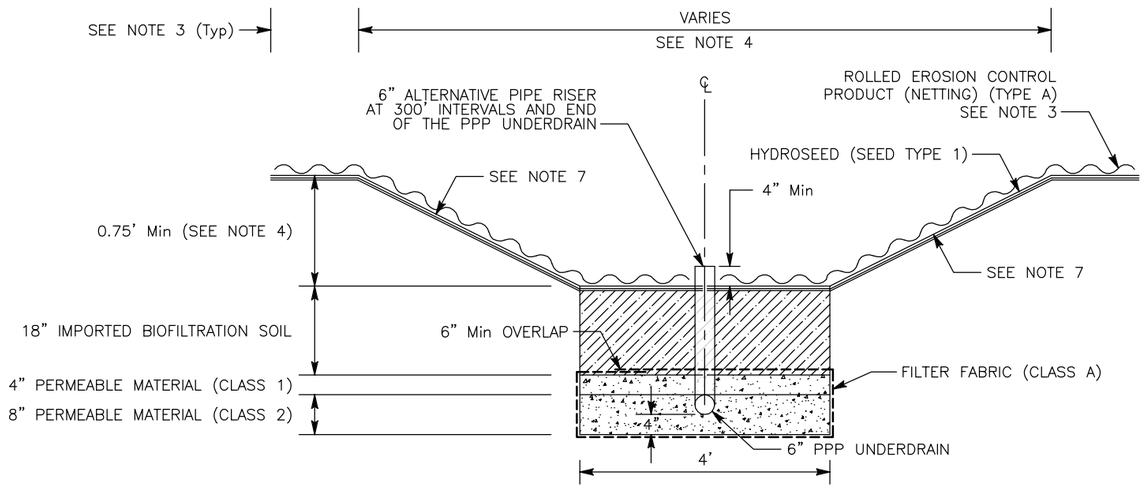
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

NOTES:

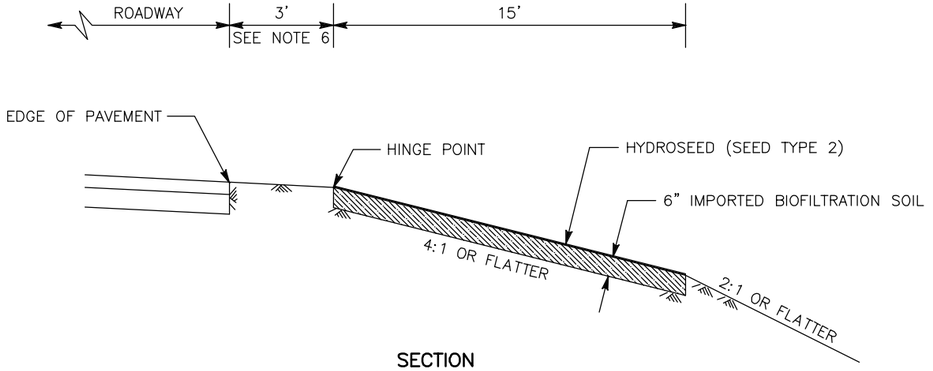
1. DIMENSIONS MAY VARY TO FIT ACTUAL FIELD CONDITIONS.
2. BEGINNING AND END OF LINEAR BIORETENTION AREA MAY VARY. EXACT DIMENSIONS SHALL BE DETERMINED BY THE ENGINEER.
3. WHERE ROLLED EROSION CONTROL PRODUCT (NETTING) IS PROPOSED, INSTALLATIONS SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS AND CALTRANS SPECIFICATIONS.
4. FOR LINEAR BIORETENTION AREA FLOW LINE ELEVATIONS AND PROFILES AND UNDERDRAIN PROFILES AND DETAILS, SEE DRAINAGE PLAN, PROFILES, AND DETAILS.
5. FOR PERFORATED PLASTIC PIPE UNDERDRAIN AND ALTERNATIVE PIPE RISER QUANTITIES, SEE DRAINAGE QUANTITIES SHEETS.
6. IF EXISTING PAVEMENT ADJACENT TO THE BIOFILTRATION STRIP WILL REMAIN UNMODIFIED, EROSION CONTROL (TYPE 3) SHALL BE PLACE BETWEEN THE EDGE OF PAVEMENT AND BIOFILTRATION STRIP. OTHERWISE, SHOULDER BACKING SHALL BE PLACE PER REVISED Std PLAN RSP P75.
7. SEE TABLE BELOW FOR SIDE SLOPE REQUIREMENTS FOR LINEAR BIORETENTION AREAS::

LOCATION	SIDE SLOPE REQUIREMENT
WEST OF SB ROUTE 101	WESTERN SIDE SLOPE (ADJACENT TO R/W): 2:1 EASTERN SIDE SLOPE (ADJACENT TO SB 101): 4:1
ROUTE 101 MEDIAN	2:1 FOR BOTH SLOPES



SECTION

LINEAR BIORETENTION AREA



SECTION
ADJACENT TO ROADWAY PAVEMENT

BIOFILTRATION STRIP

EROSION CONTROL DETAILS

NO SCALE

ECD-1

MV	4/16/12			
REVISED BY	DATE REVISED			
MARY VIDRA	GORDON SWEET			
CALCULATED–DESIGNED BY	CHECKED BY			

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

P:\Engdk\08T003-20\PWS\SHEETS\EROSION CONTROL\ECD-01.dwg 16 Apr 2012 4:28:21pm lara

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 16 2012 | TIME PLOTTED => 4:28 pm

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

10-1.__ IMPORTED BIOFILTRATION SOIL

GENERAL

Summary

This work includes furnishing and placing imported biofiltration soil.

Submittals

Compost: Before mixing compost with sand and topsoil, submit:

1. A Certificate of Compliance from the compost supplier in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
2. A copy of the compost producer's compost technical data sheet. The compost technical data sheet must include:

    2.1. Laboratory analytical test results
    2.2. List of product ingredients

3. A copy of the compost producers Seal of Testing Assurance certification.

Imported biofiltration soil: Imported biofiltration soil must be accompanied by a Certificate of Compliance, from the soil supplier, in conformance with the provisions in Section 6-1.07, “Certificates of Compliance,” of the Standard Specifications.

Quality Control and Assurance

Saturated hydraulic conductivity for imported biofiltration soil must be at least 5 inches per hour.

MATERIAL

Imported biofiltration soil must be a uniform mixture of sand, compost, and topsoil. Volumetric proportion of the mixture must be: four-parts sand; two-parts compost; one-part topsoil.

Sand

Sand must be free of wood, waste, coating such as clay, stone dust, carbonate, or any other deleterious material. All aggregate passing No. 200 sieve size must be non-plastic. Sand must be graded within the following limits:

Sieve Size	Percentage Passing
3/8"	100
No. 4	90 - 100
No. 8	70 - 100
No. 16	40 - 95
No. 30	15 - 70
No. 40	5 - 55
No. 100	0 - 15
No. 200	0 - 5

Grain size analysis results of the sand component must be performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies, and any other State and Local Agencies that regulate solid waste facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in the United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials in a manner that reduces presence of weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical and Chemical Requirements

Property	Test Method	Requirement
pH	TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.5 - 8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0 - 6.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70 +/- 5 deg C % Wet Weight Basis	30 - 60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	35 - 75
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	 80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	Inches % Passing 3 100% 1/2 0 - 95% 1/4 0 - 75% Max. Length 4 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4 mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4 mm fraction	None Detected

NOTE: TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Topsoil

Topsoil must be free of wood, waste or other deleterious material. The topsoil texture must be loamy. Overall dry weight percentages must be 60 to 90 percent sand, with less than 20 percent passing the No. 200 sieve, less than 5 percent clay, and no gravel.

CONSTRUCTION

Comply with Section 20-3.02, "Preparation," of the Standard Specifications.

Place imported biofiltration soil in 8 to 12- inch lifts. Do not compact the lifts.

MEASUREMENT AND PAYMENT

Quantity of imported biofiltration soil is measured by the cubic yard.

The contract unit price paid per cubic yard for imported biofiltration soil includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in imported biofiltration soil, complete in place, including testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

DEPARTMENT OF THE ARMY PERMIT

PERMITTEE: California Department of Transportation, District 4

PERMIT NO.: SPN-2001-262140 N

ISSUING OFFICE: San Francisco District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate District or Division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below:

PROJECT DESCRIPTION:

The Marin Sonoma Narrows (MSN) project will construct high-occupancy vehicle (HOV) lanes on United States 101 (U.S. 101) from just south of State Route 37 in the City of Novato to just north of Corona Road in the City of Petaluma. The MSN project will include construction and modification of interchanges as well as the establishment of new frontage roads. Phase A2 will consist of constructing the southbound (SB) HOV lanes along U.S. 101 within the described project reach. Phase A3 consists of widening NB U.S. 101 into the median to accommodate an HOV lane and a 10-foot inside and outside shoulder north of the U.S. 101/Atherton interchange in Novato. Work will include widening of the NB North Novato Overhead Bridge, reconstruction of the median thrie beam barrier, and replacement and extension of culverts and inlets in their current locations, including replacing four culverts to upsized box culvert structures.

Phase A2:

Specific improvements will include extending the existing HOV Lane from the Novato Creek Bridge to the Franklin Overhead and replacing the existing thrie beam barrier with concrete barrier in the median. The Novato Creek Bridge will be widened 23.17-feet in the median to accommodate SB HOV lane and shoulder. The existing gap in the median between the two structures will be closed as a result of the widening. The SB Novato Creek Bridge widening will include installation of 18 piles driven with an impact hammer. Piles will include six Class 200 Alt X Driven piles 14-in by 14-in pile dimensions and twelve 24-inch diameter Cast-in-Steel-Shell (CISS) Piles. A temporary platform (enclosed fill or trestle platform) may be required to complete pile driving of the Class 200 Alt X Driven piles. A catch platform supported on the CISS Piles will be constructed to contain the soil material removed inside the CISS Piles from falling into the creek. Cofferdams may be required. The cofferdams for installation of the Class 200 Alt X Driven piles will be constructed out of interlocking sheet pilings, using a vibratory hammer and an impact hammer if difficult driving is encountered. Coffer dams for the CISS Piles will include 36 inch corrugated steel pipe (CSP) driven vertically using a vibratory hammer at each pile location.

Phase A3:

Specific improvements will include striping, pavement widening and transitions, reconstruction of thrie beam barrier and drainage cross-culvert extensions and upgrades. Cross-culvert upgrades will include replacement of four existing cross-culvert with new (upsized box culvert structures in their current alignment/locations. The remaining existing drainage culverts and inlets within the project limits will receive culvert extensions (outside) or inlet adjustments/locations (inside/median), to account for the outside and inside widening improvements. In a few instances, new inlets (and connecting culverts) are proposed to address the widening improvements and minor grading changes along the median.

All work shall be completed in accordance with the plans and drawings titled "*USACE File #2001-262140N, Marin Sonoma Narrows-Segment A2, June 4, 2012, Figures 1 to 9*", and "*USACE File #2001-262140N, Marin Sonoma Narrows-Segment A3, June 4, 2012, Figures 10 to 19*" provided as enclosure 1.

The project will result in the discharge of fill material into 0.0392 acre of seasonal wetland and 0.0513 acre of other waters of the U.S. Temporary impacts will occur to 0.04 acre of jurisdictional wetlands and 0.0604 acre of jurisdictional waters of the U.S. Discharge of fill material is depicted in drawings titled, "*USACE File # 2001-262140N, Marin Sonoma Narrows- Segments A2 and A3 Impact Maps, June 4, 2012, Figures 1 to 9*" provided as enclosure 2. Permanently impacted jurisdictional seasonal wetlands have been mitigated off site by the purchase of wetland mitigation credits (2 credits, December 2, 1010) from the Burdell Ranch Wetland Conservation Bank.

PROJECT LOCATION: Phases A2 and A3 of the MSN project extend along U.S. 101 from the Novato Creek bridge to the Franklin Avenue overhead crossing (approximately 0.5 mile) and from the Atherton Avenue Interchange to near Airport Road in the City of Novato, Sonoma County, California.

PERMIT CONDITIONS:

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on June 15, 2017. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. Conditioned water quality certifications have been issued for your project; you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, copies of the certifications are attached (enclosures 3).

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

7. You understand and agree that, if future operations by the United States require the removal, relocation or other alteration of the structure or work authorized herein, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

SPECIAL CONDITIONS:

1. This Corps permit does not authorize you to take a federally listed species. In order to legally take a listed species, you must have a separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit or a Biological Opinion (BO) under ESA Section 7 with "incidental take" provisions with which you must comply). The enclosed U.S. Fish and Wildlife Service (USFWS) BO and letter of concurrence dated April

1, 2009 (enclosure 4), and National Marine Fisheries Service (NOAA-Fisheries) BO dated January 26, 2009 (enclosure 5), contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that are also specified in the BOs. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take authorized by the attached BOs and letter of concurrence, whose terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BOs or letter of concurrence, where a 'take' of the listed species occurs, would constitute an unauthorized take and it would also constitute non-compliance with this Corps permit. The USFWS and NOAA-Fisheries are the appropriate authorities to determine compliance with the terms and conditions of their BOs, letter of concurrence, and with the ESA.

2. You shall employ sediment and erosion control best management practices as needed throughout the project area. No objects or fill shall be placed where they can be eroded or washed into drainage systems in the project area. All debris generated as a result of the project, shall be removed from the site and disposed of at an approved location outside of Corps jurisdiction. All project staging and equipment storage areas shall be located away from areas subject to the jurisdiction of the Corps. After construction, any materials used to dewater areas within the creeks shall be removed in their entirety.

3. Within 1-year of initiation of temporary impact to a jurisdictional feature, you shall re-contour the temporarily impacted area and replant it with appropriate soil-stabilizing native species. You shall monitor each re-vegetated area for 5 years. At the end of the fifth year, re-vegetated areas shall provide 75% absolute vegetative cover. In re-vegetated wetlands, over half of the cover must be occupied by hydrophytic plants (having a facultative (FAC) or wetter indicator status). You shall submit a monitoring report for the re-vegetated areas at the end of years 1, 3, and 5. The reports shall include representative photos of the re-vegetated areas. If the cover requirements for the re-vegetated areas are not met, the Corps may require further monitoring, re-vegetation, and/or off-site mitigation.

4. In the event that you are unable to implement the plan described in special condition 3 within 1-year of initiation of temporary impact to a jurisdictional feature, you must purchase credits at a Corps approved mitigation bank to compensate for the temporary impact at a 3:1 ratio. If no approved bank or in-lieu fee is available, you shall propose an alternative mitigation plan to be reviewed and approved by the Corps.

5. You shall comply completely with the conditions established in the *"Memorandum of Agreement Between The Federal Highway Administration and the California State Historic Preservation Officer Regarding Lane Widening of Highway 101, Marin and Sonoma Counties, California"* signed September 11, 2008.

6. If future operations by the United States require the removal, relocation, or other alteration of the work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the U. S Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

   (x) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403).
   (x) Section 404 of the Clean Water Act (33 U.S.C. Section 1344).
   ( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. Section 1413).

2. Limits of this authorization:

   a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate. (See Item 4 above.)

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 C.F.R. Section 325.7 or enforcement procedures such as those contained in 33 C.F.R. Sections 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 C.F.R. Section 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Carie Simonton for Jeffrey G. Jensen — 4/12/12

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

FOR — 6/13/12

Torrey A. DiCiro, ~~P.E., PMP~~ (DATE)
Lieutenant Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

REPLY TO
ATTENTION OF:

JUN 13 2012

Regulatory Division

SUBJECT: File Number 2001-262140N

Mr. Jeffrey Jensen
California Department of Transportation
111 Grand Avenue
Oakland, California 94623-0660

Dear Mr. Jensen:

Enclosed is your signed copy of a Department of the Army permit (Enclosure 1) to complete phases A2 and A3 of the Marin Sonoma Narrows Project. Phase A2 consists of constructing the southbound (SB) HOV lanes along U.S. 101, including the SB Novato Creek Bridge within the described project reach. Phase A3 consists of widening northbound (NB) U.S. 101 into the median to accommodate an HOV lane and a 10-foot inside and outside shoulder north of the U.S. 101/Atherton interchange in Novato. Phases A2 and A3 of the MSN project extends along U.S. 101 from the Novato Creek Bridge to the Franklin Avenue overhead crossing (approximately 0.5 mile) and from the Atherton Avenue Interchange to near Airport Road in the City of Novato, Sonoma County, California

Please complete the appropriate parts of "Project Status" form (Enclosure 2), and return it to this office as your work progresses. You are responsible for ensuring that the contractor or workers executing the activity authorized herein are knowledgeable of the terms and conditions of this authorization.

Should you have any questions regarding this matter, please call Paula Gill of our Regulatory Division at (415) 503-6776. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter. If you would like to provide comments on our permit review process, please complete the Customer Survey Form available online at http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Torrey A. DiCiro, P.E., PMP.
Lieutenant Colonel, U.S. Army
Commanding

Enclosures

Copies Furnished (w/encl 1 only):
US CG, Alameda, CA
US EPA, San Francisco, CA
US FWS, Sacramento, CA
US NMFS, Santa Rosa, CA
CA DFG, Yountville, CA
CA RWQCB, Oakland, CA

PROJECT STATUS

Please use the forms below to report the dates when you start and finish the work authorized by the enclosed permit. Also if you suspend work for an extended period of time, use the forms below to report the dates you suspended and resumed work. The second copy is provided for your records. If you find that you cannot complete the work within the time granted by the permit, please apply for a time extension at least one month before your permit expires. If you materially change the plan or scope of the work, it will be necessary for you to submit new drawings and a request for a modification of your permit.

(cut as needed) ----------

Date:_____

NOTICE OF COMPLETION OF WORK under Department of the Army Permit No., 2001-262140N
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2001-262140N, this is to notify you that work was completed on_____.

Permittee: Caltrans, Mr. Jeffrey Jensen
Address: 111 Grand Avenue, Oakland, California 94623-0660

(cut as needed) ----------

Date:_____

NOTICE OF RESUMPTION OF WORK under Department of the Army Permit No. 2001-262140N
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2001-262140N, this is to notify you that work was resumed on _____.

Permittee: Caltrans, Mr. Jeffrey Jensen
Address: 111 Grand Avenue, Oakland, California 94623-0660

(cut as needed) ----------

Date:_____

NOTICE OF SUSPENSION OF WORK under Department of the Army Permit No. 2001-262140N
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No., 2001-262140N, this is to notify you that work was suspended on _____.

Permittee: Caltrans, Mr. Jeffrey Jensen
Address: 111 Grand Avenue, Oakland, California 94623-0660

(cut as needed) ----------

Date:_____

NOTICE OF COMMENCEMENT OF WORK under Department of the Army Permit No. 2001-262140N
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2001-262140N, this is to notify you that work was commenced on _____.

Permittee: Caltrans, Mr. Jeffrey Jensen
Address: 111 Grand Avenue, Oakland, California 94623-0660

Information Handout Document:

"RAILROAD RELATIONS AND INSURANCE REQUIREMENTS"

(Replaces "Reserved" in Section 5-1.20C of State 2010 Standard Specification)

1.0 General

The term "Railroad" shall mean the Sonoma-Marin Area Rail Transit District (SMART).

It is expected that the Railroad will cooperate with the Contractor to the end that the work may be handled in an efficient manner. However, except for the additional compensation provided for hereinafter for in these special provisions for delays in completion of specific unit of work to be performed by the Railroad, and except as provided in Public Contracts Code Section 7102, the Contractor shall have no claim for damages, extension of time, or extra compensation in the event his work is held up by work performed by the Railroad.

The Contractor must understand the Contractor's right to enter Railroad's property is subject to the absolute right of Railroad to cause the Contractor's work on Railroad's property to cease if, in the opinion of Railroad, Contractor's activities create a hazard to Railroad's property, employees, and operations.

The Contractor shall sign and submit to the Railroad a SMART Right of Entry Permit and will provide to the State and Railroad all insurance policies, binders, certificates or endorsements that are set forth in Section 2.

Railroad Requirements

The Contractor shall notify Mr. Charlie Burnham, Construction Manager, Sonoma-Marin Area Rail Transit (SMART), 490 Mendocino Avenue, Suite 102, Santa Rosa, CA 95401, (707) 521-0714, Cburnham@sonomamarintrain.org and the Engineer, in writing, at least 10 working days before performing any work on, or adjacent to the property or tracks of the Railroad.

The Contractor shall cooperate with the Railroad where work is over or under the tracks, or within the limits of Railroad property, to expedite the work and avoid interference with the operation of railroad equipment.

The Contractor shall comply with the rules and regulations of Railroad or the instructions of its representatives in relation to protecting the tracks and property of Railroad and the traffic moving on such tracks, as well as the wires, signals and other property of Railroad, its tenants or licensees, at and in the vicinity of the work during the period of construction. The responsibility of the Contractor for safe conduct and adequate policing and supervision of its work at the job site shall not be lessened or otherwise affected by the presence at the work site of Railroad representatives, or by the Contractor's compliance with any requests or recommendations made by Railroad representatives.

The Contractor shall perform work to not endanger or interfere with the safe operation of the tracks and property of Railroad and traffic moving on such tracks, as well as wires, signals and other property of Railroad, its tenants or licensees, at or in the vicinity of the work.

The Contractor shall take protective measures to keep railroad facilities, including track ballast, free of sand or debris resulting from his operations. Damage to railroad facilities resulting from Contractor's operations will be repaired or replaced by Railroad and the cost of such repairs or replacement shall be deducted from the Contractor's progress and final pay estimates.

The Contractor shall contact QWest at least 48 hours prior to commencing work, at Telephone: 1-800-283-4237 (a 24-hour number) to determine location of underground utilities. If a telecommunications system is buried anywhere on or near railroad property, the Contractor shall coordinate with the Railroad and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near Railroad Property.

The Contractor shall not pile or store any materials nor park any equipment closer than 7.62-meter (25'-0") to the centerline of the nearest track, unless directed by Railroad's representative.

The Contractor shall also abide by the following temporary clearances during the course of construction:

1. 2.90-meters (9'-6") horizontally from centerline of track to the west
2. 3.51-meters (11'-6") horizontally from centerline of track to the east
3. 6.27-meters (20'-6") vertically above top of rail

The above temporary vertical construction clearance provided will not be permitted until authorized by the Public Utilities Commission. It is anticipated that authorization will be received not later than 15 days after the approval of the contract by the Attorney General. In the event authorization is not received by the time specified, and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of authorization not being received by the said time, State will compensate the Contractor for such delay to the extent provided in Section 8-1.07, "Delays," of the 2010 Standard Specifications and not otherwise.

Walkways with railing shall be constructed by Contractor over open excavation areas when in close proximity of tracks, and railings shall not be closer than 2.60-meter (8'-6") horizontally from centerline of the nearest track, if tangent, or 2.90- meter (9'-6") if curved.

Infringement on the above temporary construction clearances by the Contractor's operations shall be submitted to the Railroad by the Engineer, and shall not be undertaken until approved by the Railroad, and until the Engineer has obtained any necessary authorization from any governmental body or bodies having jurisdiction thereover. No extension of time or extra compensation will be allowed in the event the Contractor's work is delayed pending Railroad approval and governmental authorization.

When the temporary vertical clearance is less than 6.86-meter (22'-6") above top of rail, Railroad shall have the option of installing tell-tales or other protective devices Railroad deems necessary for protection of Railroad trainmen or rail traffic.

Four sets of plans, in 279mm x 432mm (11" x 17") format, and two sets of calculations showing details of construction affecting Railroad's tracks and property not included in the contract plans, including but not limited to shoring and falsework, shall be submitted to the Engineer for review prior to submittal to Railroad for final approval. Falsework shall comply with railroad guidelines. Demolition of existing structures shall comply with Railroad guidelines. Shoring and falsework plans and calculations shall be prepared and signed by a professional civil engineer registered in the State of California. This work shall not be undertaken until such time as the Railroad has given such approval. Review by Railroad may take up to 6 weeks after receipt of all necessary information.

The Contractor shall notify the Engineer in writing, at least 25 calendar days but not more than 40 days in advance of the starting date of installing temporary work with less than permanent clearance at each structure site. The Contractor shall not be permitted to proceed with work across railroad tracks until this requirement has been met. No extension of time or extra compensation will be allowed if the Contractor's work is delayed due to failure to comply with the requirements in this paragraph.

Private crossings at grade over tracks of Railroad for the purpose of hauling earth, rock, paving or other materials will not be permitted. If the Contractor, for the purpose of constructing highway-railway grade separation structures, including construction ramps thereto, desires to move equipment or materials across Railroad's tracks, the Contractor shall first obtain permission from Railroad. Should Railroad approve the crossing, the Contractor shall execute Railroad's form of Contractor's Road Crossing Agreement. By this agreement, the Contractor shall bear the cost of the crossing surface, with warning devices that might be required. The Contractor shall furnish its own employees as flagmen to control movements of vehicles on the private roadway and shall prevent the use of such roadway by unauthorized persons and vehicles.

Blasting will be permitted only when approved by the Railroad.

The Contractor shall, upon completion of the work covered by this contract to be performed by the Contractor upon the premises or over or beneath the tracks of Railroad, promptly remove from the premises of Railroad, Contractor's tools, implements and other materials, whether brought upon said premises by said Contractor or any subcontractor, employee or agent of said Contractor, and cause said premises to be left in a clean and presentable condition.

Under-track pipeline installations shall be constructed in accordance with Railroad's current standards which may be obtained from Railroad. The general guidelines are as follows:

1. Edges of jacking or boring pit excavations shall be a minimum of 6.10-meter (20 feet) from the centerline of the nearest track.
2. If the pipe to be installed under the track is 100 mm (4 inches) in diameter or less, the top of the pipe shall be at least 1.067-meter (42 inches) below base of rail.
3. If the pipe diameter is greater than 100 mm (4 inches) in diameter, it shall be encased and the top of the steel pipe casing shall be at least 1.60-meter (66 inches) below base of rail.
4. Installation of pipe or conduit under Railroad's tracks shall be done by dry bore and jack method.
5. Hydraulic jacking or boring will not be permitted.

Protection of Railroad Facilities

Upon advance notification of not less than 10 working days by the Contractor, Railroad representatives, conductors, flagmen or watchmen will be provided by Railroad to protect its facilities, property and movements of its trains or engines. Notice shall be made to Mr. Charlie Burnham at telephone: (707) 521-0714. At the time of notification, the Contractor shall provide Railroad with a schedule of dates that flagging services will be needed, as well as times, if outside normal working hours.

Subsequent deviation from the schedule shall require 10 working days advance notice from the first affected date. The Railroad will furnish such personnel or other protective devices:

1. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.
2. For any excavation below elevation of track subgrade if, in the opinion of Railroad's representative, track or other Railroad facilities may be subject to settlement or movement.
3. During any clearing, grubbing, grading or blasting in proximity to Railroad which, in the opinion of Railroad's representative, may endanger Railroad facilities or operations.
4. During any of Contractor's operations when, in the opinion of Railroad's representatives, Railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines or pipe lines, may be endangered.

The cost of flagging and inspection provided by Railroad during the period of constructing that portion of the project located on or near Railroad property, as deemed necessary for the protection of Railroad's facilities and trains, will be borne by the State for a period of 260 working days beginning on the date work commences on or near property of Railroad.

Work by Railroad

The following work by Railroad will be performed by Railroad forces and is not a part of the work under this contract.

1. Railroad will perform inspection and flagging as specified in Section 1, "Protection of Railroad Facilities," of this special provision, and will review and approve plans for excavation, shoring, falsework, and demolition.

Delays Due to Work by Railroad

No delay due to work by the Railroad is anticipated.

If delays due to work by the Railroad occur, and the Contractor sustains loss which, in the opinion of the Engineer, could not have been avoided by the judicious handling of forces, equipment and plant, the

amount of said loss shall be determined as provided in Section 8-1.07, "Delays," of the 2010 Standard Specifications.

If a delay due to work by Railroad occurs, an extension of time determined pursuant to the provisions in Section 8-1.10, "Liquidated Damages," of the 2010 Standard Specifications will be granted.

Legal Relations

Section 1.0, "Relations with Railroad Company," and provision of Section2, "Railroad Protective Insurance," of this special provision shall inure directly to the benefit of Railroad.

2.0 Railroad Protective Insurance

Indemnity and Insurance. Contractor shall release, defend (with counsel reasonably satisfactory to Railroad) and indemnify Railroad, its successors and assigns, any railroad company operating on Premises, and their respective directors, officers, employees, and agents (collectively, "Indemnitees") from and against all liability, cost, and expense for loss of, or damage to, property and for injuries to, or death of, any person (including, but not limited to, the property and employees of each party) when arising or resulting from the use of Premises by Contractor, its agents, employees, contractors, subcontractors, or invitees; or Contractor's breach of these provisions. The duty of Contractor to indemnify and save harmless the Indemnitees includes the duties to defend as set forth in Section 2778 of the Civil Code. It is the express intent of the parties under this Section 2, that Contractor will indemnify and hold harmless the Indemnitees from any and all claims, suits, or actions arising from any cause whatsoever as set forth above, other than the active negligence, willful misconduct, or criminal acts of the Indemnitees. Contractor waives any and all rights to any type of express or implied indemnity against the Indemnitees arising out of Contractor's use of or activities on Premises. This indemnity shall survive termination of this Permit. It is the intention of the parties that should any term of this indemnity provision be found to be void or unenforceable, the remainder of the provision shall remain in full force and effect.

Prior to entry upon Premises, Contractor shall provide Railroad with satisfactory evidence, in the form of a Certificate of Insurance, that Contractor is insured in accordance with the following, which insurance shall remain in effect throughout the term of this Permit:

1. Workers' Compensation and Employers' Liability Insurance. Contractor shall procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance in accordance with the laws of the State of California. Employers' Liability Insurance shall have coverage for a minimum liability of Two Million Dollars ($2,000,000) covering Contractor's employees engaged in the work. Contractor shall insure the procurement and maintenance of such insurance by all contractors or subcontractors engaged on project.
   Prior to commencement of any work hereunder, Contractor shall deliver to Railroad a Certificate of Insurance which shall stipulate that thirty (30) days advance written notice of cancellation or non-renewal shall be given to Railroad.
2. Personal Injury and Property Damage Liability Insurance. Contractor shall also procure and maintain Personal Injury and Property Damage Liability Insurance, including, but not limited to, what is commonly referred to as coverage for "XCU Hazards" (Explosion, Collapse, and Underground Property Damage) which shall include as additional insured Railroad, its successors and assigns, any railroad company operating on Premises, and their respective directors, officers, employees and agents (collectively, "Insureds"), as they now or as they may hereafter be constituted, singly, jointly, or severally. Such insurance shall include Automobile Bodily Injury and Property Damages coverage including owned, hired, and non-owned vehicles.
   Said insurance shall be subject to a combined single limit of liability of not less than Five Million Dollars ($5,000,000).
3. Railroad Protective Liability Insurance. The Contractor shall provide, with respect to the construction activities it or any of its subcontractors perform above the railroad tracks or within fifty feet (50') horizontally of the railroad tracks, Railroad's Protective Liability Insurance with the Insurance Services Offices/Railroad Insurance Management Association (ISO/RIMA) form with pollution coverage for job site fuels and lubricants. The Railroad shall be the named insured and said policy shall cover all other railroads operating on the right-of-way. The policy shall have limits of liability of not less than Two Million Dollars ($2,000,000) per occurrence, combined single limit, for losses arising out of injury to or

death of all persons, and for physical loss or damage to or destruction of property, including the loss of use thereof.

Prior to commencing work or entering onto the property, Contractor shall file the original of the policy for Railroad Protective Liability Insurance with the Railroad.

Prior to entering onto Premises, Contractor shall file Certificate(s) of Insurance with Railroad evidencing the required coverage and endorsement(s) and upon request, a certified duplicate original of any of those policies. Said endorsements and Certificate(s) of Insurance shall stipulate:

1. The insurance company(ies) issuing such policy(ies) shall give written notice to Railroad of any material alteration, cancellation, non-renewal, or reduction in aggregate limits, if such limits apply, and provide at least thirty (30) days notice of cancellation.
2. That the policy(ies) is Primary Insurance and the insurance company(ies) providing such policy(ies) shall be liable thereunder for the full amount of any loss or claim which Contractor is liable for under Section 5-1.20C, up to and including the total limit of liability, without right of contribution from any other insurance effected or which may be effected by the Insureds.
3. The policy shall also stipulate: Inclusion of the Insureds as additional insureds shall not in any way affect its rights either as respects any claim, demand, suit or judgment made, brought or recovered against Contractor. Said policy shall protect Contractor and the Insureds in the same manner as though a separate policy had been issued to each, but nothing in said policy shall operate to increase the insurance company's liability as set forth in its policy beyond the amount or amounts shown or to which the insurance company would have been liable if only one interest had been named as an insured.

The insurance policy(ies) shall be written by an insurance company or companies acceptable to Railroad. Such insurance company shall be authorized to transact business in the state of California.

2.01 APPENDIX 1

Contractor's Endorsement

1. As a condition to entering upon the Railroad's right-of-way to perform Work pursuant to this agreement, State's contractor, _____
(Name of Contractor)
whose address is:
_____,
(Contractor's Mailing Address)
(hereinafter "Contractor"), agrees to comply with and be bound by all the terms and provisions of the SMART Right of Entry Permit that was signed by SMART ("Railroad") and the State of California, Department of Transportation ("State") relating to the Work to be performed and the insurance requirements set forth in "Railroad Protective Insurance" of these special provisions, hereto attached.

2. Before the Contractor commences any Work, the Contractor shall provide the Railroad with (i) a binder of insurance for the Railroad Protective Liability Insurance described in "Railroad Protective Insurance" of these special provisions, hereto attached, and the original policy, or a certified duplicate original policy when available, and (ii) a certificate issued by its insurance carrier providing the other insurance coverage and endorsements required pursuant to "Railroad Protective Insurance" of these special provisions.

3. All insurance correspondence, binders or originals shall be directed to:

   Ms. Laura Giraud
   Real Estate Manager
   Sonoma-Marin Area Rail Transit (SMART)
   490 Mendocino Avenue, Suite 102
   Santa Rosa, CA 95401

4. Please note that fiber optic cable may be buried on the Railroad's property. Prior to commencing any work, the Contractor agrees to contact the Railroad as provided in "Railroad Requirements" of these special provisions to determine if any fiber optic cable is located on the Railroad's property on or near the location where the work is to be performed. If there is, the Contractor must comply with the terms and conditions of "Railroad Requirements" of these special provisions and terms and conditions of SMART's Right of Entry Permit before commencing any work on the Railroad's property.

5. The Contractor agrees to also provide to the Railroad advance notice required in "Railroad Requirements" of these special provisions prior to working on the Railroad's property in order for the Railroad to coordinate the Contractor's work with the Railroad's operations and to make arrangements for flagging protection (if applicable).

This endorsement shall be completed and sent to the person named in Paragraph C above.

_____
(Name of Contractor)

By_____

Title:_____

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

IN REPLY REFER TO:
81420-2008-F-1619-4

APR 0 1 2009

Mr. Walter C. Waidelich Jr.
Federal Highway Administration
U. S. Department of Transportation
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

Subject: Biological Opinion for the State Route 101 Marin-Sonoma Narrows High Occupancy Vehicle Widening Project, Marin and Sonoma Counties, California (Caltrans EA 264000) on the Threatened California Red-legged Frog and the Endangered Salt Marsh Harvest Mouse

Dear Mr. Waidelich:

This is in response to your June 18, 2008, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed State Route 101 Marin-Sonoma Narrows High Occupancy Vehicle Widening Project, Marin and Sonoma Counties, California. Your request was received in this office via an electronic mail message on June 24, 2008, and included the request for formal consultation on the threatened California red-legged frog (*Rana aurora draytonii*) and the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*). This document represents the Service's biological opinion on the effects of the proposed action on this listed species. This document is issued under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq.*)(Act).

Protocol level surveys have not been completed in the action area due to scheduling issues and access problems for the soft bird's beak (*Cordylanthus mollis* ssp. *mollis*), endangered Baker's larkspur (*Delphinium bakeri*), endangered Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), endangered showy Indian clover (*Trifolium amoenum*), and endangered Contra Costa goldfields (*Lasthenia conjugens*). Suitable habitat is located within the action area for all of these listed plants. At this time, based on the preliminary and incomplete information provided to the Service, we concur that the proposed project may affect, but is not likely to adversely affect these five listed plant species. At a meeting with the Service on June 5, 2008, and in a letter to the Service dated June 18, 2008, the Federal Highway Administration (FHWA) stated that they will complete protocol level surveys within the action area for all of these listed

species prior to groundbreaking and reinitiate consultation pursuant to section 7 if any or all of these taxa are found, with the understanding that the presence of any or all of these plants could lead to additional conservation measures that will be determined in conjunction with the Service, project delays, project redesign, or other significant effects on the State Route 101 Marin Sonoma Narrows project.

Based on our current knowledge regarding their distribution we have determined the proposed action is not likely to adversely affect the endangered Sebastopol meadowfoam (*Limnanthes vinculans*, endangered Sonoma County Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*), or the endangered California clapper rail (*Rallus longirostris obsoletus*) due to lack of appropriate habitat in the action area.

This biological opinion is based on: (1) May 2008 Biological Assessment; (2) June 19, 2008, field review; (3) additional project information provided by the California Department of Transportation (Caltrans) on August 27, 2008; (4) miscellaneous correspondence and electronic mail concerning the proposed action between the Service and Caltrans, the Transportation Authority of Marin, and the Sonoma County Transportation Authority; and (5) other information available to the Service.

Consultation History

April 21, 2008	The Service received a letter dated April 17, 2008, regarding a tentative meeting agenda and information on a proposed Least Environmentally Damaging Preferred Alternative for the Marin-Sonoma Narrows Project.
June 2, 2008	The Service received a letter dated May 30, 2008, providing a summary of the May 7, 2008, meeting to discuss the proposed Least Environmentally Damaging Preferred Alternative for the Marin-Sonoma Narrows Project.
June 5, 2008	The Service received an advance copy of the Biological Assessment for the proposed State Route 101 Marin-Sonoma Narrows High Occupancy Vehicle (HOV) Widening Project, Marin and Sonoma Counties, California, at a meeting with the FHWA and Caltrans. In the Biological Assessment, Caltrans determined that the proposed project *is likely to adversely affect* Burke's goldfields, Sonoma alopecurus, Contra Costa goldfields, Sebastopol meadowfoam, California red-legged frog, and the salt marsh harvest mouse; but *will not affect* the soft bird's beak, showy Indian clover, California tiger salamander, or the California clapper rail. The Service recommended that FHWA and Caltrans revise their current determinations to a *no effect* for the Sebastopol meadowfoam and a *may affect, not likely to adversely affect* for the five remaining listed plant species given their commitment to reinitiate consultation following completion of protocol surveys for these species within suitable habitat

within the action area prior to construction. The Service also recommended that FHWA/Caltrans consider the presence of upland and aquatic habitat for California red-legged frog on the east side of State Route 101. This was based on the existing east-west connectivity provided by culverts and bridge crossings under State Route 101, particularly in Segment B. During the meeting Caltrans requested that the biological opinion first be issued as a draft for their review.

June 19, 2008 — The Service attended a field review of the project with Caltrans, the Transportation Authority of Marin (TAM), the Sonoma County Transportation Authority (SCTA), and their consultants. Following the field review, the Service met with Caltrans, TAM, and SCTA to summarize the information requests that arose during the visit. The information requests were primarily associated with the need for more complete project description for activities at creek and river crossings.

June 24, 2008 — The Service received a letter dated June 18, 2008, from the Federal Highway Administration (FHWA) requesting formal consultation for the proposed State Route 101 Marin-Sonoma Narrows High Occupancy Vehicle (HOV) Widening Project, Marin and Sonoma Counties, California. The letter was received via an electronic mail message. In the letter, FHWA requested formal consultation on the threatened California red-legged frog, the endangered salt marsh harvest mouse, and seven listed plants. It was noted in the letter that FHWA was requesting formal consultation on seven listed plants due to their incomplete plant surveys of the action area. FHWA also outlined their plan to reinitiate consultation on the individual listed plants following the completion of additional protocol plant surveys within the action area prior to ground disturbing activities.

June 25, 2008 — The Service sent FHWA a request for additional information to adequately review the determination of the effects of the project on listed species (Service File: 81420-2008-I-1619-1). The information requested primarily focused on the need for additional project description information, particularly for those activities associated with drainage crossings. Other issues of particular focus included: the effects to salt marsh harvest mouse potential habitat under the Petaluma River Bridge; the acknowledgement of California red-legged frog habitat on the east side of State Route 101 in Segment B; the potential for California red-legged frog to occur in the more urban drainages of Segments A and C; appropriate compensation ratios to offset effects; and the previously mentioned recommended listed plant species determinations.

August 7, 2008	The Service received additional information dated August 5, 2008, from Caltrans in response to the June 25, 2008, information request and questions asked during the June 19, 2008, field visit. Of note, the Caltrans letter revised the California red-legged frog effects acreage to 206.94 acres (203.78 acres of permanent effects and 3.16 acres of temporary effects) and FHWA and Caltrans revised their effects determination for the Sebastopol meadowfoam to "no effect." Caltrans also revised their determination for soft bird's beak, Baker's larkspur, Sonoma alopecurus, and Contra Costa goldfields to a "may affect, not likely to adversely affect." Caltrans committed to completing protocol level surveys for these four listed plants within the action area prior to construction. FHWA will reinitiate consultation with the Service if a listed species is found in the action area or could otherwise be affected by the project.
August 13, 2008	The Service received a revised project description from Caltrans developed for the formal consultation process with the National Marine Fisheries Service via an electronic mail message.
August 27, 2008	The Service received a revised a complete project description from Caltrans via an electronic mail message.
August 29, 2008	The Service issued a draft biological opinion (file # 81420-2008-F-1619-2).
September 16, 2008	The Service met with FHWA, Caltrans, TAM, and SCTA to discuss the draft biological opinion.
September 19, 2008	The Service received additional project information, comments on the draft biological opinion, and September 16, 2008, meeting notes from Caltrans via an electronic mail message.
September 24, 2008	The Service received elevation contours for action area near the Petaluma Bridge from Caltrans via an electronic mail message.
September 26, 2008	The Service received comments on the draft biological opinion from FHWA.
October 9, 2008	The Service met representatives from Caltrans and CDFG to discuss the proposed geotechnical borings for the Petaluma Bridge portion of the proposed action.
December 2, 2008	The Service received project description information from Caltrans for the proposed geotechnical borings for the Petaluma Bridge portion of the

proposed action via an electronic mail message. A hardcopy of the information was received on December 3, 2008.

December 10, 2008 The Service received an electronic message from Caltrans outlining the proposed compensation language for the biological assessment. The statement proposed the fulfillment of appropriate California red-legged frog compensation through either purchase of credits at a conservation bank, establishment of a conservation easement, or fee title habitat acquisition. As stated in the message, a conservation easement would include a management plan and endowment. Caltrans referenced the Lawson's Landing property as a potential site for compensation through purchase on a conservation easement.

December 11, 2008 The Service received additional project description information from FHWA for the proposed geotechnical borings for the Petaluma Bridge portion of the proposed action and other outstanding Service information requests via an electronic mail message.

December 15, 2008 The Service received a map depicting the mean high water limits in the Petaluma River Bridge portion of the action area attached to an electronic mail message. This map was sent in response to the Service's request for information regarding available upland refuge for the salt marsh harvest mouse during high water events.

December 22, 2008 The Service issued a second draft of the biological opinion (file # 81420-2008-F-1619-3).

December 22, 2008 The Service issued a second draft of the biological opinion (file # 81420-2008-F-1619-3).

December 10, 2009 The Service received comments from Caltrans regarding the second draft of the biological opinion. The comments were attached to an electronic mail message as an undated letter that represented the consolidated comments of the SCTA, TAM, FHWA, and Caltrans.

March 5, 2009 The Service met with Caltrans and FHWA to discuss the second draft of the biological opinion (file # 81420-2008-F-1619-3).

March 27, 2009 The Service received additional information from Caltrans regarding proposed project scheduling and compensation phasing via an electronic message. The correspondence also included language related to contractor actions and compliance with the Act.

March 31, 2009 The Service received project description revisions and requested terms and conditions revisions from Caltrans via an electronic mail message.

BIOLOGICAL OPINION

Description of the Proposed Action

FHWA and Caltrans propose to construct HOV lanes on State Route 101 from just south of State Route 37 in the City of Novato to just north of Corona Road in the City of Petaluma. These transportation improvements also will include construction and modification of interchanges as well as the establishment of a new frontage road. According to Caltrans, the project is intended to reduce congestion and improve mobility while providing an incentive for commuters to use buses, carpools, or vanpools for peak period travel, and to improve freeway operations including providing safe access to and from State Route 101. The project will be referred to in the remainder of this biological opinion as the Marin-Sonoma Narrows Project.

Caltrans is in the process of developing bridge designs for the Marin-Sonoma Narrows Project and not all of the project description has been fully developed. According to the May 2008, Biological Assessment, additional design engineering will be completed for Segments B and C when funding becomes available for those segments. FHWA will reinitiate consultation with the Service if the action is subsequently modified in a manner that causes an effect to the listed species that was not considered in this project description.

Construction Schedule and Funding

The proposed project is divided into three project segments (A, B, and C) that are further divided into sub-segments (such as A1 and B2). The overall project will be completed in two primary construction phases. Construction Phase 1 will include segments A1, B2, and B3. Construction Phase 2 will include all remaining project segments.

Construction in Phase 1 is scheduled to begin in Fiscal Year 2010/2011 (between July 1, 2010, and June 30, 2011). Construction in Phase 2 is scheduled to begin in Fiscal Year 2014/2015 (between July 1, 2014, and June 30, 2015).

The activities associated with the sub-segments are described as follows:

1. A1 consists of constructing approximately 1.5 miles of the southbound HOV lane between State Route 37 and Rowland Boulevard in Novato (Segment A), and approximately 4 miles of the northbound HOV lane between State Route 37 and Atherton Avenue in Segments A and B.

2. B1 consists of converting the existing Redwood Landfill overcrossing to a full interchange, including the construction of associated frontage roads in Segment B.

3. B2 consists of constructing a new Petaluma Boulevard South interchange including associated frontage roads in Segment B.

4. B3 is fully funded as well and consists of constructing a new mainline bridge at San Antonio Creek in Segment B. This segment would shift US-101 traffic to the west and allow the existing highway to be converted to a frontage road.

5. B4, not yet fully funded, would replace the Petaluma River bridges in Segment B and northbound State Route 116 bridge in Segment C. The southbound State Route 116 bridge, also in Segment C, would be widened as part of this phase.

Additional sub-phases are contemplated and will be defined and advanced as funding is identified.

Two upland and two aquatic geotechnical investigation bores under the Petaluma River Bridge will likely occur prior to construction of the three project segments. The bores are expected to be completed in approximately one week. Scheduling will be weather dependent to avoid boring activities and access of equipment in and out of the action area during rain and when the ground is wet. Additional borings will be accessed from the State Route 101 median and performed in areas that are not identified as listed species habitat or having the potential to adversely affect listed species.

Project Components

Caltrans has divided the approximately 16.1 mile long Marin-Sonoma Narrows Project into three segments, based on the activities occurring in each distinct segment and the construction schedule. The segments are labeled from south to north as A, B, and C. Segments A and C consist of the existing freeway in the cities of Novato and Petaluma, respectively. Segment B is the existing expressway between the two cities. The project activities are discussed by segment as follows. Caltrans has characterized the planned activities in each segment as those that will and will not affect aquatic habitat for listed species.

Segment A

HOV Lane Construction. The existing Segment A includes the existing State Route 101 roadway from State Route 101/State Route 37 Interchange and north of the Atherton Avenue Interchange through the City of Novato. The existing Segment A roadway consists of six 12-foot wide lanes (three in each direction) with 10 foot outside shoulders and 5 foot inside shoulders. The existing non-paved median between the opposite lanes of travel vary in width from 28 to 45 feet and include a double thrie-beam barrier.

According to Caltrans, the majority of the existing drainage features in the existing roadway right-of-way will remain with only minor modifications due to a lack of drainage issues.

Caltrans proposes to widen the Segment A roadway by adding a new HOV lane to each direction of travel. These new 12 foot lanes will be added to the median and will separated by a concrete barrier and varying-width inside shoulders. The new median width from the start of the project to the Atherton Avenue interchange will vary between 22 to 28 feet and will be paved. The median between the Atherton Avenue interchange and Olompali State Historic Park will vary between 28 to 44 feet with 10 foot minimum paved shoulders with the remainder unpaved.

To construct the HOV lanes, heavy equipment would be used to excavate the existing material to sub-grade for the proposed structural section. Excavated material would be tested for the presence of aerially deposited lead (ADL) and if high levels are found, Caltrans would require that the material be handled in compliance with state and federal requirements. According to an August 5, 2008 letter from Caltrans, recycled roadbed material will only be placed on areas that are classified as permanently disturbed by project activities, including material that will be used as fill or base material under the roadway. Material that exceeds the threshold for re-use would be hauled off-site to a Service-approved and/or Type 1 facility. Existing soil under the existing roadway will be used as fill. Temporary impact areas will not have stockpiles.

According to their August 5, 2008 letter, Caltrans would not place any stockpiles of material containing ADL near any sources of run-off. The contractor will place and cover stockpiles of ADL material on 0.33 millimeter thickness plastic sheeting. These stockpiles would not be placed in environmentally sensitive areas and in addition to be covered with plastic, they piles would be surrounded by either hay bales or wattles to protect them from runoff.

Dump or haul trucks would transport borrow and aggregate materials for placement and compaction. Water trucks would spray water on excavated material to maintain control of dust. Sub-base and base material would be compacted and leveled using vibratory rollers and other standard compacting equipment. Aggregate material would be placed in multiple lifts set at a maximum depth of 0.5 feet. The concrete median barrier would be placed via a concrete slip form machine. Asphalt concrete material would be hauled onto the site, and the asphalt would then be spread with a paving machine and rolled with a roller for compaction.

Sub-Grade Correction at the Rowland Interchange. According to Caltrans the existing sub-grade at the Rowland Interchange is failing due to poor soil conditions created by soft clay (Bay Mud) that is not able to support the existing roadbed.

Caltrans plans to remove 11 feet of existing fill and replace it with a lightweight fill material to stabilize the roadbed.

Caltrans will correct the sub-grade with a two-stage construction operation. Temporary lanes would be constructed to the outside of the mainline and traffic would be shifted. These new temporary lanes would require a temporary realignment of the northbound onramp at the Rowland Interchange. Once traffic is shifted, one half of the mainline would be dug out with excavation equipment and temporary retaining walls would be put in place to shore the excavation. Lightweight fill material would be placed 0.5 foot lifts and compacted with rollers. After the sub-grade has been reached and compacted, base and sub-base aggregates would be trucked and placed in 0.5 foot lifts and compacted with rollers. Asphalt concrete (AC) material would be hauled onto the site and the asphalt will then be spread with an AC paving machine and rolled with a roller for compaction. After the first stage is complete, traffic would be moved over to the median and the same process would be repeated for the outside lanes and shoulders. After the existing fill has been replaced, centerline and roadway edges would be re-striped.

Roadway Resurfacing and Striping. Caltrans plans to repair deteriorated localized sections of the existing pavement and put down an overlay on all of the existing six lanes of pavement to prevent reflective cracking and extend the service life of the roadway by 20 years. The centerline and roadway edges would be re-striped following rehabilitation.

Damaged roadway would be removed with a grinder or excavation equipment. The excavated material would be recycled and reused as embankment material for the fill section, or removed off-site. The dig-out areas would be patched with material and overlayed and striped during the rehabilitation process.

Culvert Improvements. According to Caltrans, the existing roadway drainage is conveyed by a depressed median to drainage inlets at low points in the median. There are thirty-five cross culverts that convey storm water to swales along the outside which then drain to adjacent water courses.

Caltrans proposes to replace the depressed median with new HOV lanes, shoulders, and a median barrier. The new roadway would sheet flow drainage towards the outside shoulders, away from the median. Through mainline horizontal curves when sheet flow drainage is directed towards the median due to super elevation, 27 existing drainage inlets would be reconfigured at the median. Cross culverts that are not needed would be abandoned in place and plugged. Caltrans determined that some of the cross culverts would need to be replaced due to deterioration or the need for a larger culvert.

After new cross-culvert construction has been completed, repaving methodology will be similar to those described for roadway rehabilitation. Existing cross culverts that are to

be abandoned would be capped with concrete at each end or filled with either a concrete slurry or sand.

California Highway Patrol (CHP) Pullouts, HOV Bypass Lanes, Ramp Metering. The addition of HOV Lanes would require the addition of HOV bypass lanes, CHP pullouts and ramp metering.

Caltrans proposes to widen existing on-ramps for HOV bypass lanes, CHP pullouts, and install ramp-metering infrastructure at all four of the existing interchanges in Segment A (State Route 37, Rowland, DeLong, and Atherton). An additional 12 foot lane would be added to the interchange ramps. The CHP pull outs would be 15 feet wide and 100 feet long. The length of the bypass lane will vary by ramp and all on-ramps within the action area would have HOV bypass lanes, CHP pullouts, and ramp-metering infrastructure.

The ramp widening would consist of importing fill material and placing in multiple lifts set at a maximum depth of 0.5 feet. The fill material would then be compacted between lifts until the sub-grade depth is met. Dump or haul trucks would transport aggregate materials for placement and compaction. Asphalt concrete material would be hauled to the site and then spread with an AC paving machine and rolled with a roller for compaction. Before AC is placed, electrical conduit would be trenched and placed for the ramp metering system infrastructure.

Sound Walls. Caltrans plans to erect sound walls at four locations within Segment A. The combined length of the four walls will be 4,770 feet.

The sound wall locations would be cleared and bulldozed to meet finished grade for the sound wall footing. The foundation type would depend on soil type. After the foundation is complete, a pile cap would be formed up with wood forming, steel would be placed within the cap, and concrete would be poured to complete the pile cap. If the sound wall is within 30 feet of the edge of travel way, the sound wall is required to be placed on a concrete protective barrier. Once the pile cap or the concrete barrier is in place, the concrete masonry blocks would be set and mortared to the top of the barrier or pile cap until the wall is complete.

Retaining Walls. Caltrans plans to construct retaining walls to reduce the widening needed to construct additional lanes at three existing ramps (the State Route 101/State Route 37 Southbound Connector, the DeLong Southbound On-Ramp, and the South of Rowland Southbound On-Ramp).

The retaining wall locations would be cleared and excavated with excavation equipment to reach grade for the retaining wall footing. Once grade is met, the footing would be formed, steel would be placed and the concrete would then be poured for the footing.

After the footing is poured, the same process would be used to build the stem wall. After the wall is complete, the excavated material would be backfilled and compacted.

In instances where a retaining wall is included in the design as a means of reducing the project footprint in the vicinity of sensitive resources, the following construction techniques and equipment will be used:

1. Retaining walls with spread footings: This work involves excavating through the existing shoulder backing to the substrate below using excavators and/or backhoes. The retaining walls would be constructed before the shoulder widening takes place and may involve the use of a crane from the roadway.

2. Retaining walls with pile foundations: This work involves constructing a retaining wall foundation which could include driven concrete or steel piles, cast-in-drilled-hole (CIDH) piles, or cast-in-steel shell (CISS) piles. If CIDH or CISS piles are used, a drill auger would be used to remove soil at the piles location.

3. Mechanically Stabilized Earth (MSE) retaining walls: This work involves constructing a retaining wall without a foundation. Precast concrete panels would be placed at the bottom of the wall to create the wall face. Reinforcing steel would connect to the wall panels and extend behind the wall. Fill would be placed in layers on top of the reinforcing steel and compacted in place. This procedure would be repeated until the wall is built up to the elevation of the highway.

If subsurface water is encountered during the drilling or excavation, the excavation will be de-watered under the direction of their Best Managmeent Practices (BMPs) of the Storm Water Pollution Prevention Plan (SWPPP). Residues may include aerially deposited lead material. If the residue exceeds the level of lead standards, the material would be deposited off-site at an approved location.

Structures. According to Caltrans, roadway widening would require modification to existing structures such as railing, sound walls, deck treatment, and bridges. Caltrans describes the proposed bridge work as follows.

> *Novato Creek Bridge*. There are two existing Novato Creek Bridges that are only wide enough to accommodate the three lanes of north or southbound traffic plus 5 foot inside shoulders and 8 to 10 foot outside shoulders. Both of the existing 192 foot long structures were built in 1974 and consist of a five-span continuous reinforced concrete T-beam superstructures on 18 inch +/- octagonal pre-stressed concrete pile bents (total 44 octagonal bent piles) and diaphragm type abutments on reinforced concrete piles.

Caltrans proposes to widen and connect the Novato Creek Bridges in the median to allow for the two HOV lanes and 10 foot shoulders. It is also proposed to replace the existing bridge barriers with current standard barriers. The widening of the existing bridges would include the construction of a new cast-in-place reinforced concrete T-beam superstructure, including new concrete bent caps and abutments. The substructure would consist of Class 140 driven pre-cast concrete piles at the abutments and driven CISS piles at the bents. The location and bearing for the new abutments and bents would match with the alignments of the existing abutments and bents. It is anticipated that four-2 foot diameter new CISS piles would be required per bent for a total of 16 piles for the 4 bents.

Caltrans would widen the Novato Creek Bridges by constructing and connecting the right and left parallel bridge structures to the median side of each of the existing bridge structures and closing the median gap. The existing bridge barrier would be replaced with current standard barriers. A portion of the existing overhang in the median would be removed. Access to the existing channel would be required for construction. (In Phase A1, the existing northbound structure would be widened to provide for the northbound HOV lane and shoulders. The complete widening and the ultimate connection of the northbound and southbound structures will not be completed until a future project phase.)

The construction of the CISS piles would likely include driving down the steel pipe pile into ground, removing the soil inside the steel pile, inserting bar reinforcing steel (rebar cages) into the steel pipe and filling the remaining void inside the steel pipe with concrete using a concrete pump truck. The piles would extend into the superstructure.

Existing pilings that need to be removed during construction or demolition (e.g. those in conflict with new bridge or falsework) would be removed by commonly practiced methods. These include pulling by crane or through use of vibratory methods. It may also be possible that some existing pilings can be left in place and cut off below ground.

According to Caltrans, temporary supports also known as falsework would be required to construct the superstructure. The falsework is used to support construction loads such as bar reinforcing steel, wet concrete and live loads (construction crew, equipment, etc). According to Caltrans, the falsework system usually consists of a series of falsework bents placed in the creek at certain intervals with steel beams (falsework stringers) spanning across the falsework bents. Plywood deckings are then placed between the steel beams to allow for the placement of bar reinforcing steel and forming/constructing the superstructure. The falsework bents may be constructed using braced steel or timber posts supported on timber pads placed on top of existing ground or supported on timber

or steel piles driven into the ground depending on the bearing capacity of the soil. Falsework piles may be completely removed or cut below the ground elevation and left in place.

Types of hammers used in piling installation would conform to Caltrans Standard Specifications (49-1.05). Impact hammers would be steam, hydraulic, air or diesel hammers sufficient to drive piles at a penetrations rate of not less than 1/8 inches per blow at the specified nominal resistance. Vibratory hammers would not be used for installation of permanent piles unless shown on the plans or specified in the special provisions. Caltrans might use vibratory hammers to install shoring, coffer dam or falsework piles unless otherwise restricted in the Contract Special Provisions or as listed in permits.

Once the falsework is complete the reinforced concrete T-beam superstructure would be constructed. After completion of the structure, all temporary falsework material would be removed, the creek banks would be stabilized and erosion control BMP's would be placed.

The Novato Creek Bridge work will be located approximately 28 meters east of potential salt marsh harvest mouse habitat. In their August 5, 2008 letter, Caltrans maintained that the bridge work will be accessed from the opposite side of the existing bridge and this pickleweed habitat would be effectively avoided.

Storm Water Quality Systems and Construction Site BMPs. The proposed project would incorporate bio-filtration strips, swales, and Austin sand filters to receive storm water discharges from the highway or other impervious surfaces. The project will also likely include off-site storm water treatment.

Bio-filtration strips would be located at the base of fill slopes and graded to flow perpendicular to the mainline. Bio-filtration swales would also be located at the base of fill slope and convey water parallel with the main line. Swales would be a graded trapezoidal channel with side slopes of 4:1 or flatter.

Bio-filtration strips and swales have the same means of construction. A backhoe and excavator would be used to excavate and set grade for the channel. After the channel is graded, it would be planted with a vegetative species that has filtration properties.

An Austin sand filter is a two-chamber device with the first chamber used to settle out larger sediment and meter flow into the second chamber. The second chamber is a sand media filter that removes the finer particulates from the influent. The treated effluent is then discharged back into the drainage system.

Construction Site BMPs. To maintain water quality during construction, Caltrans would implement BMPs to reduce unnecessary water quality impacts. The following methods and practices would be implemented:

1. Earth dikes/drainage swales and lined ditches
2. Outlet protection/velocity dissipation devices
3. Check dams
4. Silt fencing with maintenance openings
5. Fiber rolls
6. Concrete washouts
7. Drainage inlet protection
8. Construction entrance/exit protection

Staging Locations. Staging locations would be used for temporary storage of heavy construction equipment and construction materials, equipment maintenance shops, stockpile areas, and field offices. The primary staging area in Segment A would be located within the interchange at the South Novato overcrossing. According the Caltrans project description, areas that are located within the State Right-of-Way and quantified as within the project area of effect may also be used, subject to approval of the contractor submitted SWPPP. Contractors may independently seek off-site staging locations. Off-site staging locations will be subject to the requirements of resource agencies and permits will be the responsibility of the contractor.

Segment B

Nonstandard Shoulders, Vertical and Horizontal Curves. The existing State Route 101 roadway in Segment B is a four-lane expressway with two 12 foot wide lanes in each direction. Most of the existing roadway in this segment does not meet current horizontal alignment, vertical profile and sight distance requirements for the 70 mile per hour corridor design speed. The shoulders are variable width, with the outside shoulders varying from 5 to 8 feet and the inside shoulders varying from 2 to 4 feet. The non-paved median varies in width from 11 to 51 feet and contains a double thrie-beam barrier.

Caltrans plans to improve the Segment B roadway design by upgrading the existing nonstandard shoulders, constructing a HOV lane in each direction, and bringing vertical and horizontal curves to current standards. The proposed project design would include 10 foot shoulders with a concrete median barrier. Nonstandard vertical and horizontal curves would be brought to current standards to meet stopping sight distance requirements. Within the concrete medians, Type S barriers for wildlife crossing would be installed every 20 feet and Type M wildlife crossings would be installed every 0.25 miles. Type S barriers are a type 60 concrete barrier with a 6 inch diameter opening at the base of the barrier for small animal passage. Type M wildlife crossings are a type 60

concrete barrier with a 2-foot break in the barrier, with the break protected by a thrie-beam guard rail to deflect vehicle traffic.

Caltrans proposes to realign the roadway mainline to correct vertical and horizontal curves throughout Segment B.

The proposed horizontal alignment would shift from the existing alignment throughout Segment B to correct nonstandard curves. Approximately 75% of the existing alignment would be reconstructed with a new structural section. The additional 25% of Segment B would utilize the existing roadway alignment and would be widened in the median for HOV lanes and shoulders.

According to Caltrans, the proposed vertical alignment would correct nonstandard curves. The locations of the profile corrections are from approximately 229 feet south of the Redwood Landfill OC to approximately 3280 feet north of the OC; from approximately 656 feet south of San Antonio Creek to Gambini Road, and from South Kastania Road to the Petaluma River Bridge. Through these areas the proposed profile would shift the new roadway up to 28 feet above or up to 24 feet below the existing roadway.

Due to the rolling terrain in Segment B, Caltrans will use two methods for the construction of the proposed roadway realignment. When the alignment is shifted through a hillside, material would be cut from the hillside until finished grade is met. Typical equipment to be used for this method would include excavators, bulldozers, earth movers, and compaction equipment. Excess fill cut from other locations within the project would be used in areas where the roadway needs to be built up. This material would either be hauled in by trucks for long hauls, or from earth moving equipment for short hauls. Once the fill material is hauled in, it will be placed in multiple lifts set at a maximum depth of 0.5 feet. Fill material would then be compacted between lifts until the sub-grade depth is met. Dump or haul trucks would then transport aggregate materials for placement and compaction. Asphalt concrete material will be hauled to the site and then spread with an AC paving machine and rolled with a roller for compaction.

Upgrade Expressway to Freeway with the Addition of Frontage Roads. Residents, ranches, and other land uses are only directly accessible off of State Route 101 in Segment B. There are currently 31 driveways and seven at-grade intersections that connect directly to State Route 101. Also in Segment B there is no other north-south bicycle passage other than on the shoulder of State Route 101. These conditions make the State Route 101 through Segment B an expressway rather than a freeway. Caltrans proposes to upgrade Segment B to a freeway by constructing off-ramps to new frontage roads. Local access and bicycle traffic will be moved to frontage roads or a dedicated bicycle and pedestrian facility.

Therefore the proposed project will convert the existing expressway in Segment B to an access-controlled freeway. Converting the existing expressway would require reconfiguring the existing Landfill Overcrossing into an interchange, reconfiguring the Petaluma Boulevard South interchange, and building a frontage road system to maintain access to intersecting roadways and adjacent parcels, as well as replacing bicycle and pedestrian access. Bicycle access will be moved to frontage roads or a dedicated bicycle and pedestrian facility.

As previously described, due to the rolling terrain in Segment B, Caltrans will use two methods for the construction of the proposed roadway realignment. When the alignment is shifted through a hillside, material would be cut from the hillside until finished grade is met. Typical equipment to be used for this method would include excavators, bulldozers, earth movers, and compaction equipment. Excess fill cut from other locations within the project would be used in areas where the roadway needs to be built up. This material would either be hauled in by dump trucks for long hauls, or from earth moving equipment for short hauls. Once the fill material is hauled in, it will be placed in multiple lifts set at a maximum depth of 0.5 feet. Fill material would then be compacted between lifts until the sub-grade depth is met. Dump or haul trucks would then transport aggregate materials for placement and compaction. Asphalt concrete material will be hauled to the site and then spread with an AC paving machine and rolled with a roller for compaction.

Culvert Improvements. As described for Segment A, existing drainage in Segment B is conveyed by a depressed median to drainage inlets at low points in the median. Cross culverts convey the storm water to swales along the outside which drain to adjacent water courses.

The roadway realignment would replace the depressed median with new HOV lanes, shoulders, and a median barrier. These improvements would cause the sheet flow to drainage towards the outside shoulders, away from the median. Through mainline horizontal curves, where sheet flow drainage is directed towards the median due to super elevation, existing drainage inlets would be reconfigured at the median. Cross culverts that are no longer needed would be abandoned in place.

Caltrans determined that the majority of culverts are still in a state of good repair and function adequately. Some systems will require replacement due to deteriorated conditions or resizing to handle additional flow.

As described for culvert work in Segment A, Caltrans determined that some of the cross culverts would need to be replaced due to deterioration or the need for a larger culvert.

Caltrans plans to abandon unneeded culverts in place. The extension of existing box culverts may require accessing creeks.

According to an August 5, 2008 Caltrans letter, Caltrans is considering adding cross culverts, where feasible, in Segment B specifically to provide wildlife passage under State Route 101.

After new cross-culvert construction has been completed, repaving methodology will be similar to those described for roadway rehabilitation. Existing cross culverts that are to be abandoned would be capped with concrete at each end and filled with either a concrete slurry or sand.

Recurring Flooding and Culvert Improvements. Caltrans plans to replace or upgrade the majority of the drainage facilities through Segment B due to their age, capacity or condition. There are two locations, San Antonio Creek and Gunn Lane, where roadway flooding has been a problem.

Caltrans plans to realign and raise the road profile through San Antonio Creek and near Gunn Lane to alleviate recurring flooding and replace the majority of the existing culvert systems due to the proposed realignment or deteriorated condition. Cross culverts would be sized to pass design-year flows with a minimum diameter of 24 inches for maintenance and approximately 79 new cross culverts will be added.
Caltrans plans to address the flooding issue by building a fill section with a higher profile through the area. This would be constructed using the previously described methods for constructing nonstandard shoulders, vertical and horizontal curves. During construction of the new fill sections, cross-culverts would be placed as the fill section is being built. Existing drainage systems that only require extensions or reconfigurations would be installed as previously described for Segment A.

Retaining Walls. Caltrans plans to construct retaining walls to avoid a historic residence near Kastania Road, trees on the new frontage road at the Landfill Interchange, and salt marsh harvest mouse habitat near the northbound off-ramp at the Petaluma Boulevard, South Interchange.

The retaining walls near Kastania Road and the Landfill Interchange locations would be one of the three types described for Segment A.

The retaining wall near the Landfill Interchange would be a soil nail or tieback retaining structure. Soil would be excavated from the top of the wall down approximately 5 to 10 feet to the first tieback or soil nail location. Horizontal drill equipment would drill holes along the length of the wall and a post tensioned tieback tendons or soil nails would be installed and grouted in place. If post tensioned tiebacks are used, a reinforced concrete whaler would be constructed at the tieback location horizontally across the wall. Tendons would be post tensioned and locked against the concrete whaler. In either case, reinforcing steel would be placed in front of the excavation and shotcrete would be placed against the excavated hillside. If soil nails are used, they would be locked against steel

plates. The hillside would then be excavated to the next tieback or soil nail location and the process would be repeated to reach the bottom of the wall. A reinforced concrete or shotcrete facing would then be constructed to complete the wall.

Utility Relocations. The project design in Segment B would require a significant number of intricate utility relocations. According to Caltrans, the exact location and condition of the existing facilities would not be determined until positive location (potholing) work has been completed. As the designs of these relocations proceed, the remaining service life of the existing individual facilities would be calculated and a cost/benefit analysis would be performed to determine the feasibility of their retention. If retention appears to be the preferred alternative, encroachment exceptions would be requested on a case-by-case basis. Otherwise, the utility will be relocated at a location within the project footprint. Depending on the nature of the utility relocations, FHWA may reinitiate Section 7 consultation to address any additional effects to listed species not described in this biological opinion.

Structures. The proposed project includes modifications to several bridges. Of these, the San Antonio Creek Bridge (mainline), San Antonio Creek Bridge (frontage road), and the Petaluma River Bridge all cross over bodies of water, and are discussed below. Although bridge designs have not been determined, Caltrans stated in their August 5, 2008, letter that the described action area is based on the alternative with the largest footprint.

San Antonio Creek Bridge (mainline). The existing San Antonio Creek Bridges are located within an area of recurring flooding. The new San Antonio Creek Bridge would be built on a realigned portion of State Route 101, west of the existing highway, with a raised profile. The bridge is proposed as a cast-in-place concrete pre-stressed box girder with reinforced concrete bent caps and abutments. The existing northbound structure would be used for a new frontage road creek crossing and the southbound structure would be removed.

Two structure alternatives are proposed for the new bridge. Alternative 1 is a five-span structure, 634.8 feet long by 115.2 feet wide, with 4 columns per bent for a total of 16 columns for the 4 bents. Alternative 2 is a three-span structure, 428.1 feet long by 115.2 feet wide, with 4 columns per bent for a total of 8 columns for the two bents. The bridge layout for Alternative 1 and Alternative 2 are similar except that Alternative 2 includes a Mechanically Stabilized Earth (MSE) wall at abutment 1 which would result in a shorter bridge. The substructure would consist of reinforced concrete columns and abutments supported on a concrete pile cap with driven pre-cast concrete piles. The column size is expected to be approximately 5.5 feet in diameter. Each column footing size is approximately 22 by 22 by 6 feet deep. There would be approximately 25 piles per column footing. The dimensions of the pre-cast concrete pile are approximately 1.24 x 1.24 feet.

It is anticipated that the construction footprint would extend 50feet beyond each side of the edge of bridge deck. Access to the existing channel would be required for construction.

To construct the new bridge, soil at the abutment locations would be re-graded to raise the profile. If Bridge Alternative 2 is selected, the MSE wall would be constructed as the profile is raised at Abutment 1. After the profile is raised at the abutment locations, the precast concrete piles would be driven into the ground. A reinforced concrete footing would be constructed on top of the piles. Then, a reinforced concrete abutment would be constructed on the pile cap.

The contractor would excavate soil at the column footing locations. If water is anticipated at the footing elevations, cofferdams consisting of driven sheet pilings would be construction around the perimeter of the footings. If needed, cofferdams would be approximately 32 by 32 feet per column footing. After cofferdams are placed, soil would be excavated to the footing elevation. The column footing piles would then be driven with an impact hammer. If water is encountered, it would be pumped from the cofferdam to trucks or a sediment basin permitted by the Water Quality Control Board. A lean concrete seal course might be placed to minimize water intrusion. Reinforced concrete pile caps and columns would be constructed at each column footing.

To construct the new superstructure, temporary supports also known as falsework would be required. The falsework is used to support construction loads such as bar reinforcing steel, wet concrete and live loads (construction crew, equipment, etc.). The falsework system usually consists of a series of falsework bents placed at certain intervals with steel beams spanning across the falsework bents. Plywood decking is then placed between the steel beams to allow for the placement of bar reinforcing steel and forming/constructing the superstructure. The falsework bents might be constructed using steel or braced timber posts supported on timber pads which have been placed on top of existing ground or steel piles that have been driven into the ground depending on the bearing capacity of the soil. Once the falsework is complete the reinforced concrete box girder superstructure would be constructed. After completion of the structure, all temporary cofferdam and falsework material would be removed, the creek banks would be stabilized and erosion control BMP's would be placed. Falsework piles may be completely removed or cut below the ground elevation and left in place.

Bridge removal work would consist of breaking and removing the existing concrete structure. Over land, the bridge would be dropped in sections onto filter fabric or similar material and removed. Over the creek, the contractor would use approved BMP's to protect the creek from falling debris.

San Antonio Creek Bridge (frontage road). The existing historic San Antonio Creek Bridge on San Antonio Road is approximately 101 feet long and 23 feet wide. According to Caltrans the existing structure is not wide enough to provide two new12 foot-wide lanes and 5 foot wide shoulders and the historic nature of the structure does not allow it to be widened. Therefore Caltrans plans to build a new bridge to cross San Antonio Creek. The existing structure will be re-striped for a one-way bridge and a bike lane.

Two structure alternatives are proposed for the new San Antonio Creek bridge. Alternative 1 is proposed as a cast-in-place concrete slab with reinforced concrete bent caps and abutments. This seven-span bridge is approximately 227.5 feet long and 42 feet wide. The substructure would consist of Class 140 driven precast concrete piles at the abutments and driven cast-in-steel shell piles at the bents. Caltrans anticipates that five 2-foot diameter new CISS piles will be required per pier for a total of thirty for the 6-piers. Alternative 2 is proposed as a cast-in-place concrete pre-stressed box girder with reinforced concrete bent caps and abutments. This new two-span bridge would be approximately 235 feet long and 42 feet wide. The substructure would consist of reinforced concrete columns (total two) approximately 4 feet in diameter and abutments that are supported on a concrete pile cap with driven pre-cast concrete piles. The size of the column footings is approximately 28 by 28 by 6 feet. Each column footing would have approximately 25 driven piles. The size of each pile is approximately 15 x 15 inches.

Caltrans anticipates that the area required for construction activities would extend 50 feet beyond each side of the edge of bridge deck. Access to the existing channel would be required for construction.

To construct the new bridge, soil at the abutment locations would be re-graded to raise the profile. After the profile is raised at the abutment locations, the precast concrete piles would be driven into the ground. A reinforced concrete footing would be constructed on top of the piles. Then, a reinforced concrete abutment would be placed on the pile cap.

If Alternative 1 is selected, the contractor would drive CISS piles into the ground at column locations. The soil inside the steel shells would be drilled out, a reinforcing steel cage would be placed inside the shell, and concrete would be placed by a pump. The foundation piles would be extended as columns into the deck slab.

If Alternative 2 is selected, the contractor would excavate soil at the column footing locations. If water is anticipated at the footing elevations, cofferdams consisting of driven sheet pilings would be construction around the perimeter of

the footings. If needed, cofferdams would be approximately 38 by 38 feet per column footing. After cofferdams are placed, soil would be excavated to the footing elevation. The column footing CISS piles would then be driven with an impact hammer. If water is encountered, it would be pumped from the cofferdam to trucks or a sediment basin permitted by the Water Quality Control Board. A lean concrete seal course might be used to minimize water intrusion. The soil inside the steel shells will be dug out, a reinforcing steel cage would be placed inside the shell, and concrete would be placed by a pump. Reinforced concrete pile caps and columns would be constructed at each column footing.

To construct the superstructure, temporary supports also known as falsework would be required. The falsework would be used to support construction loads such as bar reinforcing steel, wet concrete and live loads (construction crew, equipment, etc). According to Caltrans, the falsework system usually consists of a series of falsework bents placed at certain intervals with steel beams spanning across the falsework bents. Plywood decking is then placed between the steel beams to allow for the placement of bar reinforcing steel and forming/constructing of the superstructure. The falsework bents might be constructed using steel or timber posts supported on timber pads which have been placed on top of existing ground or on timber or steel piles that have been driven into ground depending on the bearing capacity of the soil. Access to the existing channel would be required for pile driving, pile cap construction and falsework construction. Once the falsework is complete the reinforced concrete slab or box girder superstructure would be installed. After completion of the structure, all temporary cofferdam and falsework material would be removed, the creek banks would be stabilized and erosion control BMP's would be installed. Falsework piles may be completely removed or cut below the ground elevation and left in place.

Petaluma River Bridge. The existing Petaluma River Bridge on State Route 101 consists of two separate structures, each 885 feet long and 31 feet wide. The bridges were built in 1955.

Due to the age of the existing structures and the costs associated with bringing them up to current standards, it is proposed to replace the two existing bridges with a single bridge. There is an existing fender system protecting the bridge bents at each side of the waterway. This fender system would be removed during construction in order to facilitate bridge construction work. The new bridge would increase the span over the waterway to 210 feet long and the new Pier 3 would be located above the waterway limit. A new bridge fender system would likely be required for Pier 4 even though it would be located closer to the north bank.

Caltrans has proposed two structure alternatives for the new bridge. Both alternatives would include construction of an 855 foot long and 115 foot wide, five-span bridge. Alternative 1 would consist of a reinforced concrete box girder superstructure. Alternative 2 would consist of a Precast/Pre-stressed Concrete Bulb "T" girder superstructure. The substructure for both alternatives consists of reinforced concrete column piers supported on spread footings or on pile caps with either cast-in-drilled hole (CIDH) or cast-in-steel shell (CISS) pilings. Both alternatives would include between 3 to 5 columns per pier for a total of between 12 to 20 columns for the 4 piers. The size of the individual column footings would be approximately 35 by 28 by 7 feet deep. Caltrans anticipates that each column footing would consist of between twenty-five to forty 18-inch to 30-inch diameter CIDH or CISS pilings for each of the twelve to twenty columns.

Geotechnical investigation will be needed prior to construction of the new Petaluma River Bridge. The purpose of the investigation is to characterize the subsurface conditions and to evaluate engineering properties of the soils and/or rock for the design development of the replacement of the Petaluma River Bridge. As part of the geotechnical investigation for the proposed improvements of Segment B4 of the Marin Sonoma Narrows project, four borings, ranging from 50 to 100 feet in depth, are planned to investigate the bents of the proposed Petaluma River Bridge Replacement located north of the Petaluma River. Two of the bore sites will be located in the designated temporary staging areas and the other two will be located in the Petaluma River. Additional borings will be accessed from the State Route 101 median and performed in areas that are not identified as listed species habitat or having the potential to adversely affect listed species.
The drilling will be completed using a track-mounted drill rig, a truck-mounted drill rig, or a potable drill rig may be used to access the slopes along the east side of the freeway between the Petaluma River Bridge and the 101/116 Separation and Overhead, and the banks of the Petaluma River. A skid-mounted drill rig attached to a sectional barge will be used to explore the bent on the river bank and in the river. Drilling will be completed using rotary wash methods; the size of the borehole will be about 5 inches in diameter.

Prior to the start of the field investigation Underground Service Alert (USA) will be contacted at least 48 hours before the start of work to clear underground utilities. All boring locations will also be cleared utilizing the services of a private underground utility locator. Some locations may require that the boring first be advanced using a hand auger to a depth of at least 3 feet to check for underground utilities, and then be advanced with the drill rig.

Boring permits are required by County of Sonoma, Department of Health Services, Environmental Health Division, for completion of the borings. The permit applications will be processed by consultant, URS. The borings will be

completed during daylight hours. Traffic control will be provided during drilling pursuant to Caltrans standards and as specified in the encroachment permit. A traffic control specialty contractor will be retained to provide traffic control for other borings, where required.

Sampling in the borings will be completed at 5-foot intervals or closer intervals at changes in material type as the drilling progresses. Caltrans anticipates that the majority of the sampling will be completed using a Standard Penetration Test (SPT) or Modified California (MC) sampler. If soft cohesive soils are encountered thin-walled Shelby tube samples will also be obtained.

All soil cuttings generated during the drilling of the borings will be placed in drums and stored at an offsite location designated by Caltrans. The soil cuttings in the drums will be sampled for waste characterization (approximately 1 sample for 3 drums) and disposed of at the nearest non-hazardous waste landfill following reception of the analytical testing results and acceptance of the materials for disposal. If analytical results indicate that the soil cuttings cannot be disposed of at the nearest non-hazardous landfill further testing and analysis may be required to dispose of the drums of soil at an appropriate facility.

Waste associated with the drilling operation such as drilling fluid, material containers, and personal trash will be placed in drums or containers and moved offsite for proper disposal.

All drilling equipment and vehicles will access the drill locations using an existing designated road/path. Access will be confined to this designated route to minimize effects to adjacent pickleweed habitat for the salt marsh harvest mouse.

The two upland borings (R-08-005 and R-08-006) will be explored by using a track mounted rig. The exploration for the two borings in the Petaluma River (R-08-005A and R-08-005B) is planned using a skid-mounted CME 45 rotary drill rig attached to a sectional barge that would be floated to the proposed locations at appropriate high tide levels. The remaining proposed borings will be explored with a truck-mounted rotary drill rig.

For rotary drilling, a one-ton service truck equipped with a water tank will support the drill rig. In general, the drill rig will access the site at the beginning the job and be parked over night until drilling is complete. On the other hand, the service truck will access the site in the morning at the beginning of each shift of drilling and leave the site at the end of the day to refill for the next day. It will leave the site during the day only if the drill hole requires more water for the drilling fluid mixture. The service truck will also be used to transport drill waste containers and soil cutting drums.

The new Petaluma River Bridge would be constructed in three stages. During Stage 1, the middle portion of the new bridge would be built in between the two existing structures and the existing median barriers would be removed. During Stage 2, the existing southbound structure would be removed for the new bridge construction. During stage 3, the northbound structure would be removed to allow for the construction of the final portion of the new bridge. Pile driving for the column footings will occur year-round. Other construction activities that will occur year-round on land include: bridge demolition, vegetation clearing and planting, and road construction for site access, removal of existing piles, falsework removal and cleanup, and concrete pouring (which may involve some work over water using appropriately sealed forms).

Access to the existing channel would be required for construction. The contractor would access the north bank of the river from State Route 116 along the east side of State Route 101. The contractor would access the south bank of the river from Petaluma Boulevard South. Piers 2 and 5 are located above the banks of the Petaluma River. Pier 3 is located on land at the edge of the south bank the river. Pier 4 is located in the river, adjacent to the north bank. Caltrans anticipates that the contractor would need to construct a trestle bridge to gain access to Pier 4 and to gain access to the north side of Pier 3. The trestle would also need to be extended around the existing piers for demolition of the existing bridge and towards the center of the channel for falsework, temporary erection tower, and temporary fender pile installation. A navigational opening would be maintained for mariners on the Petaluma River. The size of the opening would be negotiated and subject to approval of the U.S. Coast Guard. At the north and south sides of the opening a temporary fender system consisting of driven piles and steel and timber barriers would be placed to protect the falsework and/or erection towers from being hit from a vessel. The contractor would drive piles in the river and place a timber deck on the pilings to create a work platform or trestle above the river. The maximum trestle size is estimated at 1000 by 36 feet. Trestle and temporary fender piles would be either steel H-piles or steel pipe piles. Pipe would be approximately 20 to 24 inches in diameter. Piles would initially be driven with a vibratory hammer. Bearing would be confirmed with an impact hammer. Caltrans anticipates that a maximum of 300 temporary trestle and fender piles would be needed. Trestle and fender piles would be between 20 to 45 feet deep and would be installed between June 15 and October 31 of any year. Caltrans estimates that the contractor would install approximately 2 to 10 trestle and/or fender piles per day. Trestle and fender piles would be installed on approximately 20 to 75 days over a three year period. When an impact hammer is used to confirm bearing, each pile would receive approximately 5 to 20 strikes. If required for noise reduction, trestle piles would be driven inside a double walled isolation casing when an impact hammer is used.

Cofferdams consisting of sheet pilings will then be installed around the perimeter of Piers 3 and 4 footings. It is anticipated that one large cofferdam approximately 135 by 38 feet would be installed per pier location. Cofferdams might also be used at Piers 2 and 4, if ground water is anticipated. Four additional cofferdams approximately 39 by 22 feet would be used during demolition of the existing column footings in the river. Cofferdams would be constructed of interlocking sheet pilings, which would be driven by a vibratory hammer. If difficult driving is encountered, an impact hammer might be used for the final few feet of installation. Cofferdams would be installed between June 15 and October 31 of any year.

According to the August 5, 2008, Caltrans letter an existing ditch that contains pickleweed and acts as a connector between two pickleweed areas on the east and west sides of the existing Petaluma River Bridges. Caltrans would construct a new bridge pier and footing at the site of the existing ditch. A new ditch would be constructed slightly south of the existing ditch to maintain flow regimes during construction. The new ditch would be culverted for three years so construction equipment can access the area to construct the new pier and footing. Once construction is complete, Caltrans would restore the ditch, which will include removing the culvert and grading it to mimic the current ditch, including the same elevation, topography, and vegetation. This will be done in order to encourage the pickleweed to self-propagate as it has in the existing ditch.

The pickleweed removal would be the first order of work at the Petaluma River Bridge, prior to any heavy equipment being brought onto the site. The pickleweed will be removed by hand and the area is expected to be re-vegetated based on previous pickleweed propagation information. Caltrans makes this assumption based on other projects such as the Guadalcanal Tidal Marsh Restoration Project on State Route 37 in Solano County where a levee was breached and pickleweed self-propagated within several years.

Additionally, the construction access road would require an approximate 25-foot long temporary culvert in the vicinity of the SMART railroad bridge. Currently drainage traverses into the Petaluma River via an open ditch that contains some pickleweed. This culvert will also be in place for approximately 3-years, during construction. At the conclusion of construction, the culvert will be removed and the ditch will be restored to pre-construction conditions

Caltrans has developed minimization and avoidance measures to address potential adverse effects to listed salmonids and will implement those measures according to the separate biological opinion issued by National Marine Fisheries.

After cofferdams are completed and cleared of salmonid issues by the fisheries biologist, the contractor would install permanent foundation piles and the soil would be excavated to the footing elevation. If final design indicates CIDH piles, the contractor would likely use temporary steel casings at pile locations to help prevent caving and control water. CIDH piles would be constructed by drilling holes to the pile tips. Slurry would also likely be placed in the holes to control water and prevent caving. Once drilling is complete, a reinforcing steel cage would be placed in the hole and concrete would be pumped to the bottom of the hole, displacing the slurry, which would be pumped into holding tanks. If final design indicates CISS piles, Caltrans anticipates that the contractor would initially drive the piles with a vibratory hammer and complete driving into bedrock with an impact hammer. Piles at Piers 3 and 4 are estimated to be between 30 to 50 feet long and each pile will receive between 200 to 600 strikes. Piles will extend to bedrock and the contractor would likely install between 2 to 20 CISS piles per day. The contractor would likely be driving piles at Piers 3 and 4 with an impact hammer for up to 60 days over an 18 month period. CISS would be installed year round from completed trestle and cofferdams. If required for noise reduction, bubble curtains would be used around CISS piles, inside of cofferdams at Piers 3 and 4, when driving with an impact hammer. After piles are driven, soil would be excavated from inside the pile shells by drilling. Slurry would likely be pumped inside the shells to displace water. A reinforcing steel cage would be placed inside the shell, and structural concrete would be pumped to the bottom of the shell, displacing the slurry. Slurry would be pumped to holding tanks.

After piles are constructed, a seal course of lean concrete would likely be placed at the bottom of the footing to prevent water intrusion. Water would be pumped from the cofferdam into a baker tanks or a sediment basin permitted by the Water Quality Control Board. Then, a reinforced concrete footing cap and columns would be constructed on top of the pilings.

To construct the superstructure, temporary supports also known as falsework would be required for Alternative 1 and temporary erection towers would be needed for Alternative 2. The falsework would be used to support construction loads such as bar reinforcing steel, wet concrete and live loads (construction crew, equipment, etc). According to Caltrans, the falsework system usually consists of a series of falsework bents placed at certain intervals with steel beams spanning across the falsework bents. Plywood decking is then placed between the steel beams to allow for the placement of bar reinforcing steel and forming/constructing the superstructure. The falsework bents might be constructed using steel or timber posts supported on timber pads which have been placed on top of existing ground or on timber or steel piles that have been driven into ground depending on the bearing capacity of the soil. Temporary erection towers are needed to provide temporary support and a work platform for splicing precast concrete bulb T-

Girders. Erection towers would be supported by piles driven in the water. Steel and/or timber posts, beams, and lateral supports would complete the tower to the bottom of the superstructure elevation. Falsework or temporary erection piles would be either steel H-piles or steel pipe piles. The pipe would be approximately 20 to 24 inches in diameter. Piles would initially be driven with a vibratory hammer. Bearing would be confirmed with an impact hammer. It is estimated that a maximum of 160 falsework or temporary erection piles would need to be driven in Petaluma River. Falsework or temporary erection piles would be between 20 to 45 feet deep and would be installed between June 15 and October 31 of any year. Caltrans estimates that the contractor would install approximately 2 to 20 falsework or temporary erection piles per day. Trestle piles would be installed on approximately 20 to 80 days over a three year period. When an impact hammer is used to confirm bearing, each pile would receive approximately 5 to 20 strikes. If required for noise reduction, falsework or temporary erection piles would be driven inside a double walled isolation casing when an impact hammer is used.

After the completion of the Stage 1 bridge construction, the existing northbound bridge would be removed. After the completion of the Stage 2 bridge construction, the existing southbound bridge would be removed. For the portion of the structure over the waterway, the structure would likely be removed by saw cutting between precast concrete girders and then using crane(s) to lift the girders out of place. Subject to the engineer's approval, the crane(s) would likely be located at the adjacent spans of the bridge or barge cranes would be utilized to remove the girders. Bridge removal protective cover, if necessary, would be attached to the existing bridge soffit/bents. Cofferdams of approximately 39 feet long by 22 feet wide each (total 4) would be required for the removal of the existing columns and/or spread footings at Pier 5 and Pier 6. Access would be gained by using the temporary trestle.

For bridge demolition work on non-waterway areas, the columns would likely be tipped over and demolished on ground or on protective ground cover such as crane mats etc. Existing footings in water and on banks would be removed to a required minimum elevation or distance below original ground.

After completion of the new bridge, all temporary cofferdam, temporary fender system, temporary erection tower, and falsework material would be removed. Piles would be removed by vibrating and/or pulling the piles with a crane. Alternatively, the piles may be cut at an elevation specified by the U.S. Coast Guard and left in place below existing grade. A new permanent pier protective system consisting of either a closed fill system or a fender system of driven piles and barriers would be placed to protect the new bridge Pier 4. The permanent fenders would consist of approximately 60 driven piles. Piles would be made of

steel pipe, steel H, or timber. Pipe would be approximately 20 to 24 inches in diameter. Piles would initially be driven with a vibratory hammer. Bearing would be confirmed with an impact hammer. Permanent fender piles would be between 20 to 45 feet deep and would be installed between June 15 and October 31 of any year. It is estimated that the contractor would install approximately 2 to 20 permanent fender piles per day. Permanent piles would be installed during approximately 3 to 15 days over a three year period. When an impact hammer is used to confirm bearing, each pile would receive approximately 5 to 20 strikes. If required for noise reduction, permanent fender piles would be driven inside a double walled isolation casing when an impact hammer is used.

The creek banks would then be stabilized and erosion control BMP's would be implemented.

Storm Water Quality Systems and Construction Site BMPs. The proposed project would incorporate bio-filtration strips and swales to receive storm water discharges from the highway or other impervious surfaces. The project would also likely include off-site storm water treatment.

The Segment B on-site storm water treatment would include bio-filtration strips, bio-filtration swales, and Austin sand filters. The installation of these features were discussed in the Segment A project description.

Construction Site BMPs. To maintain water quality during construction, Caltrans would implement BMPs to reduce unnecessary water quality impacts. The following methods and practices would be implemented:

1. Earth Dikes/Drainage Swales and Lined Ditches
2. Outlet Protection/Velocity Dissipation Devices
3. Check Dams
4. Silt Fencing with Maintenance Openings
5. Fiber Rolls
6. Concrete Washouts
7. Drainage Inlet Protection
8. Construction Entrance/Exit Protection

Staging Locations. Caltrans would use staging locations for temporary storage of heavy construction equipment and construction materials, equipment maintenance shops, stockpile areas, and field offices. The primary staging areas in Segment B would be located within the new interchange at the Sanitary Landfill Road (Station 1405-1409), at the new interchange off of Kastania Road (Station 2039-2045), and below and along the sides of the Petaluma River Bridge (Station 2053-2055). Caltrans proposes areas that are located within the State Right-of-Way and quantified as within the project area of effect,

subject to approval of the contractor submitted SWPPP. Contractors may independently seek off-site staging locations. Off- site staging locations will be subject to the requirements of resource agencies and permits will be the responsibility of the contractor.

Segment C

HOV Lane Construction. The existing State Route 101 Segment C roadway travels through the City of Petaluma. This segment is classified as a freeway, and includes two 12 foot lanes in each direction, 10 foot outside shoulders and 5 foot inside shoulders. The majority of existing curves in Segment C meet current horizontal alignment, vertical profile and sight distance requirements for the 70 mile per hour corridor design speed with the exception of the Petaluma Overhead. The existing Petaluma Overhead vertical profile is nonstandard and would be brought to current standards with this project. The non-paved median varies in width from 28 to 35 feet and contains a double thrie-beam barrier. The majority of the drainage facilities through Segment C can be utilized with only minor modifications and no historical drainage issues or recurring flooding has been documented.

In Segment C, Caltrans proposes to add a 12 foot wide HOV lane in each direction between south of the Lakeville Highway/State Route 116 Interchange and north of the Corona Road Overcrossing. The new roadway would be separated by a concrete barrier and would include 10 foot-wide inside shoulders. The majority of the widening would be in the median, with some outside widening. The roadway would be reconstructed at the approaches to the North Petaluma Overhead to correct the existing nonstandard vertical alignment. The proposed profile would be a new roadway located up to 17 feet above the existing roadway.

The HOV roadway construction would be completed as described for Segment A.

Vertical Curve Correction at the Petaluma Overhead. Caltrans plans to reconstruct the vertical profile through the Petaluma Overhead to achieve standard specification and replace the structure. The work would be completed in three stages. The first stage would consist of constructing the median portion of the overhead and fill the section leading up to both sides of the structure. Temporary retaining walls would be set in place for the fill section and imported material would be trucked in and placed in 0.5 foot lifts. Each lift would be spread and compacted with grading compacting equipment. The structural section would then be placed and compacted using the same methodology as described for HOV construction. Once the median is constructed, northbound traffic would be shifted to the median, and the same process would be used to construct the northbound portion of the vertical curve correction. Finally, northbound traffic would be moved to the new northbound lanes and southbound traffic would be shifted to the median for construction of the southbound lanes.

Roadway Resurfacing and Striping. Roadway resurfacing and striping for Segment C would use the same methodology as that described for Segment A.

Culvert Improvements. As described for the previous segments existing roadway drainage in Segment C is conveyed by a depressed median to drainage inlets at low points in the median. Segment C includes fifteen cross culverts that convey storm water to swales along the outside of the roadway which drain to adjacent water courses.

Caltrans would replace the depressed median with new HOV lanes, shoulders, and a median barrier. These improvements would result in sheet flow drainage towards the outside shoulders, away from the median. Sixteen existing drainage wells will be reconfigured at the median in Segment C. Cross culverts that are no longer needed would be abandoned in place and plugged. Caltrans has determined that most of the existing culverts are adequate but some would require replacement due to deterioration and improper sizing.

The construction methods for removing, installing, and extending culverts are as described for Segment A.

CHP Pullouts, HOV Bypass Lanes, and Ramp Metering. The addition of CHP pullouts, HOV bypass lanes, and ramp metering in Segment C will be similar to the methodology described for Segment A. These features will be added Landfill, Petaluma Boulevard South, State Route 116/Lakeville, and East Washington interchanges.

Sound Walls. Caltrans will construct new sound walls at four locations within Segment C. These locations include Ponderosa Drive to East Washington, North of Lynch Creek, Napa Drive to Corona Road, and East Washington to north of Lynch Creek. The combined length of the new walls would be approximately 12,230 feet.

Retaining Walls. Caltrans plans to construct three retaining walls for structural reasons in Segment C. The walls will be located north on both sides of the Petaluma Bridge and from McGregor Avenue Drive to East Washington. The combined length of the retaining walls in Segment C would be 3,635 feet long and will vary between 4 and 7 feet high. The walls will be constructed as described in Segment A.

Structures. Six bridges would be modified for the widening and include the structures at Route 101/116, Caulfield Lane, East Washington Street, Washington Creek, Lynch Creek, and North Petaluma. Only the two creek crossings are further described as follows.

Washington Creek Bridge. The existing 67 foot-long Washington Creek Bridges accommodate two 12 foot-wide lanes of traffic and one 2 foot-wide inside shoulder and a 4 foot-wide outside shoulder in each direction.

Caltrans plans to widen both bridges in order to add the 12 foot wide HOV lane along with 10 foot-wide shoulders and HOV bypass. The existing twin bridges will be widened by connecting the right and left bridges and matching the existing structures to make a total width of 139.8 feet. It is also proposed that the existing bridge barriers with current standard barriers be replaced.

Access to the existing channel would be required for construction. Widening would involve the construction of a new cast-in-place reinforced concrete slab superstructure including new concrete bent caps and abutments. The substructure would consist of class 140 driven steel shell piles approximately 1.2 feet in diameter at the abutments and piers. Caltrans anticipates that there would be 11 new driven steel shell piles (pier columns) per pier for a total of 22 for the two piers. The piles would extend into the superstructure.

The Washington Creek Bridge would be constructed using the same methods described for Segment B.

Lynch Creek Bridge. The two Lynch Creek Bridges are only wide enough to accommodate two 12 foot wide lanes along with 2 foot wide inside shoulders and 4 foot wide outside shoulders. Both of the existing bridges were built in 1955 and consist of a three-span continuous reinforced concrete slab superstructure on reinforced concrete pile bents and reinforced concrete "U" open abutments.

As with the Washington Creek Bridge, Caltrans plans to widen the Lynch Creek Bridges to accommodate an additional 12 foot-wide HOV lane, 10 foot wide shoulders, and a ramp taper. Caltrans also plans to replace the existing bridge barriers with current standard barriers.

Access to the existing channel would be required for construction. Caltrans would widen the Lynch Creek Bridge by constructing and connecting parallel bridge structures to the median side of each of the existing bridge structures and closing the median gap as well as constructing and connecting a parallel bridge structure to the northbound side of the existing bridge. Caltrans would construct the widened portions of the bridge similar to the existing structure so that the widened portions match the existing structure in strength, durability, and flexibility.

Caltrans also plans to construct a sound wall on a bridge barrier on the southbound side of the structure. According to Caltrans, the widening of the existing bridge would require the construction of new a cast-in-place reinforced concrete slab superstructure including new concrete bent caps and abutments. The substructure consists of Class 140 (12 by 12 inch) driven precast concrete piles

Caltrans anticipates that there would be 10 new driven precast concrete piles (pier columns) per pier for a total of 20 piles for the 2 piers. The piles would extend into the superstructure.

The location and bearing for the new abutments and bents would match with the alignments of the existing abutments and bents. The use of falsework and erosion control BMPs would be similar to that used for the other bridges in this project.

Storm Water Quality Systems and Construction Site BMPs. Segment C would use the same BMPs as described for Segment B.

Construction Site BMPs. Segment C would use the same BMPs as described for Segment B.

Staging Locations. Caltrans would use staging locations for temporary storage of heavy construction equipment and construction materials, equipment maintenance shops, stockpile areas, and field offices. The primary staging areas in Segment C would be located within the State Route 116 Interchange. Caltrans proposes to use areas that are located within the State Right-of-Way and quantified as within the project area of effect, subject to approval of the contractor submitted SWPPP. Contractors may independently seek off-site staging locations. Off- site staging locations will be subject to the requirements of resource agencies and permits will be the responsibility of the contractor.

Construction Site Restoration

Caltrans plans to restore areas of temporary ground disturbances, including storage and staging areas, and temporary roads. These areas will be re-contoured, if appropriate, and revegetated with seeds and/or cuttings of appropriate plant species to promote restoration of the area to pre-project conditions. Caltrans defines areas of "temporary" disturbance to be any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Caltrans will be developing a restoration plan that will be submitted to the Service for comment prior to initial ground breaking. According to Caltrans, to the maximum extent practicable (i.e., presence of natural lands), topsoil will be removed, cached, and returned to the site according to successful restoration protocols. Loss of soil from run-off or erosion will be prevented with straw bales, straw wattles, or similar means provided they do not entangle, block escape or dispersal routes of listed animal species.

Proposed Avoidance and Minimization Measures

According to the May 2008 Biological Assessment and the revised project description provided by Caltrans on August 27, 2008, FHWA/Caltrans propose to avoid, minimize, and compensate for effects to listed species by implementing the following measures:

Federally Listed Plants

If listed plants may be affected by the project, Caltrans will implement the following:

1. Minor design modifications will be made to avoid effects to listed plant species.

2. Any area where federally listed plants and/or populations have been observed within the temporary work area will be designated an Environmentally Sensitive Area and marked in the field with orange construction fencing.

3. The location of all Environmentally Sensitive Area's will be shown on project construction drawings and noted for monitoring during construction.

4. Preconstruction botanical surveys will be conducted prior to construction during the appropriate time of year (during spring and early summer), by qualified botanists familiar with the regional flora, and will follow Service, California Department of Fish and Game, and CNPS approved protocols.

California Red-Legged Frog

1. To compensate for the potential effects to 203.78 acres of California red-legged frog habitat Caltrans and FHWA will provide compensation at a 1:1 ratio totaling approximately (203.78 acres). This compensation, which is being provided pursuant to CEQA/NEPA and FHWA policies on mitigating effects to natural lands, and which is incorporated as part of the project description, will be achieved using a combination of the following:

    a. Purchasing credits at a resource agency approved mitigation bank servicing the action area;

    b. Purchasing conservation easements at or as close to the project site as practical within Marin and/or Sonoma Counties;

    c. Purchasing fee title and preserving the land for California red-legged frog at or as close to the project site as practical within Marin and/or Sonoma Counties.

Compensation may be provided by Caltrans itself or to the extent feasible with the assistance of a state or local partner such as a park or open space district or a resource conservation district. Compensation for California red-legged frog will be provided before or concurrent with the project effects to California red-legged frog for each project Construction Phase.

2. A Service-approved biologist(s) will be designated for the construction phase activities in Segment B and Segment C that will affect California red-legged frog habitat. The qualified biologist(s) will be on-site during specific construction activities for each construction phase work in potential California red-legged frog habitat. The qualifications of the biologist(s) will be presented to the Service for review and written approval prior to ground-breaking at the project site. The biologist(s) will coordinate through the Resident Engineer, to stop any work that may result in take of the California red-legged frog. If work is stopped, the biologist(s) will notify the Service by telephone and electronic mail within one (1) working day. The Service contact will be Chris Nagano, Division Chief, Endangered Species Program at the Sacramento Field Office at telephone (916) 414-6600.

3. The Resident Engineer will halt work and immediately contact the Service-approved project biologist(s) and the Service in the event that a California red-legged frog gains access to a construction zone. The Resident Engineer will suspend construction activities in the immediate construction zone within Segment B and Segment C for each specific project phase that may affect California red-legged frog habitat until the animal leaves the site voluntarily or is removed by the biologist(s) to a release site using Service-approved handling techniques.

4. All construction supervisory personnel for each specific project phase within Segment B and Segment C that are working in areas of potential endangered species habitat will attend an environmental education program delivered by the Service approved biologist prior to working on the project site. The program will include an explanation as how to best avoid the accidental take of California red-legged frogs. The Service approved biologist(s) will conduct a training session that would be scheduled as a mandatory informational field meeting by the Caltrans Resident Engineer for all construction contractor supervisory personnel. The field meeting will include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis will be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented. The program will include an explanation of appropriate federal and state laws protecting endangered species as well as the importance of compliance with Caltrans and various resource agency conditions.

5. To minimize temporary disturbances in areas of potential California red-legged frog habitat, project related vehicle traffic within Segment B and Segment C for construction phases with potential California red-legged frog habitat will be restricted to established roads, construction areas, and other designated areas. These areas also should be included in pre-construction surveys and, to the maximum extent practicable, should be established in locations disturbed by previous activities to prevent further adverse effects. Project related vehicles will observe a 20-mile per hour speed limit within Segment B and Segment C for construction phases with potential California red-legged frog habitat, except on County roads, and State and Federal highways. Off-road traffic outside of designated action areas of Segment B and Segment C for construction phases with potential California red-legged frog habitat will be prohibited.

6. Dust control measures will be implemented within Segment B and Segment C for construction phases with potential California red-legged frog habitat, consisting of regular truck watering of constriction access areas and disturbed soil areas with the use of organic soil stabilizers to minimize airborne dust and soil particles generated from graded areas. Regular truck watering will be a requirement of the construction contract. In addition, for disturbed soil areas, an organic tackifier to control dust emissions blowing off of the right-of-way or out of the construction area during construction will be included in the contract special provisions. Watering guildelines for dewatering will be established to avoid any excessive run-off that may flow into contiguous areas. Any material stockpiles will be watered, sprayed with tackifier or covered, to minimize dust production and wind erosion.

7. Project employees will be provided with written guidance governing vehicle use, speed limits on unpaved roads, fire prevention, and other hazards.

8. To eliminate an attraction to predators of the California red-legged frog, all food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a day from the action area.

9. To avoid injury or death of a California red-legged frog, no firearms will be allowed in the action area except for those carried by authorized security personnel, or local, State, or Federal law enforcement officials.

10. To prevent harassment, injury or mortality of a California red-legged frog or destruction of their refuge, project personnel will not be permitted to have dogs or cats in the action area.

11. Use of rodenticides and herbicides in the action area will be used in such a manner to prevent primary or secondary poisoning of a California red-legged frog and the depletion of vegetation on which they depend. All uses of such compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other appropriate State and Federal regulations, as well as additional project-related restrictions deemed necessary by the Service or the California Department of Fish and Game.

12. Dedicated fueling and refueling practices will be designated as part of the approved SWPPP. Dedicated fueling areas will be protected from storm water run-on and run-off and will be located at least 50 feet from downslope drainage facilities and water courses. Fueling must be performed on level-grade areas. On site fueling will only be used where it is impractical to send vechicles and equipment off-site for fueling. When fueling must occur on-site, the contractor will designate an area to be used subject to the approval of the Resident Engineer, representing Caltrans. Drip pans or absorbent pads will be used during on-site vehicle and equipment fueling.

13. All grindings and asphaltic-concrete waste will be stored within previously disturbed areas absent of California red-legged frog habitat and at a minimum of 150 feet from any downstream riparian habitat, aquatic habitat, culvert, or drainage feature.

14. For each specific project phase within Segment B and Segment C, and to the extent practicable, areas outside of the construction zones containing suitable habitat for the California red-legged frog will be delineated with high visibility temporary fencing at least 4 feet in height, flagging, or other barrier to prevent encroachment of construction personnel and equipment onto sensitive areas during construction activities. The fencing will be removed only when all construction equipment is removed from the site. No project activities will occur outside the delineated project construction area.

15. If requested, before, during, or upon completion of ground breaking and construction activities, Caltrans will allow access by Service personnel to the action area to inspect project effects to California red-legged frogs and their habitats. Due to safety concerns, Caltrans requests that Service staff check in with the Resident Engineer prior to accessing the construction site.

16. For work on each construction phase within Segment B and Segment C that may affect California red-legged frog habitat, a Service-approved biologist(s) will be on-site to monitor the initial ground disturbance activities for the road construction. The biologist(s) will perform a clearance survey immediately prior

to the initial ground disturbance. Safety permitting, the Service-approved biologist(s) will investigate areas of disturbed soil for signs of listed species within thirty (30) minutes following the initial disturbance of that given area.

17. To prevent inadvertent entrapment of California red-legged frogs during work within construction Phase B4, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered at the close of each working day by plywood or similar materials. Alternatively, an additional 4-foot high vertical barrier, independent of exclusionary fences, may be used to further prevent the inadvertent entrapment of California red-legged frogs. If it is not feasible to cover an excavation or provide an additional 4-foot high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals. If at any time a trapped listed animal is discovered, the on-site biologist will immediately place escape ramps or other appropriate structures to allow the animal to escape, or the Service will be contacted by telephone for guidance. The Service will be notified of the incident by telephone and electronic mail within one working day.

18. Plastic mono-filament netting (erosion control matting) or similar material will not be used at the project site because California red-legged frogs may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.

19. Injured California red-legged frogs will be cared for by a licensed veterinarian or other qualified person such as the on-site biologist; dead individuals must be placed in a sealed plastic bag with the date, time, location of discovery, and the name of the person who found the animal; the carcass should be kept in a freezer; and held in a secure location. The Service and the California Department of Fish and Game will be notified within one (1) working day of the discovery of death or injury to a California red-legged frog that occurs due to project related activities or is observed at the project site. Notification will include the date, time, and location of the incident or of the finding of a dead or injured animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. The Service contacts are Chris Nagano, Division Chief, Endangered Species Program at the Sacramento Fish and Wildlife Office (916/414-6600), and Dan Crum, Resident Agent-in-Charge of the Service's Law Enforcement Division at 916/414-6660. The California Department of Fish and Game contact is Mr. Scott Wilson at telephone (707) 944-5563. Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game

20. Caltrans will submit post-construction compliance reports for each Segment B and Segment C construction phase with potential California red-legged frog habitat, prepared by the on-site biologist, to the Service within sixty (60) calendar days following completion of each phase with potential California red-legged frog habitat or within sixty calendar days of any break in construction activity lasting more than sixty calendar days. This report will detail (1) dates that construction occurred; (2) pertinent information concerning the success of the project in implementing avoidance and minimization measures for listed species; (3) an explanation of failure to meet such measures, if any; (4) known project effects on California red-legged frogs, if any; (5) occurrences of incidental take of any of these species; (6) documentation of employee environmental education; and (7) other pertinent information. The reports will be addressed to the Deputy Assistant Field Supervisor of the Endangered Species Program, Sacramento Field Office of the Service.

Salt Marsh Harvest Mouse

Caltrans stated in their August 5, 2008 letter that the following measures would be implemented during activities associated with the Petaluma Bridge. Caltrans will avoid potential salt marsh harvest mouse habitat adjacent to the action area at other locations.

1. Caltrans will begin restoration of all salt marsh harvest mouse pickleweed and upland habitat associated with the action area to baseline or better conditions following the completion of construction at the Petaluma River Bridge. Successful establishment of baseline or better salt marsh harvest mouse pickleweed habitat should be achieved within three years.

2. A Service and the California Department of Fish and Game approved biologist will be designated for construction activities for Construction Phase B4. The qualified biologist(s) will be on-site during specific construction activities for each project activity that may have adverse effects to the salt marsh harvest mouse. The qualifications of the biologist(s) will be presented to the Service and the California Department of Fish and Game for review and written approval prior to ground-breaking at the project site. The biologist(s) will coordinate through the Resident Engineer, to stop any work that may result in take of these listed animal species. If work is stopped, the biologist(s) will notify the Service and the California Department of Fish and Game by telephone and electronic mail within one working day. The Service contact will be Chris Nagano, Division Chief, Endangered Species Program at the Sacramento Field Office at telephone (916) 414-6600. The California Department of Fish and Game contact is Mr. Scott Wilson at (707) 944-5563.

3. The Resident Engineer will halt work and immediately contact the Service and California Department of Fish and Game approved biologist and the Service and the California Department of Fish and Game in the event that a salt marsh harvest mouse gains access to a construction zone. The Resident Engineer will suspend construction activities in the immediate construction zone for work in Construction Phase B4 that could have adverse effects to the salt marsh harvest mouse until the animal leaves the site voluntarily.

4. All supervisory construction personnel for Construction Phase B4 that are working in areas of potential endangered species habitat will attend an environmental education program delivered by the Service and California Department of Fish and Game approved biologist prior to working on the project site. The program will include an explanation as how to best avoid the accidental take of salt marsh harvest mouse. The Service and California Department of Fish and Game approved biologist(s) will conduct a training session that would be scheduled as a mandatory informational field meeting by the Caltrans Resident Engineer for all construction contractor supervisory personnel. The field meeting will include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis will be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented. The program will include an explanation of appropriate federal and state laws protecting endangered species as well as the importance of compliance with Caltrans and various resource agency conditions.

5. To minimize temporary disturbances for work in areas of potential salt marsh harvest mouse habitat, project related vehicle traffic within Construction Phase B4 will be restricted to established roads, construction areas, and other designated areas. These areas also should be included in preconstruction surveys and, to the maximum extent practicable, should be established in locations disturbed by previous activities to prevent further adverse effects. Project related vehicles will observe a 20-mile per hour speed limit within Construction Phase B4, except on County roads, and State and Federal highways. Off-road traffic outside of designated action areas within Construction Phases B2 and B4 will be prohibited.

6. Dust control measures will be implemented within Construction Phase B4, consisting of regular truck watering of constriction access areas and disturbed soil areas with the use of organic soil stabilizers to minimize airborne dust and soil particles generated from graded areas. Regular truck watering will be a requirement of the construction contract. In addition, for disturbed soil areas, an organic tackifier to control dust emissions blowing off of the right-of-way or out of the construction area during construction will be included in the contract special provisions. Watering guildelines for dewatering will be established to

avoid any excessive run-off that may flow into contiguous areas. Any material stockpiles will be watered, sprayed with tackifier or covered, to minimize dust production and wind erosion.

7. Project employees will be provided with written guidance governing vehicle use, speed limits on unpaved roads, fire prevention, and other hazards.

8. To eliminate an attraction to predators of the salt marsh harvest mouse, all food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a day from the action area.

9. To avoid injury or death of the salt marsh harvest mouse, no firearms will be allowed in the action area except for those carried by authorized security personnel, or local, State, or Federal law enforcement officials.

10. To prevent harassment, injury or mortality of a salt marsh harvest mouse or destruction of their refuge/nesting areas by dogs or cats, project personnel will not be permitted to have dogs or cats in the action area.

11. Rodenticides and herbicides in the action area will be used in such a manner to prevent primary or secondary poisoning of salt marsh harvest mouse and the depletion of vegetation on which they depend. All uses of such compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other appropriate State and Federal regulations, as well as additional project-related restrictions deemed necessary by the Service or the California Department of Fish and Game.

12. Dedicated fueling and refueling practices will be designated as part of the approved SWPPP. Dedicated fueling areas will be protected from storm water run-on and run-off and will be located at least 50 feet from downstream drainage facilities and water courses. Fueling must be performed on level-grade areas. On site fueling will only be used where it is impractical to send vechicles and equipment off-site for fueling. When fueling must occur on-site, the contractor will designate an area to be used subject to the approval of the Resident Engineer, representing Caltrans. Drip pans or absorbent pads will be used during on-site vehicle and equipment fueling.

13. All grindings and asphaltic-concrete waste will be stored within previously disturbed areas absent of salt marsh harvest mouse habitat and at a minimum of 150 feet from any downslope riparian habitat, aquatic habitat, culvert, or drainage feature.

14. To minimize or avoid the loss of individual salt marsh harvest mice from construction activities in the Petaluma River area, pickleweed vegetation will be hand-removed. Following removal, a special 2-foot high fence consisting of plastic sheeting will be placed 20 feet from the boundaries of construction areas in and adjacent to the pickleweed areas after the vegetation is removed. The fence will be held in place with 2-inch wide and 3-foot long stakes and will be buried in a 6 to 8 inch deep trench to prevent mice from pushing under the fence. These methods will occur with the approval of and in coordination with the California Department of Fish and Game.

15. Prior to commencing construction work for Contract Phase B4 that can have adverse effects to salt marsh harvest mouse, and to the extent practicable, areas outside of the construction zones containing suitable habitat for salt marsh harvest mouse will be delineated with high visibility temporary fencing at least 4 feet in height, flagging, or other barrier to prevent encroachment of construction personnel and equipment onto sensitive areas during construction. The fencing will be removed only when all construction equipment is removed from the site. Actions within the action area will be limited to vehicle and equipment operation on existing roads. No construction activities will occur outside the delineated project construction area.

16. Caltrans will minimize effects on potential habitat at Location 4 by restricting construction to within 100 feet of the existing Caltrans ROW. The closest potential habitat for salt marsh harvest mouse was found approximately 150 feet from the existing Caltrans ROW.

17. If requested, before, during, or upon completion of ground breaking and construction activities, Caltrans will allow access by the Service and/or California Department of Fish and Game personnel to the project site to inspect project effects to the salt marsh harvest mouse and their habitats. Due to safety concerns, Caltrans requests that Service staff check in with the Resident Engineer prior to accessing the construction site.

18. For work within Construction Phase B4 that could have adverse effects to salt marsh harvest mouse, a Service and California Department of Fish and Game approved biologist will be on-site to monitor the initial ground disturbance activities for the road construction. The biologist will perform a clearance survey immediately prior to the initial ground disturbance. Safety permitting, the Service and California Department of Fish and Game approved biologist(s) will investigate areas of disturbed soil for signs of listed species within thirty (30) minutes following the initial disturbance of that given area.

19. To prevent inadvertent entrapment of salt marsh harvest mouse during construction, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered at the close of each working day by plywood or similar materials. Alternatively, an additional 2-foot high vertical barrier, independent of exclusionary fences, may be used to further prevent the inadvertent entrapment of salt marsh harvest mice. If it is not feasible to cover an excavation or provide an additional 2-foot high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals. If at any time a trapped listed animal is discovered, the on-site biologist will immediately place escape ramps or other appropriate structures to allow the animal to escape, or the Service and/or California Department of Fish and Game will be contacted by telephone for guidance. The Service will be notified of the incident by telephone and electronic mail within one working day.

20. Injured salt marsh harvest mice will be cared for by a licensed veterinarian or other qualified person such as the on-site biologist; dead individuals must be placed in a sealed plastic bag in which a piece of paper is placed that contains the date, time, location of discovery, and the name of the person who found the animal; the carcass should be kept in a freezer; and held in a secure location. The Service and the California Department of Fish and Game will be notified within one (1) working day of the discovery of death or injury to a salt marsh harvest mouse that occurs due to project related activities or is observed at the project site. Notification will include the date, time, and location of the incident or of the finding of a dead or injured animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. The Service contacts are Chris Nagano, Division Chief, Endangered Species Program at the Sacramento Fish and Wildlife Office (916/414-6600), and Dan Crum, Resident Agent-in-Charge of the Service's Law Enforcement Division at 916/414-6660. The California Department of Fish and Game contact is Mr. Scott Wilson at telephone (707) 944-5563. Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game.

21. Caltrans will submit a post-construction compliance report for Construction Phase B4 prepared by the on-site biologist to the Service within sixty (60) calendar days following completion of Construction Phase B4 or within sixty (60) calendar days of any break in construction activity lasting more than sixty calendar days. This report will detail (1) dates that construction occurred; (2) pertinent information concerning the success of the project in implementing avoidance and minimization measures for listed species; (3) an explanation of failure to meet such measures, if any; (4) known project effects on the salt marsh harvest mouse, if any; (5) occurrences of incidental take of this listed species; (6) documentation

of employee environmental education; and (7) other pertinent information. The report will be addressed to the Deputy Assistant Field Supervisor of the Endangered Species Program.

According to the revised project description received by the Service on December 2, 2008, Caltrans plans to implement the following measures during the geotechnical investigation activities associated with construction of the Petaluma Bridge.

1. When accessing the designated temporary staging area, located between the north bank of Petaluma River and the toe of the north approach embankment, a qualified biologist will monitor the site access path taken by the drilling equipment. Along the access path near any salt marsh harvest mouse habitat designated by the biologists, plywood boards (4 feet by 8 feet) will be placed to temporarily form a pathway for the drilling equipment. A steel plate will be used to provide temporary crossing platform of a drainage ditch.

2. Maintain all vehicles and drill rigs will be inspected frequently and maintained to repair leaks.

3. Drip pans or drop cloths will be used to catch drips and spills. Drain and replace motor oil, radiator coolant, or other fluid will be conducted off site. All spent fluids will be collected, stored in labeled separate containers, and recycled whenever possible. All fuels, oils and lubricants will be kept within secondary containment.

4. Perform major maintenance, repair jobs and vehicle and equipment washing will be performed off-site when feasible, or in designated and controlled areas on-site.

5. Vehicles will be washed at an appropriate off-site facility. If equipment must be washed on-site, water will be prevented from entering the storm drain or open channel. Use of soaps, solvents, degreasers, or steam cleaning equipment will be prohibited. Wash water will be directed to an area that will not flow to any storm drain inlets or open channels.

6. Vehicles and heavy equipment will be refueled in one designated location on the site and spills will be cleaned up immediately.

7. A biological monitor will hold daily tail gate meeting prior to start of drilling activities.

8. Plastic sheeting or visqueen will be placed over the drill site to catch spills and drips of drilling fluids.

9. Straw waddle will be placed on top of visqueen to form a temporary dike surrounding the drill hole and circulation tub to contain spills.

10. Absorbents will be made available to clean up any leaks or spills.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed action, the action area includes all lands associated with the approximately 786.402 acre project footprint and roads (except for County roads, and State and Federal highways) and other areas accessed by project vehicles.

Status of the Species and Environmental Baseline

California Red-Legged Frog

The California red-legged frog was listed as a threatened species on May 23, 1996 (Service 1996). Please refer to the final rule and the *Recovery Plan for the California Red-Legged Frog (Rana aurora draytonii)* (Service 2002) for additional information on this species.

This threatened species is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have lighter centers (Stebbins 2003) and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Red-legged frogs have paired vocal sacs and vocalize in air (Hayes and Krempels 1986). Female frogs deposit egg masses on emergent vegetation, allowing the egg mass floats on the surface of the water (Hayes and Miyamoto 1984). Red-legged frogs breed from November through March with earlier breeding records occurring in southern localities (Storer 1925). Individuals occurring in coastal drainages are active year-round (Jennings *et al.* 1992), whereas those found in interior sites are normally less active during the cold season.

The historic range of the red-legged frog extended coastally from the vicinity of Elk Creek in Mendocino County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico (Fellers 2005; Jennings and Hayes 1985; Hayes and Krempels 1986). The species historically was documented in 46 counties but the taxa now remains in 238 streams or drainages within 23 counties. This represents a loss of 70 percent of its former range (Service 2002). Red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast. Within the

remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. This listed amphibian is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (California Department of Fish and Game 2004).

Adult California red-legged frogs prefer dense, shrubby or emergent riparian vegetation closely associated with deep (>2.3 feet), still, or slow-moving water (Hayes and Jennings 1988). However, frogs also have been found in ephemeral creeks and drainages and in ponds that may or may not have riparian vegetation. The largest densities of red-legged frogs currently are associated with deep pools with dense stands of overhanging willows (*Salix* species) and an intermixed fringe of cattails (*Typha latifolia*) (Jennings 1988). Red-legged frogs disperse upstream and downstream of their breeding habitat to forage and seek sheltering habitat.

California red-legged frogs also can be found in disturbed areas such as channelized creeks and drainage ditches in urban and agricultural areas. An adult California red-legged frog recently was observed in a shallow isolated pool on North Slough Creek in the American Canyon area of Napa County (Christine Gaber/PG&E personal communication with Chris Nagano/Service on October 22, 2008). This frog location was surrounded by vineyard development. Another adult California red-legged frog was observed under debris in an unpaved parking lot in a heavily industrial area of Burlingame (Patrick Kobernus communication with Michelle Havens on October 16, 2008). This Burlingame frog was likely utilizing a nearby drainage ditch. Caltrans has also discovered California red-legged frog adults, tadpoles, and egg masses within a storm drainage system within a major cloverleaf intersection of Millbrae Avenue and State Route 101 in a heavily developed area of San Mateo County (Caltrans 2007). California red-legged frog has the potential to persist in disturbed areas as long as they provide at least one or more of their life history requirements.

According to Feller and Kleeman (2007), non-breeding dry season habitat includes several characteristics: 1) sufficient moisture to allow the frogs to survive throughout the non-breeding season that may be up to 11 months long ; 2) sufficient cover to moderate temperatures during the warmest and coldest times of the year; and 3) protection (e.g., deep pools in a stream, or complex cover such as root masses or thick vegetation) from predators such as hawks and owls, herons, and small carnivores.

During other parts of the year, habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer (Fellers 2005). According to Fellers (2005), this can include vegetated areas with coyote bush (*Baccharis pilularis*), California blackberry thickets (*Rubus ursinus*), and root masses associated with willow (*Salix* species) and California bay trees (*Umbellularia californica*). Sometimes the non-breeding habitat used by red-legged frogs is extremely limited in size. For example, non-breeding red-legged frogs have been found in a 6-foot wide coyote bush thicket growing along a tiny intermittent creek surrounded by heavily grazed grassland (Fellers 2005). Sheltering habitat for red-legged frogs is potentially all aquatic, riparian, and upland areas within the range of the species and includes any landscape features that

provide cover, such as existing animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used. Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer sheltering habitat. Accessibility to sheltering habitat is essential for the survival of red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival.

Red-legged frogs do not have a distinct breeding migration (Fellers 2005). Adult frogs are often associated with permanent bodies of water. Some frogs remain at breeding sites all year while others disperse. Dispersal distances are typically less than 0.5 mile (0.8 kilometers), with records of a few individuals moving up to 1-2 miles (Fellers 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers 2005). Dispersing frogs in northern Santa Cruz County traveled distances from 0.25 miles to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger *et al.* 2003). Fellers and Kleeman (2007) and Bulger et al. (2003) found that California red-legged frog migration corridors can be less "pristine" (e.g., closely grazed fields, plowed agricultural lands) than breeding or non-breeding habitats. Bulger *et al.* (2003) observed that this listed ranid did not avoid or prefer any landscape feature or vegetation type. They tracked individuals that crossed agricultural land, including recently tilled fields and areas with mature crops. The threats facing migrating California red-legged frogs during their movements include being run over by vehicles on roads (Gibbs 1998; Vos and Chardon 1998), degradation of habitat (Vos and Stumpel 1995; Findlay and Houlahan 1997; Gibbs 1998), predation (Gibbs 1998), and dessication (Rothermel and Semlistch 2002; Mazerolle and Desrochers 2003).

Egg masses contain about 2,000 to 5,000 moderate sized (0.08 to 0.11 inches in diameter), dark reddish brown eggs and are typically attached to vertical emergent vegetation, such as bulrushes (*Scirpus* species) or cattails (Jennings *et al.* 1992). Red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Eggs hatch in 6 to 14 days (Jennings 1988). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings *et al.* 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand results in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1990). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings *et al.* 1992). Sexual maturity normally is reached at 3 to 4 years of age (Storer 1925; Jennings and Hayes 1985). Red-legged frogs may live 8 to 10 years (Jennings *et al.* 1992). Populations of red-legged frogs fluctuate from year to year. When conditions are favorable red-legged frogs can experience extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of

occupied sites. In contrast, red-legged frogs may temporarily disappear from an area when conditions are stressful (e.g., drought).

The diet of red-legged frogs is highly variable. Hayes and Tennant (1985) found invertebrates to be the most common food items. According to their data, vertebrates, such as Pacific tree frogs and California mice (*Peromyscus californicus*) represent over half the prey mass eaten by larger frogs (Hayes and Tennant 1985). Hayes and Tennant (1985) found juvenile frogs to be active diurnally and nocturnally, whereas adult frogs were largely nocturnal. The diet of red-legged frogs is not well studied, but their diet is likely similar to other ranid frogs that feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005; Kupferberg 1996a, 1996b).

Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish (*Procambarus clarkii*), signal crayfish (*Pacifastacus leniusculus*), and several species of warm water fish including sunfish (*Lepomis* species), goldfish (*Carassius auratus*), common carp (*Cyprinus carpio*), and mosquitofish (L. Hunt, in litt. 1993; S. Barry, in litt. 1992; S. Sweet, in litt. 1993). Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the red-legged frog throughout its range.

Several researchers in central California have noted the decline and eventual disappearance of red-legged frog populations once bullfrogs became established at the same site (L. Hunt, in litt. 1993; S. Barry, in litt. 1992; S. Sweet, in litt. 1993). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs (*Rana aurora aurora*), and suggested that bullfrogs could prey on subadult northern red-legged frogs as well. Bullfrogs may also have a competitive advantage over red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan 1984). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Further more, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Bullfrogs also interfere with red-legged frog reproduction. Both California and northern red-legged frogs have been observed in amplexus (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; M. Jennings, in litt.1993; R. Stebbins in litt. 1993). Thus bullfrogs are able to prey upon and out-compete red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to red-legged frog habitat has also adversely affected red-legged frogs. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks red-legged frog dispersal, and the introduction of predatory fishes and bullfrogs. The conversion and isolation of perennial pool habitats resulting from urbanization is an ongoing impact to red-legged frogs.

The California red-legged frog may be susceptible to many of the same pathogens, fungi, water mold, bacteria, and viruses have been known to adversely affect tiger salamander species or other amphibians. As with the California tiger salamander, Chytridiomycosis and ranaviruses may be a particular developing concern for California red-legged frog populations. Mao *et al.* (1999 cited in Fellers 2005) reported northern red-legged frogs infected with an iridovirus, which was also presented in sympatric three-spined sticklebacks (*Gasterosteus aculeatus*) in northwestern California. Ingles (1932a, 1932b, and 1933 cited in Fellers 2005) reported four species of trematodes from red-legged frogs, but he later synonymized two of them (found them to be the same as the other two). Nonnative species, such as bullfrogs and nonnative tiger salamanders, are both located within the range of the California red-legged frog and have been identified as potential carriers of these diseases. Human activities can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (i.e. contaminated boots or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in red-legged frogs being more susceptible to the effects of disease. Disease will likely become a growing threat because of the relatively small, fragmented remaining California red-legged frog breeding sites, the many stresses on these sites due to habitat losses and alterations, translocation of infected animals, and the many other potential disease-enhancing anthropogenic changes which have occurred both inside and outside the species' range.

The recovery plan for red-legged frogs identifies eight Recovery Units (Service 2002). The establishment of these Recovery Units is based on the Recovery Team's determination that various regional areas of the species' range are essential to its survival and recovery. The status of the red-legged frog will be considered within the smaller scale of Recovery Units as opposed to the overall range. These Recovery Units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of the range of the California red-legged frog. The goal of the draft recovery plan is to protect the long-term viability of all extant populations within each Recovery Unit. Within each Recovery Unit, core areas have been delineated and represent contiguous areas of moderate to high red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations that, combined with suitable dispersal habitat, will allow for the long term viability within existing populations. This management strategy will allow for the recolonization of habitat within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of red-legged frogs. The Marin-Sonoma Narrows Project is within Recovery Unit 3 (North Coast and North San Francisco Bay) (Service 2002).

Project Segments A and C cross through urbanized area with little potential upland red-legged frog habitat but with urban creek crossing that include degraded riparian habitat and non-native predators of this animal. Although urban, Washington and Lynch creeks in Segment C have well developed riparian cover within their confines and provide habitat for California red-legged frogs.

The habitat in and surrounding the action area of Segment B is rural and characterized by rolling oak grasslands and creeks with well-developed riparian systems. The development in Segment B is primarily limited to several large ranches and the dominate land use is cattle grazing. Based on the habitat conditions it appears likely that there is suitable upland and aquatic red-legged frog habitat throughout Segment B. According to Caltrans assessment, potential California red-legged frog habitat on both sides of the roadway that would be affected in Segment B amounts to 206.94 acres. Therefore, the Service has determined it is reasonable to conclude the California red-legged frog inhabits and has the potential to be encountered within 206.94 acres of the action area, based on the biology and ecology of the species, and the presence of suitable habitat.

Salt Marsh Harvest Mouse

The salt marsh harvest mouse was federally listed as endangered in 1970 (Service 1970). Critical habitat has not been proposed or designated. A detailed account of the taxonomy, ecology, and biology of the salt marsh harvest mouse is presented in the *Salt Marsh Harvest Mouse & California Clapper Rail Recovery Plan* (Service 1984) (Recovery Plan) and the references cited therein. The salt marsh harvest mouse is a Fully Protected Species under California law (See California Fish and Game Code Section 4700).

The salt marsh harvest mouse is a rodent endemic to the salt and brackish marshes of the San Francisco Bay Estuary and adjacent tidally influenced areas. The salt marsh harvest mouse closely resembles the western harvest mouse (*R. megalotis*). The salt marsh harvest mouse typically weighs about 0.35 ounce, has a head and body length ranging from 2.7-2.9 inches, a tail length ranging from 2.6-3.2 inches, and a hind foot length of 0.7 inch (Fisler 1965). As stated in the recovery plan, the salt marsh harvest mouse, when compared to the western harvest mouse, have darker ears, belly and back, and a slightly thicker, less pointed and unicolored tail. The salt marsh harvest mouse is further distinguished taxonomically into the northern and southern subspecies, *R. raviventris halicoetes* and *R. raviventris raviventris*, respectively. Of the two subspecies, *R. r. halicoetes* more closely resembles *R. megalotis*, and can be difficult to differentiate in the field; body color and color of ventral hairs as well as the thickness and shape of the tail have been used to distinguish the two.

The salt marsh harvest mouse has evolved to a life in tidal marshes. Specifically, they have evolved to depend mainly on dense pickleweed as their primary cover and food source. However, salt marsh harvest mice may utilize a broader source of food and cover which includes saltgrass (*Distichlis spicata*) and other vegetation typically found in the salt and brackish marshes of this region. In natural systems, salt marsh harvest mice can be found in the middle tidal marsh and upland transition zones. Upland refugia is an essential habitat component during high tide events. Salt marsh harvest mice are highly dependent on cover, and open areas as small as 33 feet wide may act as barriers to movement (Shellhammer 1978, as cited in Service 1984). The salt marsh harvest mouse does not burrow. It has been noted that the northern subspecies may build nests of loose grasses.

As described by Fisler (1965), male salt marsh harvest mice are reproductively active from April through September, but may appear active throughout the year. Females are reproductively active from March to November, and have a mean litter size of approximately four offspring.

The historic range of the species included tidal marshes within the San Francisco and San Pablo bays, east to the Collinsville-Antioch areas. Agriculture and urbanization has claimed much of the former historic tidal marshes, resulting in a 79 percent reduction in the amount of tidal marshes in these areas (Goals Project 1999). At present, the distribution of the northern subspecies occurs along Suisun and San Pablo Bays north of Point Pinole in Contra Costa County and Point Pedro in Marin County. The southern subspecies is found in marshes in Corte Madera, Richmond, and South San Francisco Bay mostly south of the San Mateo Bridge (Highway 92).

The preservation and growth of existing populations of the salt marsh harvest mouse is considered important to assuring the survival of this species. The Recovery Plan identifies essential habitat areas to be preserved or restored throughout the Estuary to meet the recovery objectives for this species. No essential habitat for the salt marsh harvest mouse is identified within the action area in the Recovery Plan.

Although no surveys for salt marsh harvest mice have been conducted within the action area, pickleweed-vegetated tidal wetlands and other potential habitat areas of suitable for the salt marsh harvest mouse occur within the action area at the Petaluma Bridge crossing. Salt marsh harvest mice have been detected in tidal marshes approximately 0.5 mile downstream of the Petaluma Bridge portion of the action area. Given that the salt marsh harvest mouse recovery plan identified four essential habitat areas on the Petaluma River and the species is known throughout the Petaluma Marsh Wildlife Area downstream of the Petaluma Bridge it is likely that salt marsh harvest mice would be found in pickleweed habitat throughout the tidally influenced portions of the Petaluma River system. As noted in the May 2008 Biological Assessment, California Department of Fish and Game biologist Fred Botti stated that the listed mouse may use the pickleweed habitat at the Petaluma Bridge crossing for migration or dispersal. Therefore, given the biology and ecology of this animal, the presence of occupied habitat in other nearby tidal marshes, and recent records, the salt marsh harvest mouse is likely to inhabit the action area.

Effects of the Proposed Action

California Red-Legged Frog

The proposed project could have adverse effects on the threatened California red-legged frog through mortality, injury, harassment, and harm of individual juveniles and adults. According to the August 5, 2008, Caltrans letter, the proposed actions will adversely affect 206.94 acres of California red-legged frog habitat. According to Caltrans, the affects amount to 203.78 acres of permanent effects and 3.16 acres of temporary effects associated with the creation of bioswales.

The proposed project likely will result in adverse effects to the feeding, resting, aestivation, movement, and other essential behaviors of the California red-legged frog. It will result in the loss and degradation of habitat. The primary east-west habitat connectivity in Segment B is at the existing bridge spanned creek crossings. The bridge widening at these locations is unlikely to present any barriers to those movement corridors. Construction and maintenance of properly sized and located culverts likely will minimize this adverse effect of the threatened California red-legged frog (see Rodriguez *et al.* 1996; Yanes *et al.* 1905).

Construction activities associated with the proposed project would remove vegetation and other materials necessary for cover and aestivation, fill or crush burrows or crevices, and potentially reduce the prey base for the California red-legged frog. Because this listed amphibian uses small mammal burrows and soil crevices for shelter, individuals may be crushed, buried, or otherwise injured during construction activities. California red-legged frogs also may be run over by construction equipment or other vehicles accessing the construction areas. Disturbance caused by construction activities may cause frogs to disperse into areas of unsuitable habitat, increase the risk of predation or other sources of mortality. Siltation, fill, or spill of petroleum products or other chemicals could cause loss of prey items in or adjacent to the project area. Construction activities are likely to result in the direct disturbance, displacement, injury, and/or morality of California red-legged frogs. Individuals likely are to be killed or injured by construction equipment or other vehicles accessing the construction site. There is a likelihood of direct injury or mortality to the animal from injury or death due to pet cats or dogs owned by construction related personnel, poisoning by pesticides, injury or death due to predators attracted to food or trash at the site, and harassment from night-lighting, noise, and vibration. Implementation of certain types of erosion control materials, such as plastic netting, could result in the entanglement and death of California red-legged frogs within these materials due to exposure or predators (Bartin and Kinkead 2005; Stuart *et al.* 2001). Disturbance from construction activities may also cause individuals to move into or across areas of unsuitable habitat where they may be prone to higher rates of mortality from vehicles and predation.

Range-wide habitat loss, fragmentation, and degradation from multiple factors are the primary threats to the California red-legged frog (Service 1996, 2004). Loss of natural lands continues to occur further reducing the habitat available for this listed animal. However, the amount of historical and current habitat loss directly attributable to road loss has not been calculated, but the effect of habitat fragmentation on the California red-legged frog is significant. Fragmentation can reduce access to habitat as well as habitat suitability, increase mortality of animals that are moving between habitat patches due to increased risk of predation, and disrupt movements, dispersal, and gene flow. As barriers to movement for the California red-legged frog, roads create smaller patches of habitat and increase patch isolation. Smaller populations of animals are at greater risk of extinction by chance from demographic, genetic, and environmental stochastic events (Wilcox and Murphy 1985; Schoener and Spiller 1992). Isolated populations also have a higher chance of extinction without the demographic and genetic input of immigrants and a lower chance of colonization after extinction (Lande 1988; Sjogren-Gulve 1994).

The short term temporal effect will occur when suitable habitat is lost when riparian and other vegetation vegetation is removed for construction of the highway, and also due to the improved ability of predators to hunt the listed amphibian. Hilty and Merender (2004) found that, in contrast to native species, non-native mammalian predators were more active in narrow and denuded riparian corridors and in large expanses of agricultural land (vineyards) far from core habitat. The increased width of the highway along with higher numbers of vehicles and speed of the cars and trucks likely will discourage or prevent movement by the California red-legged frog.

The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the California red-legged frog are especially vulnerable to roads in the landscape. Van Gelder (1973) and Cooke (1995) have examined the effect of roads on amphibians; and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species.

Fahrig *et al.* (1995) found that high traffic two-lane paved roads had a much larger effect on frog abundance than low traffic two-lane roads. Mortality rates for anurans on high traffic roads are higher than on low traffic roads (Hels and Buchwald 2001). Vos and Chardon (1998) found a significant negative effect of road density on the occupation probability of ponds by the moor frog (*Rana arvalis*) in the Netherlands. In addition, incidences of very large numbers of road-killed frogs are well documented (e.g., Asley and Robinson 1996), and studies have shown strong population level effects of traffic density (Carr and Fahrig 2001) and high traffic roads on these amphibians (Van Gelder 1973; Vos and Chardon 1998). Most studies regularly count road kills from slow moving vehicles (Hansen 1982; Rosen and Lowe 1994; Drews 1995; Mallick *et al.* 1998) or by foot (Munguira and Thomas 1992). These studies assume that every victim is observed, which may be true for large conspicuous mammals, but it certainly is not true for small animals, such as the California red-legged frog. Amphibians appear especially vulnerable to traffic mortality because they readily attempt to cross roads, are slow-moving and small, and thus can not easily be avoided by drivers (Carr and Fahrig 2001).

The direction and type of habitat used by dispersing animals is especially important in fragmented environments (Forys and Humphrey 1996). Models of habitat patch geometry predict that individual animals will exit patches at more "permeable" areas (Buechner 1987; Stamps *et al.* 1987). A landscape corridor may increase the patch-edge permeability by extending patch habitat (La Polla and Barrett 1993), and allow individuals to move from one patch to another. The geometric and habitat features that constitute a "corridor" must be determined from the perspective of the animal (Forys and Humphrey 1996).

State Route 101 from Navato to Petaluma is a formidable barrier to California red-legged frog and general wildlife movement. There are existing bridge and culvert crossings that have the potential to provide wildlife passage under State Route 101. As part of the project, Caltrans plans to upsize the diameter of approximately 36 culvert pipes and one reinforced concrete box (RCB). These replacements will include the installation of two 18-inch pipes, twenty 24-inch

pipes, six 30-inch pipes, one 36-inch pipe, two 42-inch pipes, one 43-inch pipe and a 6 foot by 3 foot RCB. In addition, Caltrans will install approximately 41 new culvert pipes, including one new 7 foot by 7 foot cattle pass. These new structures include five 18-inch pipes, fifteen 24-inch pipes, four 30-inch pipes, three 36-inch pipes, one 42-inch pipe, and two 48-inch double pipes. There are also existing crossing structures in Segment B that are not subject to project alteration. Those include two 7- to 10-foot high cattle crossings and eight 2- to 7-foot high RCBs.

The project will provide more opportunity for wildlife passage under State Route 101, however, it is doubtful if frogs will use long corregated culverts across a 80-foot or wider roadway that are not day-lighted, do not have a natural bottom, and do not have regular maintenance to prevent filling with sediment and debris. The dimension of the tunnels is considered one of the most important variables in the design of passage ways for vertebrates (Yanes *et al.* 1995; Rodriguez *et al.* 1996); although no studies have determined a minimum width for the California red-legged frog, passages made for other small vertebrates, such as salamanders, must be wide and tall enough to enable animals to clearly see to the opposite end of the culvert, or there is lighting along the culvert provided by overhead grates. Ng *et al.* (2004) note that culverts typically are installed to accommodate water flow, the installation of such passage ways solely for listed species and wildlife, especially across major roadways, is justified if no other passages or crossings exist and there is suitable habitat. It is also important that the crossing attract target listed species and wildlife; fencing or other measures be incorporated into a wildlife crossing to guide animals to the preferred crossing; the crossing be placed strategically to enhance habitat connectivity; and that the adjacent land use be conducive to long-term habitat protection (Portland State University 2003). The culverts, RCBs, and cattle crossings proposed by Caltrans may not adequately minimize the reduction or elimination of the movement of the California red-legged frog. The long term viability of any designated wildlife crossing is questionable unless crossing locations and the habitat on both sides of the crossing are permanently set aside as open space or have a conservation easement or some other designation that limits development. In addition, hog wire apparently will not be placed on the bottom one foot of the highway perimeter fence to deter frogs from entering the roadway and guide them towards safe crossings. The culverts may not be high enough to allow the animals to see through them to the other side of the roadway, improper placement in areas where the animals will not use them, and the uncertainty of maintenance and silt removal at drainage-associated crossings could eliminate their potential use by the frogs. The lack of hog wire will result in individuals crossing the roadway where they are more likely to be killed by vehicles.

Larger culverts, e.g. at least 72 inches tall, grates placed midway on the culvert to allow lighting to encourage the animals to use them, placement in areas where the animals are moving through, and appropriate, maintenance and silt removal, and the use of properly sized hog wire along the bottom of the highway perimeter fence to guide the California red-legged frog to the culverts, RCBs, and cattle crossings should increase the potential for these animals to move across the State Route 101 right-of-way in areas other than the bridged creek crossings.

Road studies suggest that properly designed passage can significantly reduce wildlife, including frog mortality (Dodd *et al.* 2004). The Town of Amherst in the State of Massachusetts installed two culverts with guiding fences to facilitate spotted salamander (*Ambystoma maculatum*) migration from their wintering burrows during the spring. Before the placement of these culverts under Henry Street, a two-lane street, salamander mortality was high. After installation, approximately 75.9% of animals that reached the tunnel entrances successfully passed through them (Jackson 1996).

The installation of a concrete median will present a definitive barrier to California red-legged frog movement over the road. Within the concrete medians, Caltrans plans to install Type S barriers for wildlife crossing every 20 feet and Type M wildlife crossings would be installed every 0.25 miles. Type S barriers are a type 60 concrete barrier with a 6 inch diameter opening at the base of the barrier for small animal passage. Type M wildlife crossings are a type 60 concrete barrier with a 2-foot break in the barrier, with the break protected by a thrie-beam guard rail to deflect vehicle traffic. Given the amount of traffic on State Route 101 it is unlikely that frogs will be able to successfully cross the road even if they do manage to find these openings.

Though the intent of wildlife culverts and crossings are to ensure safe passage of listed species and wildlife, they are also a benefit to human safety (Aleshire 2007; Ruediger and DiGiorgio undated; Sherwood 2007). Deer-automobile collisions, estimated by the Insurance Information Institute to occur at a rate of 500,000 per year, result in over $1 billion worth of vehicular damages, 29,000 human injuries, and 200 human fatalities each year (Cornell University). Insurance company, State Farm estimates that there were more than 1.2 million claims for damage in crashes with animals during the last half of 2007 and the first half of 2008 (Highway Loss Data Institute 2008). Although most animal strikes do not result in human injury, human deaths resulting from animal collision is increasing (Highway Loss Data Institute 2008). Culverts large enough to accommodate species such as deer (*Odocoileus* species) and mountain lion (*Felis concolor*), while maintaining substrates for the California red-legged frog and smaller wildlife, could reduce roadway collisions for a variety of species. For example, wildlife crossings of the Trans-Canada Highway in Canada's Banff National Park have reduced wildlife road mortality by 80%, and as much as 96% for ungulates (Robbins 2003).

Because their habitats have been fragmented, many endangered and threatened species exist as metapopulations (Verboom and Apeldom 1990; Verboom *et al.* 1991). A metapopulation is a collection of spatially discrete subpopulations that are connected by the dispersal movements of the individuals (Levins 1970; Hanski 1991). For metapopulations of listed species, a prerequisite to recovery is determining if unoccupied habitat patches are vacant due to the attributes of the habitat patch (food, cover, and patch area) or due to patch context (distance of the patch to other patches and distance of the patch to other features). Subpopulations on patches with higher quality food and cover are more likely to persist because they can support more individuals. Large populations have less of a chance of extinction due to stochastic events (Gilpin and Soule 1986). Similarly, small patches will support fewer individuals, increasing the rate of extinction. Patches that are near occupied patches are more likely to be recolonized when local extinction

occurs and may benefit from emigration of individuals via the "rescue" effect (Hanski 1982; Gotelli 1991; Holt 1993; Fahrig and Merriam 1985). For the metapopulation to persist, the rate of patches being colonized must exceed the rate of patches going extinct (Levins 1970). If some subpopulations go extinct regardless of patch context, recovery actions should be placed on patch attributes. Patches could be managed to increase the availability of food and/or cover. Movements and dispersal corridors likely are critical to California red-legged frog population dynamics, particularly because the animals likely currently persist as metapopulations with disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Hilty and Merenlender 2004; Petit *et al.* 1995; Buza *et al.* 2000).

Most metapopulation or meta-population-like models of patchy populations do not directly include the effects of dispersal mortality on population dynamics (Hanski 1994; With and Crist 1995; Lindenmayer and Possingham 1996). Based on these models, it has become a widely held notion that more vagile species have a higher tolerance to habitat loss and fragmentation than less vagile species. But models that include dispersal mortality predict exactly the opposite: more vagile species should be more vulnerable to habitat loss and fragmentation becase they are more susceptible to dispersal mortality (Fahrig 1998; Casagrandi and Gatto 1999). This prediction is supported by Gibbs (1998), who examined the presence-absence of five amphibian species across a gradient of habitat loss. He found that species with low dispersal rates are better able than more vagile species top persist in landscapes with low habitat cover. Gibbs (1998) postulated that the land between habitat serves as a demographic "drain" for many amphibians. Furthermore, Bonnet *et al.* (1999) found that snake species that use frequent long-distance movements have higher mortality rates than do sedentary species.

The construction activities at the proposed project could result in the introduction of chemical contaminants to the site. Substances used in road building materials or could leach out or wash out of the soil into adjacent habitat. Vehicles may leak hazardous substances such as motor oil and antifreeze. A variety of substances could be introduced during accidental spills of materials. Such spills can result from leaks in vehicles, small containers falling off vehicles, or from accidents resulting in whole loads being spilled. Large spills may be partially or completely mitigated by clean-up efforts, depending on the substance. California red-legged frogs using these areas could be exposed to any contaminants that are present at the site. Exposure pathways could include inhalation, dermal contact, direct ingestion, or ingestion of contaminated soil or plants. Exposure to contaminants could cause short- or long-term morbidity, possibly resulting in reduced productivity or mortality. Carcinogenic substances could cause genetic damage resulting in sterility, reduced productivity, or reduced fitness among progeny. Little information

is available on the effects of contaminants on the California red-legged frog. The effects may be difficult to detect. Morbidity or mortality likely would occur after the animals had left the contaminated site, and more subtle effects such as genetic damage could only be detected through intensive study and monitoring.

Preconstruction surveys and the relocation of individual red-legged frogs may reduce injury or mortality. However, the capturing and handling of red-legged frogs to remove them from a work area may result in the harassment, mortality or injury of individuals. Stress, injury, and mortality may occur as a result of improper handling, containment, and transport of individuals. Death and injury of individual red-legged frogs could occur at the time of relocation or later in time subsequent to their release. Although survivorship for translocated red-legged frogs has not been estimated, survivorship of translocated wildlife, in general, is lower because of intraspecific competition, lack of familiarity with the location of potential breeding, feeding, and sheltering habitats, risk of contracting disease in foreign environment, and increased risk of predation. Improper handling, containment, or transport of individuals would be reduced or prevented by use of a Service-approved biologist, by limiting the duration of handling, limited the distance of translocation, and requiring the proper transport.

Biologists, construction workers, and construction equipment working in different areas and with different species may transmit diseases by introducing contaminated equipment. The chance of a disease being introduced into a new area is greater today than in the past due to the increasing occurrences of disease throughout amphibian populations in California and the United States. It is possible that chytrid fungus may exacerbate the effects of other diseases on amphibians or increase the sensitivity of the amphibian to environmental changes (e.g., water pH) that reduce normal immune response capabilities (Bosch *et al.* 2001). Implementation of the "Declining Amphibian Populations Task Force Fieldwork Code of Practice" during any aquatic survey activity will likely prevent transfer of diseases through contaminated equipment or clothing.

Construction of roads can facilitate the invasion and establishment by species not native to the area (Gelbard and Belnap 2003) or are native and are better competitors than the California red-legged frog, such as the bullfrog, that could feed on or compete with, the listed amphibian or its food sources. Disturbance and alteration of habitat adjacent to roads may create favorable conditions for non-native plants and animals. These exotic species can spread along roadsides and then into adjacent habitat. Non-native animals may use modified habitats adjacent to road to disperse into California red-legged frog habitat. These animals could compete with the listed ranid for resources such as food or cover, or directly injure or kill the amphibians. Non-native plants and animals may reduce habitat quality for the threatened frog, and reduce the productivity or the local carrying capacity for the animals. Introductions of non-native species could cause California red-legged frogs to alter behavioral patterns by avoiding or abandoning areas near road.

Disturbed areas adjacent to roads provide favorable habitat conditions for a number of non-native plant species. Some of these taxa are aggressively invasive and they can alter natural communities and potentially affect habitat quality. A problematic species within the range of the California red-legged frog is yellow star thistle (*Centaurea melitensis*). Dense stands of this plant can form along roadsides and then spread into adjacent habitat. This plant displaces native vegetation, competes with native plants for resources, and it may be difficult for the animals to move through due the plant's numerous sharp spines. Other species that may disperse along roads and invade adjacent riparian habitats include mustards (*Brassica* species) and Russian thistle (*Salsola tragus*) (Tellman 1997). Disturbed soils and reduced competition from native plants are some of the conditions that facilitate invasion along roads by non-native plant species.

Negative effects to wildlife populations from roads may extend some distance from the actual road, as the proposed project. The phenomenon can result from any of the effects already described in this biological opinion, such as vehicle-related mortality, habitat degradation, and invasive exotic species. Forman and Deblinger (1998) described the area affected as the "road effect" zone. Along a 4-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1970 feet. However, in places they detected an effect > 0.6 mile from the road. Rudolph *et al* (1999) detected reduced snake abundance up to 2790 feet from roads in Texas. They estimated snake abundance out to 2790 feet, so the effect may have been greater. Extrapolating to a landscape scale, they concluded the effect of roads on snake populations in Texas likely was significant, given that approximately 79% of the land area of the Lone Star State is within 1640 feet of a road. The "road-zone" effects can be subtle. Van der Zandt *et al.* (1980) reported that lapwings (*Vanellus vanellus*) and black-tailed godwits (*Limosa limosa*) feeding at 1575 feet-6560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep (*Ovis canadensis*) increases near roads (MacArthur *et al.* 1979). Trombulak and Frossell (2000) described another type of "road-zone' effect. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, by elevated levels of metals in both soil and plants were detected at 660 feet of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman (2000) estimated the effect zone along primary roads of 1000 feet in woodlands, 1197 feet in grasslands, and 2657 feet) in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road zone" and the California red-legged frog have not been adequately investigated.

The proposed compensation for the effects to 203.78 acres of California red-legged frog habitat will likely be beneficial to this listed species in Marin and/or Sonoma Counties. Caltrans proposes expenditure of the funds to purchase California red-legged frog credits at a Service-approved approved conservation bank, establishment of a Service-approved conservation easement, or obtaining fee title to habitat acquisition.

Caltrans is entertaining the possibility of obtaining a conservation easement at the Lawson's Landing property at Dillon Beach in Marin County. Lawson's Landing property is approximately 940 acres, and is one of the few areas remaining in coastal California with an active dune system that is not under permanent conservation status. The site supports a high proportion of dune slack wetlands with breeding habitat for the California red-legged frog. It has the largest expanse of native coastal scrub vegetation on paleodunes north of Monterey. The beach supports one of the largest wintering populations for the threatened western snowy plover (*Charadrius alexandrinus nivosus*) between San Francisco and the northern end of their range in Washington State. The endangered Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*) has been documented in the past as well as the endangered Tidestrom's lupine (*Lupinus tidestromii*) and the potential exists to repatriate these species for their recovery. The dunes and wetlands host numerous other special status plants and invertebrates that are adapted to shifting sands and coastal wetlands. The site not only offers important biological resources, but geological interest, as well as stunning scenic resources. The area contains important habitat for the California red-legged frog, as well as other listed species. Not all of the Lawson's Landing property provides habitat for the California red-legged frog but the establishment of a conservation easement on the California red-legged frog habitat within the Lawson's Landing property likely will provide benefits to several listed species, as well as native wildlife.
There are also several ranchers in Marin and Sonoma Counties that would be willing to sell conservation easements on their land that would allow them to maintain ecologically sustainable grazing while providing in-perpetuity management for the California red-legged frog. Conservation easements would be especially valuable for this listed frog in areas of designated or proposed California red-legged frog critical habitat.

Salt Marsh Harvest Mouse

Construction and other work activities at the Petaluma River Bridge crossing would permanently eliminate about 0.05 acres of pickleweed-vegetated habitat currently available for salt marsh harvest mice. Construction and other work activities in and around the pickleweed habitat near the Petaluma River Bridge crossing could affect individual salt marsh harvest mice through increased disturbance and habitat destruction. Increased levels of disturbance to salt marsh harvest mice would result from noise and vibrations from equipment and other work activities. Operation of equipment and associated loss of habitat would result in displacement of salt marsh harvest mice from protective cover and their territories/home ranges (through noise and vibrations) and/or direct injury or mortality (through crushing). These disturbances likely would disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal, and likely result in the displacement of salt marsh harvest mice from their territory/home range in the areas where their habitat is destroyed. Displaced salt marsh harvest mice may have to compete for resources in occupied habitat, and may be more vulnerable to predators. Female salt marsh harvest mice are reproductively active from March through November (Fisler 1965), so disturbance during this period could result in abandonment or failure of their litter. Thus, displaced salt marsh harvest mice may suffer from increased predation, competition, mortality, and reduced reproductive success.

Salt marsh harvest mice could be harmed if the habitat area affected by the proposed action is colonized by non-native, invasive plant species. The proposed action could result in the invasion of non-native plant species in the habitat area off the Petaluma River and subsequently into adjacent habitat areas for the salt marsh harvest mouse and California clapper rail. If established in these habitat areas, these non-native plant species could limit the habitat value of these areas for salt marsh harvest mice and California clapper rails by out competing and preventing or limiting the establishment of native wetland plant species. Successful removal of non-native, invasive plant species could prevent, or at least severely reduce the establishment of these undesirable species and ensure that current habitat values are reestablished or increased.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Numerous non-Federal activities continue to negatively affect the California red-legged frog in Marin and Sonoma Counties. Habitats are lost or degraded as a result of road and utility construction and maintenance, overgrazing, agricultural expansion, and water irrigation and storage projects that may not be funded, permitted, or constructed by a Federal agency. Other threats include contamination, poisoning, increased predation, and competition from non-native species associated with human development. Small private actions that may impact listed species, such as conversion of land, small mammal population control, mosquito control, and residential development, may occur without consultation with or authorization by the Service or the California Department of Fish and Game pursuant to their respectively Endangered Species Act.

As urban development continues, it will likely adversely affect upland areas that serve as dispersal and aestivation habitat for red-legged frogs. Continued development and maintenance of roadways to serve expanding urban areas may further fragment and isolate populations of red-legged frogs from other nearby populations. Increased predation associated with domesticated pets or feral animals generally accompanies urban expansion. As urban development encroaches on rural areas, the need increases for mosquito abatement programs that may introduce exotic fish into ponds used for breeding by red-legged frogs, thus impacting the reproductive success of this species.

Increased levels of vehicles and increased vehicle speeds could lead to an increased mortality level for the California red-legged frog. The cumulative local development will result in temporary and permanent habitat fragmentation. The results of fragmentation are inhibition of genetic exchange between populations and impediments to recolonization of habitats from which populations have been extirpated. Small, isolated populations are substantially more vulnerable

to stochastic events (e.g., aberrant weather patterns, fluctuations in availability of food) and may exhibit reduced adaptability to environmental (natural or anthropogenic) changes.

There is a continued demand for new housing and commercial development in Marin and Sonoma Counties and other road and development projects have been recently completed or are planned along the State Route 1, State Route 12, State Route 101, and State Route 116. These developments and further infill will eliminate the habitat connectivity between listed species habitat remaining habitat in the action area vicinity and the local region. Development of adjacent wildlife habitat will continue to result in the loss of not only breeding, resting, and foraging habitat, but the loss of dispersal corridors between breeding populations, thereby further isolating and fragmenting wildlife populations. Additionally, development of small reservoirs or water bodies, such as golf course hazards, and water diversions may occur which may pose further threats such as disruption of dispersal corridors for terrestrial species, and competition or predation from with non-native species such as bullfrogs for aquatic species.

Cumulative effects to the California red-legged frog include continuing and future conversion of suitable breeding, foraging, sheltering, and dispersal habitat resulting from urban development. Additional urbanization can result in road widening and increased traffic on roads that bisect habitat, thereby increasing road-kill while reducing in size and further fragmenting remaining habitats.

Cattle-grazing is a common land use practice in rural Marin and Sonoma Counties. Overgrazing results in degradation and loss of riparian vegetation, increased water temperatures, streambank and upland erosion, and decreased water quality in streams. Livestock operations may also degrade water quality with pesticides and nutrient contamination. However, light to moderate livestock grazing is generally thought to be compatible with continued successful use of rangelands by the red-legged frog and other listed species, provided the grazed areas do not also have intensive burrowing rodent control efforts (T. Jones, in litt. 1993; Shaffer et al. 1993). The shorter vegetation associated with grazed areas may make the habitat more suitable for ground squirrels whose burrows are utilized by red-legged frogs. Rodent control in rural areas in Marin and Sonoma Counties could contribute to the decline of red-legged frogs in the region, as well as other sensitive species that utilize burrows created by burrowing rodents.

Agricultural development, impoundments, and irrigation can reduce stream flows, resulting in the loss of aquatic habitat during the summer for red-legged frogs. Discing is a common practice on agricultural lands which can result in substantial losses of upland habitat for red-legged frogs. Significant conversion of rural, undeveloped land to agricultural land, particularly vineyards, is currently occurring in Sonoma County, resulting in loss of upland habitat for listed species. California red-legged frogs likely are exposed to a variety of pesticides and other chemicals throughout their ranges. This amphibian species could also die from starvation due to the loss of their prey base. Hydrocarbon and other contamination from oil production and road runoff; the application of numerous chemicals for roadside maintenance; urban/suburban landscape maintenance; and rodent and vector control programs may all have negative effects on red-legged

frog populations. In addition, red-legged frogs may be harmed through increased road kill due to the construction and use of new roads and increased traffic in the overall region and collection by amphibian enthusiast and others.

Further habitat fragmentation; additional non-native species introduction; translocation of infected individuals, and increased access to aquatic habitat could facilitate or increase the spread of amphibian diseases within the range of the California red-legged frog. The global mass extinction of amphibians primarily due to chytrid fungus continues to be of significant concern (Norris 2007; Skerratt *et al* 2007).

The global average temperature has risen by approximately 0.6 degrees centigrade during the 20th Century (International Panel on Climate Change 2001, 2007; Adger et al 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (International Panel on Climate Change 2001, 2007; Adger et al. 2007), and that it is "very likely" that it is largely due to increasing concentrations of greenhouse gases (carbon dioxide, methane, nitrous oxide, and others) in the global atmosphere from burning fossil fuels and other human activities (Cayan et al. 2005, EPA Global Warming webpage http://yosemite.epa.gov; Adger et al. 2007). Eleven of the twelve years between 1995 and 2006 rank among the twelve warmest years since global temperatures began in 1850 (Adger et al. 2007). The warming trend over the last fifty years is nearly twice that for the last 100 years (Adger et al. 2007). Looking forward, under a high emissions scenario, the International Panel on Climate Change estimates that global temperatures will rise another four degrees centigrade by the end of this Century; even under a low emissions growth scenario, the International Panel on Climate Change estimates that the global temperature will go up another 1.8 degrees centigrade (International Panel on Climate Change 2001).

The increase in global average temperatures affects certain areas more than others. The western United States, in general, is experiencing more warming than the rest of the Nation, with the 11 western states averaging 1.7 degrees Fahrenheit warmer temperatures than this region's average over the 20th Century (Saunders et al. 2008). California, in particular, will suffer significant consequences as a result of global warming (California Climate Action Team 2006). In California, reduced snowpack will cause more winter flooding and summer drought, as well as higher temperatures in lakes and coastal areas. The incidence of wildfires in the Golden State also will increase and the amount of increase is highly dependent upon the extent of global warming. No less certain than the fact of global warming itself is the fact that global warming, unchecked, will harm biodiversity generally and cause the extinction of large numbers of species. If the global mean temperatures exceed a warming of two to three degrees centigrade above pre-industrial levels, twenty to thirty percent of plant and animal species will face an increasingly high risk of extinction (International Panel on Climate Change 2001, 2007).

The mechanisms by which global warming may push already imperiled species closer or over the edge of extinction are multiple. Global warming increases the frequency of extreme weather events, such as heat waves, droughts, and storms (International Panel on Climate Change 2001,

2007; California Climate Action Team 2006; Lenihan et al. 2003). Extreme events, in turn may cause mass mortality of individuals and significantly contribute to determining which species will remain or occur in natural habitats. As the global climate warms, terrestrial habitats are moving northward and upward, but in the future, range contractions are more likely than simple northward or upslope shifts. Ongoing global climate change (Anonymous 2007; Inkley et al. 2004; Adger et al. 2007; Kanter 2007) likely imperils the California red-legged frog and the resources necessary for its survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Numerous activities continue to eliminate habitats of salt marsh harvest mice. Habitat loss and degradation affecting this species continues as a result of urbanization, freshwater urban run-off, and contaminant inputs. Salt marsh harvest mice are also affected by increased predation associated with human development, and disturbance of breeding and foraging behavior. All of these non-Federal activities are expected to continue to adversely affect listed species considered in this opinion within the action area.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by FHWA so that they become binding conditions of any grant or permit issued to FHWA as appropriate, in order for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this Incidental Take Statement. If FHWA (1) fails to require Caltrans to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect because when California red-legged frogs are not in their breeding ponds, they inhabit the burrows of ground squirrels or other rodents; they may be difficult to locate due to their cryptic appearance and behavior; the juvenile and adult animals may be located a distance from the breeding ponds; the migrations occur on a limited period during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Recent project monitoring suggests that California red-legged frogs are difficult to find during preconstruction clearance surveys that include excavation of potential upland salamander refugia in close proximity to breeding ponds and other aquatic habitat. Losses of California red-legged frogs may also be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as all of the California red-legged frogs inhabiting or utilizing the 206.94 acres of habitat identified within Segment B and Washington Creek and Lynch Creek in Segment C. The incidental take is expected to be in the form of harm, harassment, injury, and mortality to adult California red-legged frogs from habitat loss/degradation, construction-related disturbance, and capture and relocation.

The Service anticipates incidental take of the salt marsh harvest mouse will be difficult to detect or quantify because of the variable, unknown size of any resident population over time, and the difficulty of finding killed or injured small mammals. The level of take of salt marsh harvest mice can be anticipated by the loss of available habitat. The Service considers the number of salt marsh harvest mice subject to harassment from noise and vibrations to be impracticable to estimate. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the proposed project in the form of harm, and harassment of the salt marsh harvest mouse caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Upon implementation of the following reasonable and prudent measures incidental take associated with the proposed action described above for the California red-legged frog and salt marsh harvest mouse will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service determined that this level of anticipated take is not likely to result in jeopardy to the California red-legged frog or the salt marsh harvest mouse. There is no designated or proposed critical habitat for the listed frog in the action area and critical habitat has not been designated for the salt marsh harvest mouse.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effect of the proposed action on the California red-legged frog and the salt marsh harvest mouse. FHWA will be responsible for compliance with these measures which they will entrust Caltrans to implement:

1. FHWA will ensure the conservation measures in the project description as described in the May 2008, Biological Assessment, the August 27, 2008 revised project description, and this biological opinion will be implemented.

2. FHWA will ensure adverse effects to the California red-legged frog and the salt marsh harvest mouse will be minimized.

3. FHWA will ensure their compliance with this biological opinion.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, with implementation under the direction of Caltrans, FHWA shall ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

   a. FHWA shall minimize the potential for harm, harassment, or killing of federally listed wildlife species resulting from project related activities by implementation of the conservation measures as described in the May 2008, Biological Assessment, the August 27, 2008 revised project description, and appearing in the *Project Description* of this biological opinion.

   b. FHWA/Caltrans shall include Special Provisions that include the Conservation Measures and the Terms and Conditions of this biological opinion in the solicitation for bid information. In addition, Caltrans shall educate and inform contractors involved in the project as to the requirements of the biological opinion.

   c. Caltrans and FHWA have proposed to provide 1:1 compensation for the effects to 203.78 acres of California red-legged frog habitat. Acceptable compensation shall be satisfied through in-perpetuity preservation of high quality red-legged frog habitat consisting of a breeding and/or significant dispersal habitat between breeding populations or a biological equivalent site similar to Lawson's Landing through

purchase of bank credits and/or acquisition of a conservation easement or fee title. Purchase of the site shall be reviewed and approved by the Service.

If a compensation bank is proposed in lieu of acquisition it shall be a Service-approved bank.

An approved ecologically-based conservation easement shall include restricted public access, a management plan, and an in-perpetuity endowment or other permanent non-wasting management fund based on a property analysis. The management plan shall include a description of the site, management needs (e.g. grazing plan, non-native vegetation and animal control, etc), when the management activities should be implemented, how often and to what level monitoring of the site shall occur, and a action/contingency plan to address potential management issues.

Proposed habitat acquisition shall also be accompanied by a Service-approved conservation easement that shall include restricted public access, a management plan, and an in-perpetuity endowment based on a property analysis.

Caltrans will demonstrate measurable progress in proving the Service approved compensation prior to initiating construction in Segment B in Phase 1, not no later than initiating construction on Phase 2.

d. Wildlife crossings established in Segment B shall be reviewed and approved by the Service.

e. FHWA/Caltrans shall prepare a relocation plan for moving California red-legged frogs that will be submitted to the Service for review and approval at least thirty (30) calendar days prior to the date of groundbreaking.

2. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):

a. The Resident Engineer or their designee shall be responsible for implementing the conservation measures and Terms and Conditions of this biological opinion and shall be the point of contact for the project. The Resident Engineer or their designee shall maintain a copy of this biological opinion onsite whenever construction is taking place. Their name and telephone number shall be provided to the Service at least thirty (30) calendar days prior to groundbreaking at the project. Prior to ground breaking, the Resident Engineer must submit a letter to the Service verifying that they posses a copy of this biological opinion and have read the Terms and Conditions.

b. The Caltrans biologist shall have oversight over implementation of all the Terms and Conditions in this biological opinion, and shall have the authority to stop project

activities, through communication with the Resident Engineer or their designee, if any of the requirements associated with these Terms and Conditions are not being fulfilled. If biologist/construction liaison has requested a stop work due to take of any of the listed species the Service and the California Department of Fish and Game will be notified within one (1) working day via email or telephone.

c. Only Service-approved biologist(s) who are familiar with the biology and ecology of the California red-legged frog shall capture or handle this listed species.

d. To control erosion during and after implementation of the project, the applicant will implement erosion control BMPs. Erosion control measures and BMPs, which retain soil or sediment, runoff from dust control, and hazardous materials on the construction site and prevent these from entering aquatic habitat, will be placed, monitored, and maintained throughout the construction operations. These measures and BMPs may include, but are not limited to, silt fencing, sterile hay bales, vegetative strips, hydroseeding, and temporary sediment disposal.

e. Nets or bare hands may be used to capture California red-legged frogs. Service-approved biologists will not use soaps, oils, creams, lotions, repellents, or solvents of any sort on their hands within two hours before and during periods when they are capturing and relocating red-legged frogs. To avoid transferring disease or pathogens between aquatic habitats during the course of surveys or handling of red-legged frogs, Service-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice." Service-approved biologists will limit the duration of handling and captivity of red-legged frogs. While in captivity, individual frogs shall be kept in a cool, moist, aerated environment, such as a bucket containing a damp sponge. Containers used for holding or transporting adults shall not contain any standing water. California red-legged frogs should not be moved outside their functional population in order to reduce translocation stress and the spread of disease.

f. Biologists shall take precautions to prevent introduction of amphibian diseases to the action area by disinfecting equipment and clothing as directed in the October 2003, California tiger salamander survey protocol titled, Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander and the recommended equipment decontamination procedures within the Service's California Red-Legged Frog Survey Guidance. Both items are available at the Service's Sacramento office website (http://www.fws.gov/sacramento/es/protocol.htm). Disinfecting equipment and clothing is especially important when biologists are coming to the action area to handle salamanders or frogs after working in other aquatic habitats.

g. All California red-legged frogs encountered in the action area should be relocated to a Service-approved location. The relocation site must be approved for the Marin Sonoma Narrows Project prior to ground breaking.

h. An outline of the employee environmental awareness program shall be submitted to the Deputy Assistant Field Supervisor of the Endangered Species Program at the Sacramento Fish and Wildlife Office within twenty (20) working days prior to the start of construction. Documentation of the training, including individual signed affidavits, will be kept of file and available on request.

i. Permanent and temporary disturbances and other types of project-related disturbance to the habitats of the California red-legged frog and the salt marsh harvest mouse shall be minimized to the maximum extent practicable by Caltrans. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and other designated areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

j. Areas disturbed by project activities will be recontoured to pre-project conditions and reseeded with an appropriate erosion-control mixture. The seed mixture will include appropriate native grasses and forbs. Areas that will be subjected to ongoing maintenance are not areas of temporary effects even if they are restored within one year following the initial disturbance.

k. Construction activities shall not occur adjacent to the pickleweed wetland on the north side of the Petaluma River during high tide events of eight feet or greater (as determined by NAVD88 vertical datum) when salt marsh harvest mice might seek refuge outside of the adjacent inundated tidal marsh. Activities shall not resume until the water level has dropped below the eight foot NAVD88 elevation.

3. The following Terms and Conditions implement Reasonable and Prudent Measure three (3):

a. The following shall be implemented for staging, storage sites, vehicle parking, and access associated with the project:

1. Caltrans shall require as part of the construction contract that all contractors comply with the Act in the performance of the work as described in the project description of this biological opinion and conducted within the action area.

2. If a staging, storage, access, or vehicle parking area that is in compliance with the Act is not available, the agency with jurisdiction and the contractor would be responsible for compliance with the Act.

c. Caltrans shall report to the Service any information about take or suspected take of listed wildlife species not authorized by this biological opinion. Caltrans must notify the Service via electronic mail and telephone within 24 hours of receiving such information. Notification must include the date, time, location of the incident or of the finding of a dead or injured animal, and photographs of the specific animal. The individual animal shall be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contacts are Chris Nagano, Division Chief, Endangered Species Program, Sacramento Fish and Wildlife Office at (916) 414-6600, and Resident Agent-in-Charge Dan Crum of the Service's Law Enforcement Division at (916) 414-6660.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

The Service requests notification of the implementation of any conservation recommendations in order to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats. We propose the following conservation recommendations:

1. FHWA, Caltrans, Transportation Authority of Marin, and Sonoma County Transportation Authority should assist the Service in implementing recovery actions identified in the *Recovery Plan for the California Red-legged Frog* (Service 2002).

2. Caltrans should consider participating in the planning for a regional habitat conservation plan for the California red-legged frog, salt marsh harvest mouse, other listed species, and sensitive species.

3. FHWA, Caltrans, Transportation Authority of Marin, and Sonoma County Transportation Authority should consider establishing functioning preservation and creation conservation banking systems to further the conservation of the California red-legged frog, salt marsh harvest mouse, and other listed species. Such banking systems also could possibly be utilized for other required mitigation (i.e., seasonal wetlands, riparian habitats, etc.) where

appropriate. Efforts should be made to preserve habitat along roadways in association with wildlife crossings.

4. Roadways can constitute a major barrier to critical wildlife movement. Therefore, FHWA, Caltans, Transportation Authority of Marin, and Sonoma County Transportation Authority should incorporate culverts, tunnels, or bridges on highways and other roadways that allow safe passage by California red-legged frog, other listed animals, and wildlife. Photographs, plans, and other information in to the biological assessments if "wildlife friendly" crossings are incorporated into projects. Efforts should be made to establish upland culverts designed specifically for wildlife movement rather than accommodations for hydrology. Transportation agencies should also acknowledge the value of enhancing human safety by providing safe passage for wildlife in their early project design.

5. FHWA and Caltrans should continue to pursue multifaceted compensation packages such as the one developed for the proposed U.S. Interstate 580/Isabel Avenue Interchange Construction Project on future formal consultations with the Service.

6. Caltrans should continue to develop and implement their Early Statewide Biological Mitigation Planning Project that has been developed by the University of California at Davis, Road Ecology Center through Caltrans funding.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and/or proposed species or their habitats, the Service requests notification of the implementation of these recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the proposed State Route 101 Marin-Sonoma Narrows HOV Widening Project, Marin and Sonoma Counties, California. As provided in 50 CFR §402.16 and in the terms and conditions of this biological opinion, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the final project design exceeds the described action area in the May 2008 Biological Assessment; (2) the amount or extent of incidental take is exceeded; (3) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (4) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (5) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have questions concerning this opinion on the proposed State Route 101 Marin-Sonoma Narrows HOV Widening Project, Marin and Sonoma Counties, California, please contact John Cleckler or Ryan Olah at the letterhead address or at (916) 414-6600.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Larry Vinzant, Cesar Perez, Federal Highway Administration, Sacramento, California
Dale Jones, California Department of Transportation, Sacramento, California
Jim Richards, John Yeakel, Kevin Melanephy, California Department of Transportation, Oakland, California
Corinna Lu, CH2M Hill, Oakland, California
Scott Wilson, Melissa Escaron, California Department of Fish and Game, Yountville, California
Guy Preston, Preston Engineering Management Consulting, Ashland, Oregon
Bill Gamlen, Transportation Authority of Marin, San Rafael, California
John Maitland, Seana Gause, Sonoma County Transportation Authority, Santa Rosa, California

Literature Cited

Adger, N., P.Aggarwal, S. Agrawala, J.Alcamo, A. Allali, O. Anisimov, N. Arnell, M. Boko, O.Canziani, T. Carter, G. Cassa, U. Confalonieri, R. Cruz, E.de Alba Alcaraz, W. Eastreling, C. Field, A. Fischlin, B. Fitzharris, C.G. Garcia, C. Hanson, H. Harasawa, K. Hennessy, S.Huq, R. Jones, L. K. Bogataj, D. Karoly, R. Kliein, Z. Kundzewicz, M. Lal, R. Lasco, G. Love, X. Lu, G. Magrin, L.J. Mata, R. McLean, B. Menne, G. Midgley, N. Mimura, M.Q. Mirza, J. Moreno, L. Mortsch, I. Niang-Diop, R. Nichols, B. Novaky, L. Nurse, A. Nyon, M. Oppenheimer, J. Palutikof, M. Parry, A. Patwardhan, P. R. Lankao, C. Rosenzweig, S. Schneider, S. Semenov, J. Smith, J. Stone, J van Ypersele, D. Vaughan, C. Vogel, T. Wilbanks, P.Wong, S. Wu, and G. Yohe. 2007. Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Climate Change 2007: Climate change impacts, adaptation and vulnerability. Brussels, Belgium.

Aleshire, P. 2007. Safe Crossing. High Country News November 12, 2007.

Anonymous. 2007. Global warming is changing the World. Science 316:188-190.

Buechner, M. 1987. Conservation in insular parks: simulation models of factors affecting the movement of animals across park boundaries. Biological Conservation 41:57-76.

Bulger, J. B., N. J. Scott Jr., and R. B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. Biological Conservation 110:85-95.

California Department of Transportation (Caltrans). 2007. Biological assessment for the restoration of the hydraulic capacity of the Cowan Storm Drain Canal within the U.S. Highway 101/Millbrae Avenue Interchange. EA 3A0400. December 2007. Caltrans District 4, Oakland, California.

California Climate Action Team. 2006. Climate Action Team Final Report to the Governor and Legislature. http://www.climatechange.ca.gov/climate_action_team/index.html.

Cayan, D.A., L. Leurs, M. Hanemann, G. Franco, and B. Croes. 2006. Sceanrios of climate change in California: an overview. A report from the California Climate Change Center, California Energy Commission and the California Environmental Protection Agency, Sacramento, California.

Carr, L.W., and L. Fahrig. 2001. Effect of road traffic on two amphibian species of differing vagility. Conservation Biology 15: 1071-1078.

Casagrandi, R., and M. Gatto. 1999. A mesoscale approach to extinction in fragmented habitats. Nature 400: 560-562.

Cornell University. Management of Wildlife Damage in Suburban and Rural Landscapes. http://wildlifecontrol.info/ne1005. Accessed December 2007.

Dodd, C. K. Jr., W. J. Barichivich, and L. L. Smith. 2004. Effectiveness of a barrier wall and culverts in reducing wildlife mortality on a heavily traveled highway in Florida. Biological Conservation 118 (2004) 619-631.

Drews, C. 1995. Road kills of animals by public traffic in Mikumi National Park, Tanzania, with notes on baboon mortality. African Journal of Ecology 33: 89-100.

Emlen, S. T. 1977. "Double clutching" and its possible significance in the bullfrog. Copeia 1977(4):749-751.

Fahrig, L. 1998, When does fragmentation of breeding habitat affect population survival? Ecological Modeling 105: 273-292.

Fahrig, L., and G. Merriam. 1985. Habitat patch connectivity and population survival. Ecology 66:1762-1768

Fahrig, L., J.H. Pedlar, S.E. Pope, P.D. Taylor, and J. F. Wegner. 1995. Effect of road traffic on amphibian density. Biological Conservation 73: 177-182.

Fellers, G. 2005. *Rana draytonii* Baird and Girard, 1852b California red-legged frog. Pages 552-554 *in* M. Lannoo (editor). Amphibian declines the conservation status of United States species. University of California Press. Berkeley, California.

Fellers, G. M. and P. M. Kleeman. 2007. California Red-Legged Frog (*Rana draytonii*) movement and habitat use: implications for conservation. Journal of Herpetology 41(2): 271-281

Findlay, C.S. and J. Houlahan. 1997. Anthropogenic correlates of species richness in southeastern Ontario wetlands. Conservation Biology 11: 1000-1009.

Fisler, G. F. 1965. Adaption and speciation in harvest mice of the marshes of San Francisco Bay. Univ. Calif. Publ. Zool. 77:1-108.

Forman, R. T., L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29:207-231.

Gibbs, J.P. 1998. Amphibian movements in response to forest edges, roads, and streambeds in southern New England. Journal of Wildlife Management 62: 584-589.

Goals Project. 1999. Baylands ecosystem habitat goals. A report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, California, and San Francisco Bay Regional Water Quality Control Board, Oakland, California. 209 pp. plus appendices.

Hanski, I. 1982. Dynamics of regional distribution: the core and satellite hypothesis. Oikos 38:210-221.

_____ 1991. Single species metapopulation systematics: concepts, models and observations. Biological Journal of the Linnean Society 42:3-16.

_____ 1994. A practical model of metapopulation dynamics. Journal of Animal Ecology 63: 151-162.

Hayes, M. P., and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): implications for management. Pages 144-158 *in* R. Sarzo, K. E. Severson, and D. R. Patton (technical coordinators). Proceedings of the symposium on the management of amphibians, reptiles, and small mammals in North America. United States Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station, Fort Collins, Colorado. General Technical Report (RM-166): 1-458.

Hayes, M. P. and D. M. Krempels. 1986. Vocal sac variation among frogs of the genus *Rana* from western North America. Copeia 1986(4):927-936.

Hayes, M. P. and M. M. Miyamoto. 1984. Biochemical, behavioral and body size differences between *Rana aurora aurora* and *R. a. draytonii*. Copeia 1984(4):1018-1022.

Hayes, M. P., and M. R. Tennant. 1985. Diet and feeding behavior of the California red-legged frog, *Rana aurora draytonii* (Ranidae). Southwestern Naturalist 30(4): 601-605.

Hels, T. and E. Buchwald. 2001. The effect of road kills on amphibian populations. Biological Conservation 99: 331-340.

Highway Loss Data Institute. 2008. Collisions with deer and other animals spike in November; fatal crashes up 50% since 2000. October 30, 2008, news release. Available at http://www.iihs.org/news/2008/iihs_news_103008.pdf.

IFPC. 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change

[Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (editors)]. Cambridge University Press, Cambridge, United Kingdom and New York, New York. 881 pp. Available at http://www.ipcc.ch/.

_____ 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Alley, R., T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, P. Friedlingstein, J. Gregory, G. Hegerl, M. Heimann, B. Hewitson, B. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, M. Manning, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, D. Qin, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, S. Solomon, R. Somerville, T.F. Stocker, P. Stott, R.F. Stouffer, P. Whetton, R.A. Wood, D. Wratt. 21 pp. Available at http://www.ipcc.ch/.

Ingles, L.G. 1932a. Four new species of *Heamatoloechus* (Trematoda) from California. University of California Publications in Zoology 37: 189-201.

_____ 1932b. *Cephalogonimus brevicirrus*, a new species of trematoda from the intestine of *Rana aurora* from California. University of California Publications in Zoology 37:203-210.

_____ 1933. Studies on the structure and life history of *Ostiolum oxyorchis* (Ingles) from the California red-legged frog *Rana aurora draytonii*. University of California Publication in Zoology 39:135-162.

Inkley, D.B., M.G. Anderson, A.R. Blaustein, V.R. Burkett, B. Felzer, B. Griffin, J. Price, and T.L. Root. 2004. Global climate change and wildlife in North America. Wildlife Society Technical Review 04-2.

Jackson, S.D. 1996. Underpass systems for amphibians. 4 pages. In G.L. Evink, P. Garrett, D. Zeigler and J. Berry (editors) Trends in Addressing Transportation Related Wildlife Mortality, proceedings of the transportation related wildlife mortality seminar. State of Florida Department of Transportation, Tallahassee, Florida. FL-ER-58-96.

Jennings, M. R. 1988. Natural history and decline of native ranids in California. Pages 61-72 *in* H. F. De Lisle, P. R. Brown, B. Kaufman, and B. McGurty (editors). Proceedings of the Conference On California Herpetology. Southwestern Herpetologists Society, Special Publication 4:1-143.

Jennings, M. R., and M. P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for bullfrog (*Rana catesbeiana*) introduction. Herpetological Review 31(1):94-103.

_____ 1990. Final report of the status of the California red-legged frog (*Rana aurora draytonii*) in the Pescadero Marsh Natural Preserve. Final report prepared for the California Department of Parks and Recreation, Sacramento, California, through Agreement (4-823-9018). Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California. 30 pages.

Jennings, M. R., M. P. Hayes, and D. C. Holland. 1992. A petition to the U.S. Fish and Wildlife Service to place the California red-legged frog (*Rana aurora draytonii*) and the western pond turtle (*Clemmys marmorata*) on the list of endangered and threatened wildlife and plants. 21 pages.

Kanter, J. 2007. Scientists detail climate changes, Poles to Tropics. New York Times. April 10, 2007.

Kruse, K. C. and M. G. Francis. 1977. A predation deterrent in larvae of the bullfrog, *Rana catesbeiana*. Transactions of the American Fisheries Society 106(3):248-252.

Kupferberg, S. J. 1996a. Hydrologic and geomorphic factors affecting conservation of a river-breeding frog (*Rana boylii*). Ecological Applications 6: 1322-1344.

_____ 1996b. The ecology of native tadpoles (*Rana boylii* and *Hyla regilla*) and the impacts of invading bullfrogs (*Rana catesbeiana*) in a northern California river. PhD dissertation. University of California, Berkeley, California.

Lenihan, J. M., R. Drapek, D. Bachelet, R. P. Neilson. 2003. Climate Change Effects on Vegetation Distribution, Carbon, and Fire in California. Ecological Applications 13(6): 1667-1681.

Lindenmayer, D.B., and H.P. Possingham. 1996. Modeling the interrelationships between habitat patchiness, dispersal capability and metapopulation persistence of the endangered species, Leadbeater's possum, in southeastern Australia. Landscape Ecology 11:79-105.

Mao, J., D. E. Green, G. M. Fellers, and V. G. Chincar. 1999. Molecular characterization of iridoviruses isolated from sympatric amphibians and fish. Virus Research 6: 45-52.

Mallick, S.A., G.J. Hocking, and M.M. Driessen. 1998. Road-kills of the eastern barred bandicoot (*Perameles gunnii*) in Tasmania: an index of abundance. Wildlife Research 25: 139-145.

Munguira, M.L. and J.A. Thomas. 1992. Use of road verges by butterfly and moth populations, and the effect of roads on adult dispersal and mortality. Journal of Applied Ecology 29: 316-329.

Ng, S.J., J.W. Dole, R.M. Savajot, S.R.D. Riley, and T.J. Valone. 2004. Use of highway undercrossings by wildlife in southern California. Biological Conservation 115: 499-507.

Portland State University. 2003. Wildlife crossing, rethinking road design to improve safety and reconnect habitat. Prepared for Metro. Portland State University Planning Workshop. June 2003.

Robbins, E. 2003. No more road kill: What it takes to make highways friendly to animals. Planning 69(2): 33-34.

Rodriguez, A., G. Crema, and M. Delibes. 1996. Use of non-wildlife passages across a high speed railway by terrestrial vertebrates. Journal of Applied Ecology 33: 1527-1540.

Rosen, P.C. and C.H. Lowe. 1994. Highway mortality of snakes in the Sonoran desert of southern Arizona. Biological Conservation 68: 143-148.

Rothermel, R.B. and R. D. Semlitsch. 2002. An experimental investigation of landscape resistance of forest versus old-field habitats to emigrating juvenile amphibians. Conservation Biology 16: 1324-1332.

Rubbo, M.J., and J.M. Kiesecker. 2005. Amphibian breeding distribution in an urbanized landscape. Conservation Biology 19: 504-511.

Ruediger, B., and M. DiGiorgio. Undated. Safe passage. A user's guide to developing effective highway crossings for carnivores and other wildlife. Southern Rockies Ecosystem Project.

Saunders, S., C. Montgomery, and T. Easley. 2008. Hotter and drier: The West's changing climate. The Rocky Mountain Climate Ortganization, and Natural Resources Defense Council. New York, New York.

Schoener, T.W. and D. A. Spiller. 1992. Is extinction rate related to temporal variability in population size? An empirical answer for orb spiders. The American Naturalist 139: 1176-1207.

Sherwood, A. 2007. As cars hit more animals on roads, toll rises. New York Times December 22, 2007.

Sjogren-Gulve, P. 1994. Distribution and extinction patterns within a northern metapopulation of the pool frog, *Rana lessonae*. Ecology 75: 1357-1367.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston, Massachusetts.

Storer, T. I. 1925. A synopsis of the amphibia of California. University of California Publications in Zoology 27:1-1-342.

_____ 1933. Frogs and their commercial use. California Department of Fish and Game 19(3)203-213.

Stuart, J. M., M. L. Watson, T. L. Brown, and C. Eustice. 2001. Plastic netting: an entanglement hazard to snakes and other wildlife. Herpetological Review 32(3): 162-164.

Twedt, B. 1993. A comparative ecology of *Rana aurora* Baird and Girard and *Rana catesbeiana* Shaw at Freshwater Lagoon, Humboldt County, California. Unpublished. Master of Science thesis. Humboldt State University, Arcata, California. 53 pages plus appendix.

U.S. Fish and Wildlife Service (Service). 1970. United States List of Endangered Native Fish and Wildlife. October 13, 1970. Fed. Reg. 35(199): 16047-16048

_____ 1984. Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon. 141 pages.

_____ 1996. Endangered and threatened wildlife and plants; determination of threatened status for the California red-legged frog. **Federal Register** 61:25813-25833.

_____ 2002. Recovery plan for the California red-legged frog (*Rana aurora draytonii*). Portland, Oregon. 173 pages.

_____ 2004. Endangered and threatened wildlife and plants; proposed designation of critical habitat for the California red-legged frog (*Rana aurora draytonii*), proposed rule. **Federal Register** 69:19620-19642.

Van der Zande, A.N., W.J. ter Keurs, and W.J. Van der Weijden.. 1980. The impact of roads on the densities of four bird species in an open field habitat - evidence of a long-distance effect. Biological Conservation 18: 299-321.

Van Gelder, J.J. 1973. A quantitative approach to the mortality resulting from traffic in a population of *Bufo bufo* L. Oecologia 13:93-95.

Verboom, B., J., K. Lankester, and J.A. Metz. 1991. Linking local and regional dynamics in stochastic metapopulation models. Biological Journal Linnean Society 42:39-55.

Vos, C.C. and J.P. Chardon. 1998. Effects of habitat fragmentation and road density on the distribution pattern of the moor frog, *Rana arvalis*. Journal of Applied Ecology 35: 44-56.

Vos, C.C. and A.H.P. Stumpel. 1995. Comparison of habitat-isolation parameters in relation to fragmentation distribution patterns in the tree frog (*Hyla arborea*). Landscape Ecology 11: 203-214.

Wilcox, B.A. and D.D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. The American Naturalist 125: 879-887.

With, K.A. and T. O. Crist. 1995. Critical thresholds in species' responses to landscape structure. Ecology 76: 2246-2459.

Wright, A. H. and A. A. Wright. 1949. Handbook of frogs and toads of the United States and Canada. Comstock Publishing Company, Inc., Ithaca, New York. 640 pages.

Yanes, M., J.M. Velasco, and Francisco Suarez. 1995. Permeability of roads and railways to vertebrates: the importance of culverts. Biological Conservation 71: 217-222.

PERMIT EVALUATION AND DECISION DOCUMENT

Applicant: Jeffery G. Jensen
District 4 Office Chief
Office of Biological Science and Permits
California Department of Transportation
111 Grand Avenue
PO Box 23660
Oakland, CA 94623-0660

Corps File No:
Caltrans EA: 264081

This document constitutes my Environmental Assessment, Statement of Findings, and review and compliance determination according to the Section 404(b)(1) guidelines for the proposed work (applicant's preferred alternative) described in the attached Public Notice (PN).

Federal Highways Administration and the California Department of Transportation (Caltrans) propose to construct HOV lanes on State Route 101 from just south of State Route 37 in the City of Novato to just north of Corona Road in the City of Petaluma. These transportation improvements also will include construction and modification of interchanges as well as the establishment of a new frontage road. According to Caltrans, the project is intended to reduce congestion and improve mobility while providing an incentive for commuters to use buses, carpools, or vanpools for peak period travel, and to improve freeway operations including providing safe access to and from State Route 101.

The Marin Sonoma Narrows (MSN) project will be completed in a series of independently funded phases:

1. Phase A1 consists of constructing approximately 1.5 miles of the southbound HOV lane between State Route 37 and Rowland Boulevard in Novato (Segment A), and approximately 4 miles of the northbound HOV lane between State Route 37 and Atherton Avenue in Segments A and B.

2. Phase B1 consists of converting the existing Redwood Landfill overcrossing to a full interchange, including the construction of associated frontage roads in Segment B.

3. Phase B2 consists of constructing a new Petaluma Boulevard South interchange including associated frontage roads in Segment B.

4. Phase B3 and consists of constructing a new mainline bridge at San Antonio Creek in Segment B. This phase would shift US-101 traffic to the west and allow the existing highway to be

converted to a frontage road. Phase B3 is scheduled to go to construction in December 2011 or early 2012.

5. Phase B4, not yet fully funded, would replace the Petaluma River bridges in Segment B.

This permit application is for Phase B2.

I. **PROPOSED PROJECT**: The project is located on United States (U.S.) Highway 101 just south of the Petaluma River crossing in Petaluma, Sonoma County, California. The project extends from the South Petaluma Blvd. interchange on the north side of U.S. 101 and to Gunn Drive in the south. The project area is located between latitude 38.224 N and 38.206 N and longitude 122.612 W and 122.598 W or T4N, R7W in sections 2, 3 and 11 in Petaluma River USGS 7.5 minute Quadrangle. The elevation ranges from close to mean sea level to about 180 feet above mean sea level.

The MSN Project B2 will consist of upgrading the existing U.S. 101 four lane expressway into a full access controlled freeway and replacing the existing South Petaluma Blvd. interchange with a new diamond interchange overcrossing, and constructing frontage roads on both sides of U.S. 101 for maintaining access to intersecting roadways and adjacent parcels. The project will accommodate future construction of HOV lanes in both directions and future reconstruction of U.S. 101 to meet the current horizontal alignment, vertical profile and sight distance requirements for the 70 mph corridor design speed.

The proposed South Petaluma Blvd. diamond interchange overcrossing will be constructed just south of the existing South Petaluma Blvd. undercrossing. The South Petaluma Blvd. overcrossing will consist of four lanes, two lanes in each direction connecting the proposed West Frontage Road on the west side of U.S. 101 to South Petaluma Blvd. on the east side of U.S. 101. The northbound off-ramp will be a single lane off ramp widening to 3 lanes at the ramp terminus. Intersections at NB and SB ramps and at South Petaluma Blvd. will be signalized.

The proposed West Frontage Road connects the proposed South Petaluma Blvd. overcrossing with the existing Kastania Road. The West Frontage Road continues south from Kastania Road providing access to properties along the west side of U.S. 101 until the road meets Gunn Drive at the southern limit of the project area.

The proposed East Frontage Road would extend from the termination of South Petaluma Blvd. at the proposed overcrossing to a dirt driveway approximately even with the existing southern end of Kastania Road.

Impacts: The impacts to wetlands and other waters of the U.S. are described in the following paragraphs starting with the impacts at the northern end of the project working toward the south.

On the west side of U.S. 101 and just north of the proposed South Petaluma Blvd. overcrossing is an intermittent drainage (OW-4 and OW-5) that flows east across the project area, through a culvert under U.S. 101, where it connects to a small wetland (WL-8) in the median area between U.S. 101 and the existing U.S. 101 northbound off ramp. A proposed access road serving properties northwest of

the proposed South Petaluma Blvd. interchange will cross the unnamed intermittent stream (OW-4). At the access road stream crossing, a 4 ft. by 2 ft. reinforced concrete box culvert with a headwall and rock slope protection on either side of the culvert is proposed. The box culvert will be approximately 31 ft. long and require approximately 22.9 cubic yards of concrete fill for culverts and headwalls, 256 cubic yards for roadway fill and 4.6 cubic yards for rock slope protection permanently affecting approximately 0.059 acre and temporarily impacting 0.011 acre of waters of the U.S.

The unnamed drainage (OW-5) flows downstream from the proposed access road to an existing 4 ft. by 3 ft. concrete box culvert (CW-5) that spans the width of U.S. 101 into a small wetland (WL-8) in the median between U.S. 101 and South Petaluma Blvd. An approximately 125 ft. extension of the concrete culvert (CW-5) is proposed for the west side of the culvert to drain the stream under the proposed overcrossing ramp. Approximately 0.032 acre of the unnamed drainage (OW-5) is to be permanently impacted and 0.003 acre temporarily impacted by construction of the South Petaluma Blvd. overcrossing ramp and extended culvert. The extension of the culvert on the west side of U.S. 101 will result in approximately 40.1 cubic yards of reinforced concrete fill and 88.0 cubic yards of roadway fill.

The proposed project would extend the reinforced concrete box culvert (CW-5) that terminates on the east side of U.S. 101 and connect it to the 4 ft. by 3 ft. box culvert (CW-6) that is underneath South Petaluma Blvd. Approximately 26.8 cubic yards of reinforced concrete fill and 5.6 cubic yards of roadway fill are proposed for construction of this culvert. Construction of the culvert to connect the existing culverts would permanently impact 0.020 acre of the median wetland (WL-8). The existing box culvert (CW-6) underneath South Petaluma Blvd. terminates in a wetland (WL-9) of approximately 0.226 acres. Approximately 0.178 acre of this wetland will be permanently impacted and 0.053 acre temporarily impacted from roadway fill material and extension of the reinforced concrete box culvert required for construction of the South Petaluma Blvd. overcrossing and realignment of South Petaluma Blvd. The wetland (WL-9) will be impacted by approximately 285 cubic yards of roadway fill and 2.3 yards of rock slope protection. A 4 ft. by 3 ft. culvert that is approximately 351 ft. long is proposed to extend from the edge of the wetland (WL-9) to wetland (WL-13) east of the proposed frontage road. The project will permanently impact approximately 0.001 acre of the wetland (WL-13) with 4.4 cubic yards of rock slope protection.

Further south along U.S. 101, two wetlands that span the eastern side of the highway are approximately 650 ft. and 1,050 ft. in length respectively. A frontage road (East Frontage Road) on the east side of U.S. 101 is proposed to be constructed along a portion of both of these wetlands. Approximately 0.467 acre of the first wetland (WL-6) will be permanently impacted and 0.276 acre temporarily impacted by the project. Of the second wetland (WL-5), approximately 0.111 acre will be permanently impacted and 0.313 acre temporarily impacted by the proposed project. Across from these wetlands on the west side of U.S. 101 are three small jurisdictional features. Approximately 0.017 acre (permanent) and 0.007 acre (temporary) of wetland (WL-4), and 0.002 acre (temporary) of the second wetland (WL-7) will be impacted by the proposed project. The roadway widening work will also have 0.009 acre of permanent impacts to a 2 ft. wide drainage ditch (OW-3) on the west side of U.S. 101.

Approximately 450 feet north of the gas station on the corner of Kastania Road and U.S. 101 is a second unnamed stream that crosses the project area from west to east and is tributary to the Petaluma

River. The stream crosses Kastania Road on the west side of the project area and U.S. 101 on the east side. Kastania Road is proposed to be widened from approximately 15 ft. wide to 20 ft. wide with 5 ft. shoulders on either side. The unnamed stream passes through a box culvert at Kastania Road. Proposed construction work will result in 0.002 acre of temporary impacts to waters of the U.S. (OW-7) and 0.002 acres of wetlands within waters (WL-14) on the west side of the culvert. Proposed construction on the east side of the culvert consists of small modifications to the headwall and rock slope protection placed at the end of a biofiltration swale and adjacent culvert. Approximately 9.5 cubic yards of rock slope protection will be placed on the east side of the culvert next to the unnamed stream. Construction work will cause approximately 0.001 acre of temporary impacts to waters of the U.S. (OW-8) and 0.002 acre of temporary impacts to wetlands (WL-15).

At U.S. 101, the unnamed stream (OW-9 and OW-2) passes under the highway through a 10 ft. by 6 ft. box culvert (CW-2) approximately 177 ft. in length. The East Frontage Road is proposed along the eastern side of U.S. 101 where the existing box culvert for the unnamed stream terminates. The 10 ft. by 6 ft. box culvert (CW-2) will be extended an additional 52 ft., for a total length of 224 ft. long to extend past the width of the proposed frontage road. At the end of the proposed box culvert (extension), a headwall will be constructed. Approximately 0.011 acre of the unnamed stream (OW-2) will be permanently impacted and 0.008 acre temporarily impacted by the culvert, headwall and rock slope protection needed for the drainage of the unnamed stream at this location of the proposed East Frontage Road. Approximately 75 cubic yards of concrete fill are proposed for the reinforced concrete box culvert, headwall, and 20 cubic yards of rock slope protection below the headwall. On the west side of the culvert, approximately 5.3 cubic yards of rock slope protection is proposed. The fill is expected to have less than 0.001 acre of permanent impacts to waters of the U.S. (OW-9) and wetlands within waters (WL-12). The construction work is expected to have approximately 0.001 acre of temporary impacts to waters of the U.S. (OW-9) and 0.001 acre of temporary impacts to wetlands within waters (WL-12).

West of Kastania Road opposite of the gas station there is an approximately 6,035 square ft. wetland (WL-3). The wetland is comprised of mostly weedy, herbaceous plants. The widening and realignment of Kastania Road will permanently impact 0.001 acre and temporarily impact 0.024 acre of this wetland. This wetland (WL-3) is connected to another wetland (WL-10) via a small culvert (CW-3) that will be permanently impacted by the proposed project. Approximately 0.008 acres of the wetland (WL-10) will be impacted (temporary) by the proposed project. Another wetland (WL-11) east of U.S. 101 may be impacted (temporary) by access needed for utility installations. The construction work is expected to have approximately 0.003 acres of temporary impacts to the wetland (WL-11).

The proposed West Frontage Road will extend south from the end of Kastania Road to Gunn Drive. Midway between Kastania Road and Gunn Drive, construction of the proposed frontage road will permanently impact approximately 0.009 acre and temporarily impact 0.006 acre of a small wetland (WL-1) which is adjacent to a second wetland (WL-2) of which 0.004 acre will be permanently impacted and 0.006 acre temporarily impacted by the proposed project. In-between the two small wetlands is a culvert (CW-1) that is approximately 16 feet long and will be removed by the proposed project.

Further south, construction of the west frontage road will have approximately 0.013 acre of permanent impacts and 0.001 acre of temporary impacts to a roadside ephemeral ditch (OW-1) that runs along the north end of Gunn Drive where the proposed frontage road would connect with Gunn Drive. The project proposes to drain the roadside ditch to the other side of Gunn Drive via an eighteen inch corrugated steel pipe.

Combined the project will permanently impact 0.808 acre of wetlands, 0.030 acre of culverted waters and 0.124 acre of waters of the U.S. and temporarily impact 0.703 acre of wetland, 0.008 acre of culverted waters and 0.069 acre of other waters of the U.S.

II. **ENVIRONMENTAL AND PUBLIC INTEREST FACTORS CONSIDERED**:

A. Purpose and Need (40 C.F.R. Section 230.10(a) and 40 C.F.R. Section 1508.9(b)): The purpose of the proposed MSN HOV Widening Project is to reduce existing congestion, anticipate future congestion, improve highway operations and correct existing drainage and flooding hazards for the US 101 highway through Marin and Sonoma counties. Over the last 15 years, the Marin and Sonoma county areas have experienced significant commercial and residential growth as well as growth to the tourism industry. This has resulted in many more vehicles using this crucial link for commuters and commerce that connects the vital business centers of San Francisco and the East Bay with Marin, Sonoma and the North Coast. The freeway narrows into a four-lane expressway at a place called the "narrows" which constricts travel and contributes to local traffic congestion. Projected growth in the area would further contribute to congestion and delays. The existing expressway has at grade, non-signalized intersections or driveways where adjacent landowners can access the freeway. However, local traffic needs are no longer served well and commuter traffic conflicts with the vehicles entering and exiting the expressway at these points.

The proposed project, the MSN HOV Widening Project B2, is a necessary component of the overall MSN HOV Widening Project, which will convert the existing four-lane expressway into a contiguous freeway with the requirements for a 70 mph design speed. The proposed project is designed to accomplish the following:

- Reduce existing and projected traffic congestion
- Accommodate future travel demand
- Reduce travel time and delay
- Encourage use of carpooling during peak travel hours
- Encourage public transit use
- Improve system reliability for the movement of goods
- Reduce energy use and improve local and regional air quality
- Improve traffic safety
- Improve drainage system
- Reduce flood hazards

B. Alternatives (33 C.F.R. Section 320.4(b)(4) and 40 C.F.R. Section 230.10(a)):

1. No Build Alternative – The no-build alternative proposes no new modifications to US 101 other then routine maintenance and rehabilitation to support existing highway operations. The proposed project would result in greater traffic congestion, inefficient energy use, and air pollution due to slowing and congestion of traffic within the Marin-Sonoma U.S. 101 travel corridor.

This alternative would have no impacts to wetland and other waters of the United States but as the congestion continues to increase with the population there would be increased air pollution and energy use as the traffic becomes more congested over time. This alternative would not meet the transportation needs of the region and is therefore not a practicable alternative.

2. Other Project Designs or Alternatives. Numerous alternatives to meet the Purpose and Need were evaluated but rejected during the preliminary engineering and environmental analysis phase. The alternatives include:

Transportation Management System. This alternative would reduce congestion without significant new infrastructure by implementing strategies focused on reducing peak period travel demand. These strategies included express buses traveling in HOV lanes, electronic metering and information systems, new and expanded Park and Ride facilities, enhanced rideshare matching services, measures such as flex time and alternative work schedules, and satellite telecommuting centers. This alternative was rejected, as it did not fully meet the Purpose and Need; it would be only partially effective without construction of the HOV lanes.

Fixed HOV Lanes and Reversible HOV Lane Build Alternatives

Both build alternatives have many of the same elements. These common elements are listed below:

- Lane additions are proposed in U.S. 101 median
- At interchanges ramp metering would be installed and HOV bypass lanes would be constructed on on-ramps
- Modifications to existing mainline, widening and realignment of U.S. 101 to accommodate upgrading the expressway into a freeway
- Construction of sound walls and sound barriers where land uses are sensitive to the noise environment
- Construction of retaining walls
- Modifications to access roads
- Bridge widenings
- Upgrades to drainage facilities

2A. Fixed HOV lanes Alternative: This alternative would have two HOV lanes, one in each direction, that would be constructed in the median of U.S. 101 for the length of the MSN project. The HOV

lanes would be restricted to vehicles carrying two or people during specific hours, usually during the peak commute periods. Outside of these hours, the HOV lanes would be open to all vehicles regardless of the number of passengers.

The HOV lanes would have a standard width of 3.6 meters or 12 feet plus shoulders in the median that would allow disabled vehicles to pull over or emergency vehicles pass. A median barrier would be installed to separate the northbound and southbound lanes of traffic.

2B. Reversible HOV lane alternative: This alternative is exactly the same as the fixed lane alternative described above for segments A and C of the MSN project. However, within segment B a single reversible HOV lane would be constructed in the median of U.S. 101. The median would be 9.6 meters or 32 feet wide, which would provide sufficient room for the 3.6 meter wide reversible HOV lane and shoulders. On either side of this HOV lane, barriers would be constructed to separate the traffic from the existing "mixed flow" lanes. This HOV lane would be approximately 6.5 miles in length.

The key difference with this reversible alternative is that the HOV lane in segment B would only allow traffic in one direction, depending on the time of day. During the A.M. peak period only southbound traffic would be permitted to use the reversible HOV lane and during P.M. commute hours only northbound traffic could use the reversible HOV lane. The reversible concept allows the HOV lane to accommodate traffic flow based on the predominant travel direction during the peak commute periods.

There are differences in the operations of the two build alternatives that make the fixed HOV lanes alternative the preferred alternative:

- The fixed HOV lane alternative has more throughput in the off-peak direction
- The fixed HOV lanes alternative would be available to mixed flow traffic during off-peak periods; the reversible HOV lane alternative would be closed
- The fixed HOV lanes alternative has the additional flexibility to recognize job growth within Marin and Sonoma counties and would accommodate growth to a reverse commute pattern
- The reversible HOV lane alternative would require switching devices, safety devices, and message signs to notify motorists. More monitoring and staff would be required to ensure that it operates effectively compared to the fixed HOV lanes alternative
- Removing a disabled vehicle or emergency operations would be more difficult under the reversible HOV lanes alternative

Other Sites. Other sites were not considered, as they would not meet the Purpose and Need. The existing urban freeway corridor is the best site to construct the additional HOV lanes in order to extend the existing north/south HOV network northerly from southern Marin County.

C. **Impacts on the Aquatic Ecosystem** (33 C.F.R. Section 320.4(a); 33 C.F.R. Part 325, Appendix B, Part 7 and 40 C.F.R. Sections 230.20-60):

1. **Physical/Chemical Characteristics and Anticipated Changes**

Substrate – Approximately 0.808 acre of wetland and 0.124 acre of other waters of the U.S. will be filled with approved sands, gravels, earthen material mixes, concrete and RSP. The fill below the ordinary high water mark (OHWM) for both wetland and other water features will amount to approximately 1,870 cubic yards. Approximately 164.8 cubic yards of fill will be reinforced concrete, 66.1 cubic yards will be rock slope protection and 1,639.3 cubic yards will be roadway fill. The proposed project will have a minor, long-term, adverse impact to substrate.

Currents/Circulation - No effect

Drainage Patterns – Improvements to drainage design and culvert structures are expected to improve localized flooding and drainage problems. As a result drainage flow is expected to improve due to the proposed project. The project would result in a minor increase in impervious surface in the project area. This is expected to translate into minor localized increases in urban runoff. Due to the lag time between the peak runoff from major tributaries and that from the freeway runoff, the peak flow from the freeway will have substantially subsided by the time the watershed peak occurs. As a result, there will only be insignificant increases in peak flow in the overall watershed due to this project. The proposed project is expected to have minor, long-term, adverse impact to drainage patterns.

Streamflow – The streamflow patterns will not be significantly changed by this project other than a slight increase in runoff from an increase of impervious surfaces. The proposed project will have a minor, long-term, adverse impact to streamflow.

Flood Control Function of Wetland - No effect

Aquifer Recharge - No effect

Baseflow - No effect

Storm, Wave, Erosion Buffer of Wetland - No effect

Erosion/Sedimentation Rate – Erosion control measures would be used to address site soil stabilization and reduce deposition of sediments in the adjacent surface waters. Typical measures include the application of soil stabilizers such as hydroseeding, netting, erosion control mats, biofiltration strips and rock slope protection. During construction, other erosion control procedures will be used such mulch on all disturbed areas, fiber rolls along slopes, silt fences at the boundaries of the construction site, stabilized construction entrances and exits equipped with tire washing capability, and check dams placed strategically to reduce flow velocity and to filter flows in defined drainage-ways. The proposed project will have a minor, short-term, adverse impact to erosion and sedimentation rate.

Water Supply (Natural) - No effect

Water Quality – The proposed design integrates conventional flood control methodology with a system for storm water quality control that protects the off-site drainages and streams from non-point source pollution generated from the freeway. Potential pollutants found on streets and freeways include heavy metals, organic compounds (including petroleum hydrocarbons), sediments, trash, debris, oil, and grease. Concentrations of such pollutants are generally highest during the "first flush" of an initial rain storm, after which concentration levels decrease rapidly. Best Management Practices (BMPs) that remove such pollutants are being proposed for incorporation into the project drainage system. In general, the on-site storm drain system will include structural treatment BMPs such as vegetated swales or detention basins. These BMPs would allow for a significant reduction, compared with current conditions, in trash, debris, absorbed hydrocarbons and metals in freeway runoff entering the streams and channels that cross the freeway.

Temporary construction related activities will also have an impact water quality at the site. Construction activities that may cause impacts to water quality include excavation and grading activities, loading and unloading of stockpiled soils, and fueling or maintenance of construction vehicles. Construction site BMPs will be implemented during construction activities to reduce pollutants in storm water discharges throughout construction. All necessary soil stabilization and sediment control practices will be implemented to minimize the potential for impacts to the watershed. A Storm Water Pollution Prevention Plan (SWPPP) will be implemented during construction. The proposed project is expected to have long-term, minor, beneficial impacts to water quality and some short term adverse impacts to water quality.

2. **Biological Characteristics and Anticipated Changes**

Wetlands (Special Aquatic Sites) – The proposed project would result in permanent impacts to 0.808 acre of wetland area and temporary impacts to 0.703 acre of wetland area. The wetlands that would be impacted are mainly within roadside ditches or man made channels adjacent to US 101 or frontage roads. These roadside ditch wetlands would function to filter roadside runoff. Other functions include surface and subsurface water storage, particulate removal, nutrient cycling, water filtration, maintenance of vegetation and animal communities and groundwater recharge. Various bird and terrestrial wildlife species may utilize these areas including amphibians such as the California red-legged frog. Many of the wetlands within the project area will be permanently and temporarily impacted by the construction of frontage roads, access roads, and widening of existing roads. The proposed project will have long-term, moderate, adverse impacts to wetlands and short-term, minor, adverse, impacts to wetlands.

Mud Flats (Special Aquatic Sites) - No effect

Vegetated Shallows (Special Aquatic Sites) - No effect

Coral Reefs (Special Aquatic Sites) - No effect

Pool and Riffle Areas (Special Aquatic Sites) - No effect

Wildlife Sanctuaries - No effect

Threatened and Endangered Species – In its April 1, 2009, Biological Opinion, USFWS concluded that the area along both sides of US 101 is habitat for the California red-legged frog (CRLF) and contains components that can be used by the California red-legged frog for feeding, resting, mating, movement corridors, and other essential behaviors. Construction activities associated with the project would remove vegetation and other materials necessary for cover and aestivation, fill or crush burrows or crevices and potentially reduce the prey base for the frogs. Construction activities may result in the direct disturbance, displacement, injury or mortality of CRLFs. The increased width of the highway along with an increase in vehicles may lead to the discouragement or prevention of CRLF movement. The existing US 101 highway is a formidable barrier to CRLF movement, although there are existing bridge and culvert crossings that have the potential to provide wildlife passage under US 101. Caltrans plans to upsize many existing culverts and install new culvert pipes where appropriate for drainage. Although these new structures are not specifically designed for amphibian or wildlife passage, the improvements may provide additional movement capacity for CRLF and other wildlife species.

The April 1, 2009 Biological Opinion from the USFWS provides several measures to avoid and minimize the potential effects of the project to CRLF including providing an onsite biologist to monitor construction work in potential CRLF habitat areas, providing awareness training of construction personnel, restricting speed and access of construction equipment and controlling dust, food related waste and equipment oils and fuels at the site.

The proposed compensation for the effects to 204 acres of CRLF habitat will include compensation at a 1:1 ratio. Caltrans proposes expenditure of the funds to purchase CRLF credits at a Service-approved conservation bank, establishment of a Service approved conservation easement or obtaining fee title to habitat acquisition. Caltrans will provide compensation for affects to CRLF before construction begins in the B Phases, per the requirements of the BO. In addition to the compensation, there are several requirements related to the protection of the California red-legged frog during construction activities. These requirements will be a special condition of the BO. The proposed project will have long-term, moderate, adverse impact to California red-legged frog habitat.

Segment B2 of the MSN HOV widening project does not include potential habitat for the Salt Marsh Harvest Mouse (SMHM). Therefore there will be no adverse impacts to SMHM as a result of this project.

Habitat for Fish, Other Aquatic Organisms, and Wildlife – There is a large amount of trees located within the project corridor that have potential nesting habitat for birds including herons, egrets, red-shouldered hawks, red-tailed hawks, etc. Surveys for nesting birds will be conducted by a qualified biologist prior to trimming or tree removal activities to ensure that nesting birds are not impacted by the project. Over the long-term tree mitigation projects will compensate for nesting habitat that is lost to tree removal as a result of the project. The proposed project will have moderate, short-term adverse impacts and minor, long-term adverse impacts to nesting bird habitat.

D. **Impacts on Resources Outside the Aquatic Ecosystem**:

1. **Physical Characteristics and Anticipated Changes**

Air Quality – According to the Bay Area Air Quality Management District's (BAAQMD) CEQA Guidelines emissions of carbon monoxide and ozone precursors from exhaust and other construction activities are included by the BAAQMD in their emissions inventory that is the basis for regional air quality planning, and their generation is not expected to impede attainment or maintenance of the ozone and carbon monoxide standards. BAAQMD's approach to CEQA analysis of construction impacts is to emphasize the implementation of effective and comprehensive control measures. BAAQMD's recommended approach to mitigating construction emissions focuses on a consideration of whether all feasible control measures are being implemented. The BAAQMD CEQA Guidelines provide feasible control measures for construction emissions. If the appropriate construction controls are implemented, air pollutant emissions for construction activities would be considered less than significant. The proposed MSN project is intended to improve highway operations without adding substantial new capacity and without creating a facility that is likely to increase emissions, and thus, would not affect the region's total vehicle emissions. Since regional total vehicle emissions are not anticipated to increase, changes in vehicle emissions would be minimal. No impacts to air quality are therefore anticipated with the proposed project.

Noise Conditions – Project Activity will have minor, short-term, intermittent impacts on noise conditions during construction activity. This includes the use of heavy equipment, jackhammers, and/or pile drivers. Completion of the proposed project proposal will result in an overall increase in traffic noise within the transportation corridor of approximately one to two dBA Leq(h). Most of the land use along this stretch of US 101 is predominantly rural and the sensitive noise receptors (such as rural residences) are dispersed over longer distances. Because of the isolated and dispersed location of the rural residences and the change in noise levels of only 12 dB (between existing and future conditions) noise abatement would not be effective for this segment. Where practical noise walls will be constructed that will protect sensitive receptors and mitigate for the change in noise levels. The noise impact evaluation criteria for the proposed project are in agreement with the Noise Abatement Criteria (NAC) established by the FHWA in Procedures for Abatement of Highway Traffic Noise and Construction Noise [23 CFR Part 772, 2003] and criteria adopted by CCTA in Traffic Noise Analysis Protocol (Protocol) (Caltrans, 1998a).

The proposed project is anticipated to have short-term, minor, adverse impacts to noise levels during the construction period. The completed project is expected to have long-term minor adverse impacts to noise conditions within the project.

Geologic Conditions - No effect

2. **Biological Characteristics and Anticipated Changes**

Riparian Habitat – Small portions of riparian habitat are expected to be impacted by the proposed project. Approximately 583 square feet of riparian habitat along the unnamed stream that passes

through Kastania Road and US 101 will be permanently impacted by construction of the frontage road on the east side of US 101. On the west side of US 101 just south of where the existing Kastania Road connects with US 101, 564 square feet of riparian habitat along a roadway ditch will be impacted by the project. Considering both areas of riparian habitat impacted by the project are directly adjacent to a busy highway, and have little connectivity to other habitats, the relative quality of the riparian habitat is poor.

Caltrans will preserve and maintain as many healthy trees and native vegetation particularly riparian vegetation as practicable during the planning, design and construction of the 101 MSN HOV Widening B2 project. Identification and fencing off of environmentally sensitive areas and implementation of erosion control measures will be utilized to minimize disturbance to riparian areas. Mitigation will be provided for removed trees. On-site locations will be utilized to the fullest extent possible, however due to the size of this project, both on and offsite locations may be required to fulfill proposed mitigation. Riparian oaks will be mitigated at a 5:1 ratio, non-oak native riparian trees will be replaced at a 3:1 ratio, and non-native riparian trees will be replaced with native riparian species at a 1:1 ratio.

Other Terrestrial Habitat - Bay oak woodland and scattered oak savannah dominate much of the less disturbed landscape in the project area. The most common tree species in this area are California Bay, Coast Live Oak, Valley Oak and Blue Oak. Outside of the oak woodlands a variety of native and non native species are found. Patches of redwood trees are found in the highway corridor. Although native to Northern California, the redwood trees are not native to the area and in general are not in good condition because of the hot dry summers and vehicle exhaust the trees are exposed to. Several species of Eucalyptus have been planted and are common along the shoulder of the roadway. These and various other types of ornamental trees are scattered along the length of the project. Many of these trees are proposed to be removed as part of the project. Approximately 62 native trees and 157 non-native trees are proposed to be removed. Caltrans will preserve and maintain as many healthy trees and native vegetation as possible during the planning, design and construction of the project. Linear patches and disjunct segments of non-native grasslands, and ruderal/disturbed vegetation would be permanently affected by MSN B2 project construction. These losses are not considered to be substantially adverse because other vegetation communities in the project vicinity are of equal or better quality and would be used by wildlife as an alternative and preferable habitat source.

Construction activities associated with the project may spread invasive and noxious weeds into uninfested areas, which can degrade wildlife habitat. Contractors will include measures such as worker training, avoidance of sensitive communities and cleaning of construction machinery to reduce the likelihood that noxious weeds would be spread by the proposed project. Disturbed areas will be replanted and revegetated when construction is complete to prevent invasive weeds from recolonizing other areas. Landscaping and revegetation will use not use species listed as noxious weeds. Overall the proposed project will have long-term, moderate, adverse impacts to the terrestrial habitat.

Special Wildlife Areas - No effect

3. **Socioeconomic Characteristics and Anticipated Changes**

Aesthetic Quality – The change of US 101 from a four lane expressway separated by an unpaved median to a single six lane expanse with concrete median barrier would substantially increase the dominance of the roadway seen by motorists. The effect would be further emphasized with the additions of the new access roads and intersection overcrossings. The increased dominance of the roadway would cause a pronounced qualitative change of the overall character of the landscape to a more urban highway dominated setting. The new interchange at South Petaluma Blvd. would result in a decline of visual quality and potentially substantial adverse impacts to motorists and nearby residences. Some tree and vegetation removal will be required for construction of the interchanges and access roads that may also impact aesthetic resources.

Standard project landscaping and additional revegetation shall be employed that will increase the amount of landscaping in the visual foreground over the long term, to compensate for the loss of visual quality due to increased roadway dominance. Landscape measures shall include tree and shrub plantings in areas between the mainline and access roads to provide screening and reduce overall roadway dominance. Architectural design measures shall be applied to major design structures such a bridges, soundwalls and interchange overcrossings to enhance the visual quality of the area. Existing trees shall be avoided to the extent feasible. Grading shall utilize techniques such as slope rounding, slope sculpting, and variable gradients to approximate the appearance of natural topography. All areas disturbed by construction staging or equipment storage shall be vegetated. All the measures should serve to reduce the adverse visual impacts of the project to the project corridor.

Agricultural Activity - No effect

Commercial Fishing - No effect

Community Cohesion - One residential unit situated on an agricultural property located approximately 600 meters south of Kastania Road would be subject to relocation under the proposed project. This represents less than one percent of the total occupied dwelling units in the community impacts study area. Full appraisals would be conducted prior to acquisition of the property to be relocated to determine the market value of the property according to current market conditions. September 2005 market data indicate that there are adequate resources in the cities of Novato and Petaluma to accommodate relocation of the displaced residential unit. After project approval, a full inventory of available relocation resources and a correlation with the units taken will be conducted and identified in the Final Relocation Impact Report.

Economics - The proposed project would provide temporary construction jobs, generate increased employment opportunities and tax revenues to the county. The proposed project is expected to have short-term, minor, beneficial impacts on local economics and employment.

Employment – The proposed project would provide temporary construction jobs and generate increased employment opportunities.

Energy – Improved traffic operations under the proposed project would reduce direct or operating energy use, whether in the form of petroleum fuels or alternative sources of energy, compared to the

current conditions. This would be accomplished by reducing congestion, encouraging HOV use, and accommodating a mass transit system within the transportation corridor. Thus, the proposed project is anticipated to have a minor, long-term, beneficial impact on energy.

Mineral Resources - No effect

Population/Growth Inducement - The growth inducing effect of the MSN project on the surrounding communities was evaluated in the Growth Inducement Analysis Technical Report. The report concluded that travel times as a result of the proposed project would likely decrease an average of between 1 and 9 minutes for trips from six residential zones and eight employment zones. This travel savings time will slightly increase growth pressure in Petaluma. However this effect on growth inducement will be minimized by local plan and policies that have a greater influence on development and growth in their respective jurisdictions. High housing prices and low vacancy rates in the area will tend to act as growth deterrents that would counteract and outweigh the minor effect of travel time savings. Therefore the proposed project will likely support proposed growth in the area but not substantially contribute to growth inducement in Marin and Sonoma Counties.

Prime and Unique Agricultural Lands - No effect

Public Facilities and Services - No effect

Public Health and Safety – The project would alleviate congestion along US 101 and thereby provide police, fire and other emergency service providers with improved response times. The upgrade of the existing expressway with at grade connections to a freeway with overcrossings and standard horizontal and vertical curves will improve circulation. All of these improvements would enhance the ability of emergency responders to react to calls for service.

Road construction may result in lane closures, detours and slow moving construction vehicles that might inconvenience or delay emergency vehicle response. Through coordination with emergency service providers and public information program, emergency service delays will be avoided by ensuring that all providers are aware well in advance of lane closures or detours. The proposed project will have a temporary, short-term, minor, adverse impact on public health and safety but major, long-term, beneficial impact to public health and safety.

Recreational Opportunities - No effect

Recreational Fishing - No effect

Silviculture - No effect

Traffic/Transportation – The proposed project would substantially increase the ability of US 101 to serve peak period travel demand. This increased capacity of US 101 under the proposed project would enable more vehicles to be accommodated during the peak hour of extended peak periods. The increased capacity would also lead to less congestion, fewer delays and shorter travel times. The proposed project therefore would have major, long-term, beneficial impacts to travel and

transportation.

Transportation/Navigation - No effect

Water Supply (Municipal & Industrial) - No effect

Wild & Scenic Rivers - No effect

4. **Historic - Cultural Characteristics and Anticipated Changes**

Archaeological Resources – A record and literature search was undertaken to determine the proximity of previously documented prehistoric and historical archaeological resources. An archaeological field reconnaissance was conducted during 2002 and 2003. Based on the information collected during field surveys, documentary research, and subsurface testing, it is anticipated that the proposed project would have no impacts on archaeological resources.

Historic Resources – The Freeman-Parker residence located on the east side of US 101 directly across from the gas station on the opposite side of US 101 is an historic property and qualifies for listing in the National Register. The residence was built in 1854 and is a rare example of a vernacular residence built in the first decade of California statehood and qualifies for the National Register under Criterion C.

The proposed construction near the Freeman-Parker residence will not require any take of the property but will be entirely within the state right away. The construction will consist of a driveway near the front of the property to the East Frontage access road. The proposed construction would not diminish nor adversely affect the properties character defining features.

National Register Properties – See about Freeman-Parker residence above.

National Natural Landmarks - No effect

E. **Summary of Indirect Impacts**

None have been identified

F. **Summary of Cumulative Impacts** (40 C.F.R. Section 230.11(g)):

The wetlands and other waters of the U.S. affected by the US 101 MSN HOV Widening Project are of low service and function and do not represent a significant percent of the wetlands and waters within the area. Caltran's wetland compensation is expected to offset the potential cumulative effects of the project and other approved or foreseeable future actions. The low functions and services of wetland impacted by the proposed project would represent a negligible effect on cumulative impacts within the project region.

G. **Conclusion and Recommendations**:

III. **FINDINGS**:

A. **Other Authorizations**:

1. **Clean Water Act Section 401 Water Quality Certification** (33 C.F.R. Section 325.2(b)(1)): An application for a 401 Certification for the US 101 MSN HOV Widening B2 Project has been prepared and will be submitted to the San Francisco Bay Regional Water Quality Control Board.

2. **Coastal Zone Management Act Consistency Determination** (33 C.F.R. Section 325.2(b)(2)): The project does not occur in the coastal zone and would not affect coastal zone resources.

3. **California Department of Fish and Game Lake and Streambed Alteration Agreement**: An application for a 1602 Lake and Streambed Alteration Agreement from CDFG has been prepared and will be submitted to the California Department of Fish and Game.

4. **U.S. Fish and Wildlife Service**: The U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion April 1, 2009 covering impacts to the California red-legged frog and the salt marsh harvest mouse. The USFWS Biological Opinion requires Caltrans and FHWA to implement a score of avoidance and minimization measures to substantially reduce the potential impact of the project to California red-legged frogs. Salt march harvest mouse habitat is not found in the MSN B2 segment of the project but is present in other segments of the 101 MSN project. To compensate for the potential effects to California red-legged frog habitat Caltrans and FHWA will provide compensation at a 1:1 ratio which will be achieved by a combination of the following: 1) purchasing credits at a resource agency approved mitigation bank servicing the action area, 2) purchasing conservation easements at or close to the project site as practical within Marin and Sonoma Counties, 3) purchasing fee title and preserving the land for California red-legged frog at or as close to the project site as practical within Marin and Sonoma Counties. This compensation will be purchased prior to the start of construction in the B Phases of the MSN project. General construction phase conditions would apply, such as controlling waste, plastic netting and fuel, and incident notification. After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the 101 MSN B2 project is not likely to jeopardize the continued existence of California red-legged frogs.

B. **A Public Notice** (PN) describing the project was issued on October 16, 2007, and was sent to all interested parties including appropriate Federal and State agencies. All comments received on this action have been reviewed and are summarized below:

1. **Summary of Comments Received**: (Record the Comments from the various agencies and how the comments were addressed under appropriate heading. If no comments sent in for a certain group put NONE under that group) Were there comments to the public notice and how did Caltrans respond to those comments. (Note: the comments will be sent from the public to the Corps and the Corps will send those comments to Caltrans to address. Caltrans will need to send their comments back to the Corps as well as to the person addressing Caltrans, The Corps will Fill this section out but Caltrans has to send back to the Corps Caltrans' comments.

a. **Federal Agencies**:

(1) U.S. Environmental Protection Agency (EPA):

(2) U.S. Fish and Wildlife Service (FWS):

(3) National Marine Fisheries Service (NMFS):

(4) U.S. Coast Guard (CG):

(5) Other Federal Agency(ies): (List others federal or state agencies or write None)

b. **State and Local Agencies**:

(1). California Department of Fish and Game (CDF&G):

c. **Organizations**: (List any other organizations or write None)

d. **Individuals**:

Corps will fill the Rest of this Out, You Can Stop here

2. **Evaluation**:

I have reviewed and evaluated, in light of the overall public interest, the documents and factors concerning this permit application and the stated views of other interested agencies and the concerned public. In doing so, I have considered the possible consequences of this proposed work in accordance with regulations published in 33 C.F.R. Parts 320 to 331 and 40 C.F.R. Part 230. The following paragraphs include my evaluation of comments received and how the project complies with the above cited regulations:

a. **Consideration of Comments**: (how were the comments considered)

b. **Evaluation of Compliance with the Section 404(b)(1) Guidelines** (40 C.F.R. Section 230.10):

(1) **Alternative Test** (40 C.F.R. Section 230.10(a)): The applicant has reasonably demonstrated that there are no other locations to accommodate the project or alternative designs to further reduce adverse impacts to aquatic resources. Based on this evaluation, the Corps concludes there are no other practicable alternatives to the project with less adverse impact on the aquatic ecosystem or without other significant adverse environmental consequences.

(2) **Special Restrictions** (40 C.F.R. Section 230.10(b)): The proposed fill or discharge would not: (all of the following statements must be true or they will have to be resolved before a permit is issues, no

comments needed here.)

(a) violate State water quality standards;

(b) violate toxic effluent standards (under Section 307 of the Clean Water Act);

(c) jeopardize endangered or threatened species or their critical habitat; or

(d) violate standards set by the Department of Commerce to protect marine sanctuaries.

(e) Evaluation of the information in Sections II.C and II.D indicates that:
(The following criteria just needs to be true, no comments needed)

the dredged or fill material is not a carrier of contaminants.

the dredged or fill material complies with the testing exclusion criteria and no contamination would be associated with the disposal materials.

the levels of the contaminants in the proposed dredged or fill material are substantially similar at the extraction and disposal sites and the discharge is not likely to result in degradation of the disposal site and pollutants will not be transported to less contaminated areas.

acceptable constraints are available and will be implemented to reduce contamination to acceptable levels within the disposal site and prevent contaminants from being transported beyond the boundaries of the disposal site.

(3) **Other Restrictions** (40 C.F.R. Section 230.10(c)): The discharge would not cause or contribute, by the discharge of pollutants, to significant degradation of waters of the United States by adversely effecting, individually or collectively: (The following criteria need to be true)

(a) human health or welfare including, but not limited to, municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites;

(b) life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their by-products outside the disposal site through biological, physical and chemical processes;

(c) aquatic ecosystem diversity, productivity, and stability including, but not limited to, loss of fish and wildlife habitat, or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy; or

(d) recreational, aesthetic and economic values.

(4) **Actions to Minimize Potential Adverse Impacts** (40 C.F.R. Section 230.10(d)): As Special Conditions to the permit, the permitted would be required to:

This is were I will put Special Conditions to the permit, so you don't need to add anything here.

c. **General Evaluation/Public Interest Review** (33 C.F.R. Section 320.4(a))

(1) **Extent of the Public and Private Need**: (Were public and/or private needs addressed, if so discuss)

(2) **Alternative Locations and Methods**: (were alternative locations and methods discussed)

(3) **Extent and Permanence of Beneficial and Detrimental Effects**: (discuss)

d. **Significant National Issues** (33 C.F.R. Section 320.4(j)(4)):

No national issue of overriding importance to State and local issues was identified that would cause the issuance of a permit to be contrary to the public interest.

IV. **DETERMINATIONS**:

A. **Public Hearing Request** (33 C.F.R. Section 325.3(a)(15):

The Corps received no request to hold a public hearing regarding this project as a result of our Public Notice.

B. **CLEAN AIR ACT CONFORMITY RULE** (40 C.F.R. Section 51.850):

The project has been analyzed for conformity applicability in accordance with regulations implementing Section 176(c) of the Clean Air Act (CAA). The Corps concludes any increase in direct emissions of a criteria pollutant or its precursors associated with the permitted fill discharges would be clearly de minimis and are; therefore, exempt from the requirement of a CAA conformity determination, pursuant to 40 C.F.R. Section 93.153. Any indirect emissions associated with later phases of the project would not be a continuing program responsibility of, nor practicably controlled by, the Corps and, for these reasons, a conformity determination is not required for this permit.

C. **SECTION 404(b)(1) COMPLIANCE/NON-COMPLIANCE REVIEW** (40 C.F.R. Section 230.12):

the discharge complies with the Section 404(b)(1) Guidelines and represents the least environmentally damaging practicable alternative.

the discharge complies with the Guidelines with the inclusion of the appropriate and practicable special conditions listed above [See III.B.2.b(4).] to minimize pollution or adverse effects to the affected ecosystem and now represents the least environmentally damaging practicable alternative.

the discharge fails to comply with the requirements of these Guidelines because.

there is a practicable alternative to the proposed discharge that would have less adverse effect on the aquatic ecosystem and the alternative does not have other significant adverse environmental consequences.

the proposed discharge will result in significant degradation of the aquatic ecosystem under 40 C.F.R. Section 230.10(b) or (c).

the discharge does not include all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem

there is not sufficient information to make a reasonable judgment as to whether the proposed discharge will comply with the guidelines.

C. **FINDING OF NO SIGNIFICANT IMPACT** (33 C.F.R. Part 325, Appendix B):

Based on a review of information incorporated in the final environmental assessment, including views of the applicant, general public, and resource agencies having special expertise or jurisdiction by law, the Corps concludes the permitted activity would not significantly affect the quality of the human environment. Pursuant to the provisions of the National Environmental Policy Act of 1969, the preparation of an Environmental Impact Statement (EIS) will, therefore, not be required.

D. **PUBLIC INTEREST DETERMINATION** (33 C.F.R. Section 320.4(a)):

The decision on whether to issue a permit is based on an evaluation of probable effects, including cumulative effects, of the project and its intended use on the public interest. This evaluation reflects the national concern for both the protection and utilization of important resources identified at 33 C.F.R. Section 320.4(a)(1). The Corps has reviewed the administrative record for the permit application and considered all pertinent comments received on the project. Upon completing this evaluation and weighing all factors relevant to the project, I find that issuance of a Department of the Army permit, with special conditions, as prescribed by regulations published in 33 C.F.R. Parts 320 to 331 and 40 C.F.R. Part 230 is not contrary to the public interest.

Recommended by:

Wajahat Nyaz Project Manager	Date

Concurred with:

Skip Sowko District Division Chief, Design South	Date

Approved by:

name Lieutenant Colonel, Corps of Engineers District Engineer	Date

Supplement to Application for Department of the Army Permit (33 CFR 325)

Block 18: Nature of Activity

The MSN Project B2 will consist of upgrading the existing U.S. 101 four lane expressway into a full access controlled freeway, and replacing the existing South Petaluma Blvd. interchange with a new diamond interchange overcrossing, and constructing frontage roads on both sides of U.S. 101 for maintaining access to intersecting roadways and adjacent parcels. The project will accommodate future construction of HOV lanes in both directions and future reconstruction of U.S. 101 to meet the current horizontal alignment, vertical profile and sight distance requirements for the 70 mph corridor design speed.

The proposed South Petaluma Blvd. diamond interchange overcrossing will be constructed just south of the existing South Petaluma Blvd. undercrossing. The South Petaluma Blvd. overcrossing will consist of four lanes, two lanes in each direction connecting the proposed West Frontage Road on the west side of U.S. 101 to South Petaluma Blvd. on the east side of U.S. 101. The northbound off-ramp will be a single lane off ramp widening to 3 lanes at the ramp terminus. Intersections at NB and SB ramps and at South Petaluma Blvd. will be signalized.

The proposed West Frontage Road connects the proposed South Petaluma Blvd. overcrossing with the existing Kastania Road. The West Frontage Road continues south from Kastania Road providing access to properties along the west side of 101 until the road meets Gunn Drive at the southern limit of the project area.

The proposed East Frontage Road will extend from the termination of South Petaluma Blvd. at the proposed overcrossing to a dirt driveway approximately even with the existing southern end of Kastania Road.

Block 19: Proposed Project Purpose

The purpose of the proposed MSN HOV Widening Project is to reduce existing congestion, anticipate future congestion, improve highway operations and correct existing drainage and flooding hazards for the U.S. 101 highway through Marin and Sonoma counties. Over the last 15 years, the Marin and Sonoma county areas have experienced significant commercial and residential growth as well as growth to the tourism industry. This has resulted in an increase in vehicles using this crucial link for commuters and commerce that connects the vital business centers of San Francisco and the East Bay with Marin, Sonoma and the North Coast.

The freeway narrows into a four-lane expressway at a place called the “narrows” which constricts travel and contributes to local traffic congestion. Projected growth in the area would further contribute to congestion and delays. The existing expressway has at grade, non-signalized intersections or driveways where adjacent landowners can access the freeway. However, local traffic needs are no longer served well and commuter traffic conflicts with the vehicles entering and exiting the expressway at these points.

The proposed project, the MSN HOV Widening Project B2, is a necessary component of the overall MSN HOV Widening Project which will convert the existing four-lane expressway into a contiguous freeway with the requirements for a 70 mph design speed. The proposed project is designed to accomplish the following:

- Reduce existing and projected traffic congestion.
- Accommodate future travel demand.
- Reduce travel time and delay.
- Encourage use of carpooling during peak travel hours.
- Encourage public transit use.
- Improve system reliability for the movement of goods.
- Reduce energy use and improve local and regional air quality.
- Improve traffic safety.
- Improve drainage system.
- Reduce flood hazards.

Block 21: Types of Material Being Discharged and the amount of Each Type in Cubic Yards
Block 22: Surface Area in Acres of Wetlands or Other Waters Filled

Table A: MSN B2 Impacts to Wetlands and Waters

Wetlands or Water Feature	(P) Impact	(P) Impact	(T) Impact	(T) Impact	Fill
	(ACRE)	(SQFT)	(ACRE)	(SQFT)	(CY)
OW1	0.013	580	0.001	63	21.48 CY roadway fill
OW2	0.011	468	0.008	363	75.00 CY concrete 20.00 CY rock slope protection
OW3	0.009	371			13.74 CY roadway fill
OW4	0.059	2551	0.011	485	255.88 CY roadway fill 22.90 CY concrete 4.66 CY rock slope protection
OW5	0.032	1,404	0.003	129	88.00 CY roadway fill 40.1 CY concrete
OW6			0.042	1,835	
OW7			0.002	75	
OW8			0.001	67	
OW9	0.000	20	0.001	30	5.30 CY rock slope protection
Total Other Waters	*0.124*	*5,394*	*0.069*	*3,047*	*379.10 CY roadway fill* *138.00 CY concrete* *29.96 CY rock slope protection*

Wetlands or Water Feature	(P) Impact	(P) Impact	(T) Impact	(T) Impact	Fill
	(ACRE)	(SQFT)	(ACRE)	(SQFT)	(CY)
WL1	0.009	412	0.006	256	15.26 CY roadway fill 6.11 CY rock slope protection
WL2	0.004	184	0.006	248	6.81 CY roadway fill 2.33 CY rock slope protection
WL3	0.001	60	0.024	1,050	2.22 CY roadway fill
WL4	0.017	760	0.007	305	28.15 CY roadway fill
WL5	0.111	4,827	0.313	13,631	169.46 CY roadway fill 9.32 CY rock slope protectio
WL6	0.467	20,356	0.276	12,004	747.60 CY roadway fill 6.33 CY rock slope protection
WL7			0.002	96	
WL8	0.020	876			5.64 CY roadway fill 26.80 CY concrete
WL9	0.178	7,760	0.053	2,301	285.08 CY roadway fill 2.33 CY rock slope protection
WL-10			0.008	360	
WL-11			0.003	123	
WL-12	0.000	4	0.001	44	5.30 CY rock slope protection
WL-13	0.001	45			4.40 CY rock slope protection
WL-14			0.002	85	
WL-15			0.002	75	
Total Wetlands	*0.808*	*35,100*	*0.703*	*30,578*	*1,260.22 CY roadway fill 26.80 CY concrete 36.12 CY rock slope protection*
CW1	0.002	82			
CW2	0.006	283			
CW3	0.001	52	0.001	22	
CW5	0.002	77	0.006	287	
CW6	0.012	526			
CW7	0.007	285	0.001	25	
Total Culverted Waters	*0.030*	*1,305*	*0.008*	*334*	
Total Wetlands and Other Waters	*0.962*	*41,799*	*0.780*	*33,959*	*1639.32 CY roadway fill 164.80 CY concrete 66.08 CY rock slope protection*

The impacts to wetlands and other waters of the U.S. are described in the following paragraphs, starting with the impacts at the northern end of the project working toward the south.

On the west side of U.S. 101 and just north of the proposed South Petaluma Blvd. overcrossing is an intermittent drainage (OW-4 and OW-5) that flows east across the project area, through a culvert under U.S. 101, where it connects to a small wetland (WL-8) in the median area between U.S. 101 and the existing U.S. 101 northbound off ramp. A proposed access road serving properties northwest of the proposed South Petaluma Blvd. interchange will cross the unnamed intermittent stream (OW-4). At the access road stream crossing, a 4 ft. by 2 ft. reinforced concrete box culvert with a headwall and rock slope protection on either side of the culvert is proposed. The box culvert will be approximately 31 ft. long and require approximately 22.9 cubic yards of concrete fill for culverts and headwalls, 256 cubic yards for roadway fill and 4.6 cubic yards for rock slope protection permanently affecting approximately 0.059 acre and temporarily impacting 0.011 acre of waters of the U.S.

The unnamed drainage (OW-5) flows downstream from the proposed access road to an existing 4 ft. by 3 ft. concrete box culvert (CW-5) that spans the width of U.S. 101 into a small wetland (WL-8) in the median between U.S. 101 and South Petaluma Blvd. An approximately 125 ft. extension of the concrete culvert (CW-5) is proposed for the west side of the culvert to drain the stream under the proposed overcrossing ramp. Approximately 0.032 acre of the unnamed drainage (OW-5) will be permanently impacted and 0.003 acre temporarily impacted by construction of the South Petaluma Blvd. overcrossing ramp and extended culvert. The extension of the culvert on the west side of U.S. 101 will result in approximately 40.1 cubic yards of reinforced concrete fill and 88.0 cubic yards of roadway fill.

The proposed project would extend the reinforced concrete box culvert (CW-5) that terminates on the east side of U.S. 101 and connect it to the 4 ft. by 3 ft. box culvert (CW-6) that is underneath South Petaluma Blvd. Approximately 26.8 cubic yards of reinforced concrete fill and 5.6 cubic yards of roadway fill are proposed for construction of this culvert. Construction of the culvert to connect the existing culverts would permanently impact 0.020 acre of the median wetland (WL-8). The existing box culvert (CW-6) underneath South Petaluma Blvd. terminates in a wetland (WL-9) of approximately 0.226 acres. Approximately 0.178 acre of this wetland will be permanently impacted and 0.053 acre temporarily impacted from roadway fill material and extension of the reinforced concrete box culvert required for construction of the South Petaluma Blvd. overcrossing and realignment of South Petaluma Blvd. The wetland (WL-9) will be impacted by approximately 285 cubic yards of roadway fill and 2.3 yards of rock slope protection. A 4 ft. by 3 ft. culvert that is approximately 351 ft. long is proposed to extend from the edge of the wetland (WL-9) to wetland (WL-13) east of the proposed frontage road. The project will permanently impact approximately 0.001 acre of the wetland (WL-13) with 4.4 cubic yards of rock slope protection.

Further south along U.S. 101, two wetlands that span the eastern side of the highway are approximately 650 ft. and 1,050 ft. in length respectively. A frontage road (East Frontage Road) on the east side of U.S. 101 is proposed to be constructed along a portion of both of these wetlands. Approximately 0.467 acre of the first wetland (WL-6) will be

permanently impacted and 0.276 acre will be temporarily impacted by the project. Of the second wetland (WL-5) approximately 0.111 acre will be permanently impacted and 0.313 acre will be temporarily impacted by the proposed project. Across from these wetlands on the west side of U.S. 101 are three small jurisdictional features. The project will have approximately 0.017 acre (permanent) and 0.007 acre (temporary) of impacts to wetland (WL-4) and 0.002 acre (temporary) of impacts to the second wetland (WL-7). The roadway widening work will also have 0.009 acre of permanent impacts to a 2 ft. wide drainage ditch (OW-3) on the west side of U.S. 101.

Approximately 450 feet north of the gas station on the corner of Kastania Road and U.S. 101 is a second unnamed stream that crosses the project area from west to east and is tributary to the Petaluma River. The stream crosses Kastania Road on the west side of the project area and U.S. 101 on the east side. Kastania Road is proposed to be widened from approximately 15 ft. wide to 20 ft. wide with 5 ft. shoulders on either side. The unnamed stream passes through a box culvert at Kastania Road. Proposed construction work will result in 0.002 acre of temporary impacts to waters of the U.S. (OW-7) and 0.002 acres of wetlands within waters (WL-14) on the west side of the culvert. Proposed construction on the east side of the culvert consists of small modifications to the headwall and rock slope protection placed at the end of a biofiltration swale and adjacent culvert. Approximately 9.5 cubic yards of rock slope protection will be placed on the east side of the culvert next to the unnamed stream. Construction work at this location will cause approximately 0.001 acre of temporary impacts to waters of the U.S. (OW-8) and 0.002 acre of temporary impacts to wetlands (WL-15).

At U.S. 101, the unnamed stream (OW-9 and OW-2) passes under the highway through a 10 ft. by 6 ft. box culvert (CW-2) approximately 177 ft. in length. The East Frontage Road is proposed along the eastern side of U.S. 101 where the existing box culvert for the unnamed stream terminates. The 10 ft. by 6 ft. box culvert (CW-2) will be extended an additional 52 ft., for a total length of 224 ft. long to extend past the width of the proposed frontage road. At the end of the proposed box culvert (extension), a headwall will be constructed. Approximately 0.011 acre of the unnamed stream (OW-2) will be permanently impacted and 0.008 acre temporarily impacted by the culvert, headwall and rock slope protection needed for the drainage of the unnamed stream at this location of the proposed East Frontage Road. Approximately 75 cubic yards of concrete fill are proposed for the reinforced concrete box culvert, headwall, and 20 cubic yards of rock slope protection below the headwall. On the west side of the culvert, approximately 5.3 cubic yards of rock slope protection is proposed. The fill is expected to have less than 0.001 acre of permanent impacts to waters of the U.S. (OW-9) and wetlands within waters (WL-12). The construction work is expected to have approximately 0.001 acre of temporary impacts to waters of the U.S. (OW-9) and 0.001 acre of temporary impacts to wetlands within waters (WL-12).

West of Kastania Road opposite of the gas station there is a wetland (WL-3) that is approximately 6,035 square ft. in area. The wetland is comprised of mostly weedy, herbaceous plants. The widening and realignment of Kastania Road will permanently impact 0.001 acre and temporarily impact 0.024 acre of this wetland. This wetland (WL-3) is connected to another wetland (WL-10) via a small culvert (CW-3) that will be permanently impacted by the proposed project. Approximately 0.008 acres of the

wetland (WL-10) will be impacted (temporary) by the proposed project. Another wetland (WL-11) east of U.S. 101 may be impacted (temporary) by access needed for utility installations. The construction work is expected to have approximately 0.003 acres of temporary impacts to the wetland (WL-11).

The proposed West Frontage Road will extend south from the end of Kastania Road to Gunn Drive. Midway between Kastania Road and Gunn Drive, construction of the proposed frontage road will permanently impact approximately 0.009 acre and temporarily impact 0.006 acre of a small wetland (WL-1). This wetland (WL-1) is adjacent to a second wetland (WL-2). Construction of the proposed frontage road will result in 0.004 acre of permanent impacts and 0.006 acre of temporary impacts to the second wetland (WL-2). In-between the two small wetlands is a culvert (CW-1) that is approximately 16 feet long and will be removed by the proposed project.

Further south, construction of the West Frontage Road will have approximately 0.013 acre of permanent impacts and 0.001 acre of temporary impacts to a roadside ephemeral ditch (OW-1) that runs along the north end of Gunn Drive where the proposed frontage road would connect with Gunn Drive. The project proposes to drain the roadside ditch to the other side of Gunn Drive via an eighteen inch corrugated steel pipe.

Combined the project will permanently impact 0.808 acre of wetlands, 0.030 acre of culverted waters and 0.124 acre of other waters of the U.S. and temporarily impact 0.703 acre of wetlands, 0.008 acre of culverted waters and 0.069 acre of other waters of the U.S.

Block 23: Description of Avoidance, Minimization and Compensation

Roadway realignments, project footprint and waterway crossings have been planned to avoid to the greatest extent feasible, wetlands, waters of the U.S., and environmentally sensitive areas. The project will implement permanent, design pollution prevention, best management practices (BMPs) that employ landscaping and drainage elements to reduce runoff and erosion such as biofiltration strips and swales and detention devices. The applicant will comply with the NPDES permit, which requires implementation of a Stormwater Pollution Prevention Plan (SWPPP) that identifies a list of construction site BMPs. A variety of techniques will be implemented for the project to prevent sediment from entering the watercourse and to prevent erosion, and degradation of water quality. Biofiltration swales, fiber rolls and erosion control netting will be utilized throughout the construction zone to reduce loose disturbed sediment from entering waters.

Temporary silt fences will be set up near riparian areas and throughout the construction zone to reduce sediment loads into waters. Fencing for environmentally sensitive areas (ESA) will be set up around riparian areas and wetlands that are not to be impacted by the project. Construction work will be scheduled to maximize the dry summer months when construction activities are less likely to result in the mobilization of sediment.

An Erosion Control and Water Pollution Plan will be implemented prior to the commencement of the Project and will contain all the specifications to minimize erosion,

sedimentation and water pollution. Implementation of this plan will greatly reduce erosion potential and enhance the rehabilitation of the site. The slopes at the site will be revegetated and concentrated flow conveyance systems will be utilized to reduce erosion.

Compensation will be provided for wetlands and other waters of the U.S. impacted by the project. In consultation with the USEPA, the USACE and the RWQCB, Caltran's and FHWA will determine replacement ratios for impacts to wetlands and waters. The majority of the mitigation will be to enhance and restore freshwater and seasonal wetland habitat. This mitigation may also incorporate habitat for aquatic species such as salmonids and California red-legged frog. For impacts to wetlands of the U.S., Caltrans expects to purchase credits at the Burdell Ranch Mitigation Bank.

The Final Biological Opinion (attached) issued by the U.S Fish and Wildlife Service on April 1, 2009 describes the proposed mitigation/compensation for potential effects to California red-legged frog (CRLF) habitat. The compensation will be provided at a 1:1 ratio and will be achieved using a combination of the following:

1) purchasing credits at a resource agency approved mitigation bank servicing the action area; 2) purchasing conservation easements at or as close to the project site as practical within Marin or Sonoma Counties; 3) purchasing a fee title and preserving land for CRLF at or close to the project site as practical with Marin or Sonoma Counties. The compensation for CRLF will be provided prior to starting construction on the project.

FOUNDATION REPORT

MSN A3 – NB HOV LANE WIDENING PROJECT
NORTH NOVATO OVERHEAD WIDEN (BR. # 27-0094R)
NOVATO, MARIN COUNTY, CALIFORNIA

For

BKF-ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94588

PARIKH CONSULTANTS, INC.

2360 Qume Drive, Suite A, San Jose, CA 95131
(408) 452-9000

June 7, 2012

Job No. 2011-145-BRG

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 1
2.0 PURPOSE AND SCOPE 1
3.0 EXISTING BRIDGE AND PROPOSED CONSTRUCTION 2
4.0 SITE CONDITIONS 3
5.0 FIELD EXPLORATION AND LABORATORY TESTING 3
6.0 SUBSURFACE SOIL CONDITIONS 5
7.0 GEOLOGY 7
8.0 EARTHQUAKE CONSIDERATIONS 10
8.1 Seismic Sources 10
8.2 Seismic Design Criteria 11
8.3 Seismic Hazards/Liquefaction Potential 12
9.0 FINDINGS AND RECOMMENDATIONS 15
9.1 General 15
9.2 Earthwork and Grading 15
9.3 Bridge Foundations 15
9.3.1 Pile Design 16
9.4 Lateral Design for Piles 20
9.5 Lateral Earth Pressures and Friction Coefficient 26
9.6 Embankment Settlement & Waiting Period 27
9.7 Embankment Stability 27
9.8 Corrosion 27
10.0 PLAN REVIEW 28
11.0 CONSTRUCTION OBSERVATION 29
12.0 INVESTIGATION LIMITATIONS 29

PLATE

PROJECT LOCATION MAP ..... Plate 1

SITE PLAN ..... Plate 2

GEOLOGIC MAP ..... Plate 3

FAULT MAP ..... Plate 4

ARS DESIGN CURVE ..... Plates 5A and 5B

PASSIVE PRESSURE MOBILIZATION AGAINST PILE CAPS ..... Plate 6

APPENDICES

APPENDIX A

Log of Test Borings, As-Built Log of Test Borings

TABLE OF CONTENTS (Continued)

APPENDIX B

Laboratory Test.....Plate B-1

Summary..... Plates B-2A and B-2B
Plasticity Chart .....Plate B-3
Grain Size Distribution Curves..... Plates B-4A and B-4B
Unconfined Compression Test .....Plates B-5A through B-5H
Corrosion Tests ..... Plates B-6A through B-6C
Consolidation Test .....Plate B-7

APPENDIX C

ARS – Calculated Spectra Deterministic and Probabilistic Input Data

Calculation of Shear Wave Velocity

Evaluation of Liquefaction Potential

APPENDIX D

OSFP Technical Comment Review and Reponses (North Novato Overhead Widen)

FOUNDATION REPORT
MSN A3 - NB HOV LANE WIDENING PROJECT
NORTH NOVATO OVERHEAD WIDEN (BRIDGE NO. 27-0094R), NOVATO
MARIN COUNTY, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed "MSN A3 - NB HOV Lane Widening Project – North Novato Overhead Widen" in City of Novato, Marin County, California, hereinafter referred to as "PROJECT". The work was performed in general accordance with the scope of work outlined in our agreement with BKF-Engineers (Designer). The approximate location of the project site and its vicinity are shown on the Project Location Map, Plate 1.

The geotechnical recommendations presented in this report are intended for design input and are not intended to be used as specifications. In addition, the data provided in this report including these geotechnical recommendations should not be used for bidding purposes or for construction cost estimates. If the report is provided as a reference document, any interpretation of the data and recommendations should be the sole responsibility of the user and PARIKH Consultants, Inc. (PARIKH) shall not be liable for any consequences.

2.0 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate the general subsurface conditions at the project site, to evaluate their engineering properties, and to provide geotechnical recommendations for the foundation design of the proposed project.

The scope of work performed for this investigation included a review of the readily available soils and geologic literature pertaining to the site including available as-built Log of Test Borings (LOTB) for the existing structure (Br. No. 27-0094R), site reconnaissance, obtaining representative soil samples and logging soil materials encountered in exploratory soil borings, laboratory testing of the representative soil samples, performing engineering analyses based on the field and laboratory data, and preparation of this foundation report. The borings for this study were drilled by PARIKH in October/November 2011 and May 2012.

3.0 EXISTING BRIDGE AND PROPOSED CONSTRUCTION

Existing Bridge

Based on the as-built general plan of "North Novato Overhead (Post Mile 22.3)", the existing bridges are 4-span structures, which were originally built in around 1975. The bridge consists of cast-in-place prestressed concrete box girder superstructure. The width of each bridge structure (northbound or southbound) is approximately 54 feet. The length of the bridges is approximately 445 feet. The North Novato Overhead bridges cross over the Sonoma-Marin Area Rail Transit (SMART) Corridor and Rush Landing Road.

Proposed Construction

The California Department of Transportation (Caltrans) in cooperation with Federal Highways Administration (FHWA), the Transportation Authority of Marin (TAM), and Sonoma County Transportation Authority (SCTA) propose to improve State Route (SR) 101 through Marin/Sonoma Narrows (MSN) between SR 37 in the City of Novato to just north of the Corona Road Overcrossing in the City of Petaluma.

The "Marin-Sonoma Narrows (MSN) A3 NB High Occupancy Vehicle (HOV) Lane Widening Project" (hereinafter referred to as "MSN A3 PROJECT") is proposed to widen northbound SR 101 to provide an HOV lane and 10-foot inside shoulder for approximately 2 miles north of the MSN A1 HOV system within the City of Novato in Marin County.

The existing North Novato Overhead Bridge, which is located just north of Atherton Avenue, will be widened by 18 feet 4 inches to accommodate the 10-foot shoulders and the 12-foot HOV Lane. The proposed northbound widening will be on the west side of the existing bridge between the northbound and southbound structure.

This report provides foundation recommendations for the widening of the northbound North Novato Overhead Bridge (Bridge No. 27-00974R).

Our recommendations in this report are based on the above information. Any major deviation should be reported to this office for consideration.

4.0 SITE CONDITIONS

At the project location, existing Rte 101 cuts across the toes of several steep slopes and gently sloping valleys and plains adjacent to Petaluma River marshes to the east. Topography along Rte 101alignment is relatively flat except for the North Novato Overhead section where the elevation of the roadway was raised to a maximum elevation of about 45 feet.

5.0 FIELD EXPLORATION AND LABORATORY TESTING

As-Built LOTB

We refer to the as-built LOTB of "North Novato Overhead" for the subsurface soil conditions at the project site.

Based on the as-built LOTB, Borings B-4, B-5 and B-8 were drilled by Caltrans in the vicinity of northbound North Novato Overhead Bridge in October/November 1968. These soil borings were drilled to the approximate depths between 50 feet and 90 feet and to the bottom elevation between approximately -40.5 feet and -85.5 feet.

Field Exploration in 2011

Based on the preliminary plans, discussions with the designers, and readily available geotechnical data in the area, Borings R-11-NO-001 and R-11-NO-002 were drilled for the proposed widening of the northbound North Novato Overhead Bridge. Boring R-11-NO-001 was drilled on the north side of SMART railroad and east side of the northbound North Novato Overhead Bridge along Rush Landing Road, to the depth of 101.5 feet in November 2011. Boring R-11-NO-002 was drilled on the south side of SMART railroad at the median of south abutment of North Novato Overhead Bridge, to the depth of 96 feet in October 2011.

Field Exploration in 2012

An additional Boring R-12-NO-003 was drilled for the proposed widening of the northbound North Novato Overhead Bridge. This was in response to Caltrans' review

comment on the Foundation Report for the "North Novato Overhead Widen". Boring R-12-NO-003 was drilled on the southbound lane of Rush Landing Road and on the west side of the northbound North Novato Overhead Bridge (in the vicinity of Bent 3 of North Novato Overhead Bridge), to the depth of 121.5 feet in April 2012.

The approximate locations of the borings are shown on the Site Plan, Plate 2. The details of the field exploration are included in Appendix A. The descriptions of the subsurface soil materials encountered in the soil borings field exploration and relevant boring information are presented in the LOTB in Appendix A of the report.

Borings R-11-NO-001, R-11-NO-002 and R-12-NO-003 were advanced using truck-mounted rotary-wash drilling method. Boring R-11-NO-001 was drilled to the depth of 101 feet with approximately 20 feet of coring into the Franciscan Complex. Boring R-12-NO-003 was drilled to the depth of 121.5 feet with approximately 70 feet of coring into the Franciscan Complex. The rock coring was using the HQ Diamond Core Rock Bit.

Selected soil samples were obtained from Modified California samplers (2.5 in. I.D.) and Standard Penetration Test samplers (1.375 in. I.D.) at various depths. The MC and SPT samplers were driven under the impact of a 140 lb hammer having a free fall of 30 inches. The blow counts are presented on the LOTB. (When correlating standard penetration data, the blow counts for the Modified California Sampler may be converted to equivalent SPT blow counts by multiplying a conversion factor of 0.65). The samples were sealed and transported to our laboratory for further evaluation and testing. The field investigation was conducted under the supervision of our field engineer who logged the test borings and prepared the samples for subsequent laboratory testing and evaluation.

Laboratory tests were performed on selected soil samples collected during field exploration to evaluate the properties of the subsurface soils. Laboratory tests performed for the study include the following: Laboratory determination of Moisture-Density (California Test Method T-226), Atterberg Limits (California Test Method T-204), Grain Size Distribution Analysis (California Test Method T-202), Unconfined Compression Test (California Test Method T-221), Consolidation Test (ASTM D-2435) and Corrosion Test (California Test Method T643). The laboratory test results are presented in Appendix B.

It should be noted that the descriptions of the soils encountered and relevant boring information presented on the LOTB depict subsurface conditions only at the locations indicated on the plan and on the particular date noted on the boring logs of LOTB (October/November 2011 and April 2012). Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the boring locations explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental changes.

The locations of Borings R-11-NO-001, R-11-NO-002, and R-12-NO-003 and the as-built borings and CPTs are shown on Plate 2, "Site Plan".

Copy of the Caltrans "as-built" LOTB (October/November 1968) is included in Appendix A.

6.0 SUBSURFACE SOIL CONDITIONS

Based on the as-built LOTB, the subsurface soils at the project site generally consist of:

- Approximately top 40 feet to 75 feet of interbedded layers of loose to medium dense silty sand and firm to very stiff silt/lean clay.
- Boring B-8 - Pockets/lenses (approximately 3 feet to 7 feet thick) of loose to medium dense sand were encountered at the approximate depths between 10 feet and 20 feet. Five feet of soft silt was encountered at approximate depth of 35 feet.
- Boring B-4 - Pocket/lens (approximately 5 thick) of medium dense sand was encountered at the approximate depth of 15 feet and 20 feet. Occasional pockets/lenses/layers of dense to very dense sand/gravel were encountered at the approximate depths of 25 feet and 40 feet.
- Boring B-5 - twenty feet of soft silt/lean clay were encountered at approximate depth of 45 feet.
- The approximate depth and elevation of the decomposed Greywacke of Franciscan Complex encountered are summarized in the table below:

Boring Number	Approximate Depth (feet)	Approximate Elevation (feet)
B-1	-	-
B-4	75.5	-66.0
B-5	88.0	-83.5
B-8	45.0	-42.5

Groundwater was measured at the approximate depths between 2 feet (approximate Elev. 2.5 feet) and 6 feet (approximate Elev. -1.5 feet) below the ground surface during drilling in Boring B-5, CPTs B-6 and B-7.

Based on the LOTB with Borings R-11-NO-001, R-11-NO-002 and R-12-NO-003, the subsurface soils at the project site generally consist of:

- Boring R-11-NO-001 – approximately top 5 feet of medium dense sand;
  Underlain by approximately 25 feet of very stiff lean clay;
  Underlain by approximately 25 feet of dense to very dense silty/clayey sand;
  Underlain by approximately 20 feet of interbedded layers of stiff lean/fat clay and clayey sand;
  Underlain by very dense silty sand/hard intensely fractured/crushed rock to the bottom of boring at the depth of 101 feet.

- Boring R-11-NO-002 – approximately top 5 feet of very stiff lean clay;
  Underlain by approximately 10 feet of dense clayey sand with gravel;
  Underlain by approximately 20 feet of very stiff lean clay;
  Underlain by approximately 35 feet of interbedded layers of very dense sand and hard lean clay;
  Underlain by approximately 10 feet of medium dense sand;
  Underlain by approximately 10 feet of stiff fat clay;
  Underlain by hard lean clay to the bottom of boring at the depth of 96 feet.

- Boring R-12-NO-003 – approximately top 9 feet of medium dense clayey gravel;
  Underlain by approximately 4 feet of very soft fat clay;
  Underlain by approximately 12 feet of very stiff lean clay;
  Underlain by approximately 4 feet of very dense clayey gravel;
  Underlain by approximately 25 feet of stiff to hard lean clay with pocket/lens of medium

dense clayey sand;
Underlain by very dense silty sand/hard intensely fractured/crushed rock to the bottom of boring at the depth of 121.5 feet.

Groundwater was encountered at approximate Elev. +21.5 feet (depth of 17 feet) in Boring R-11-NO-002, Elev. +1.0 feet (depth of 11 feet) in Boring R-11-NO-001 and approximate Elev. +6.0 feet (depth of 6.5 feet) in Boring R-12-NO-003 during drilling. Based on the comparison with the groundwater measured in the nearby borings, the groundwater encountered in Boring R-11-NO-002 within the embankment is likely to be perched water. It is anticipated that groundwater level will vary with the passage of time due to seasonal ground water fluctuations, surface and subsurface flow, ground surface run-off and other factors that were not existent at the time of our investigations.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the subsurface soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope. Such variations, when encountered, generally require additional engineering services to attain properly constructed project. We, therefore, recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during construction.

7.0 GEOLOGY

General geologic features pertaining to the site were evaluated by reference to the "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California, by M.C. Blake, Jr., R.W. Graymer and D.L. Jones, 2000". Based on the publication, the project site is underlain by artificial fill over marine and marsh deposits (Bay Mud) (Quaternary) (Qmf), Alluvium (Quaternary) (Qal) that were deposited upon the previously eroded surface of Franciscan bedrock and Metagreywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex. A geologic map of the general project area is shown on Plate 3. The general constituents and the engineering characteristics of each geologic unit are described below.

Artificial fill over marine and marsh deposits (Quaternary) (Qmf) – Mud, including much organic material, silty mud, silt, and sand; very soft to soft if wet, similar to unit Qm overlain by artificial fill, the limits of which are not mapped.

Alluvium (Quaternary) (Qal) – Variably sized gravel overlain by unconsolidated sand, silt and clay comprises the unit. Alluvium (Quaternary) is mapped in small valleys where separate fan, basin, and terrace units could not be delineated at the scale of general geologic mapping, and where deposits might be of either latest Pleistocene or Holocene age. This unit occurs in the floodplains of streams and rivers. The sediments form a rich loam and are excellent for agriculture.

The older Quaternary deposits are those mapped units that were deposited in the Quaternary, but are no longer actively being deposited. They have been deposited within the Pleistocene Epoch between 10,000 to 1.8 million years ago. These older units may also have an increased susceptibility to seismic shaking, liquefaction, differential settlement and landslide because they have generally not been buried deep or long enough to become well compacted and indurated. However, in general they are less susceptible to geologic hazards than the younger surficial deposits.

The **Metagreywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex** was formed in a subduction zone where sea floor (basalt) was forced downward into the upper mantle beneath the North American Continent; carrying with it various sediments (sand, silt, and clay) eroded from the continent or precipitated by organisms. Increased pressure and heat, combined with the tectonic displacement and shear forces, resulted in a chaotic mixing of the various materials with various strengths. The Franciscan Complex forms a diverse assemblage of rock types called mélanges (French: *mélange* or "mixture"), chaotic mixtures of hard blocks of various rock types surrounded by weaker matrix of sheared to pulverized rock. The Franciscan mélange is predominantly weathered and fractured sandstone and shale, with lesser amounts of chert.

To focus on the common fundamental engineering problems related to the characterization of complex geological mixtures, Medley (1994) coined the geologically neutral word "bimrocks" from Raymond's (1984) "block-in-matrix rocks". Medley's definition of

bimrocks is: *"a mixture of rocks composed of geotechnically significant blocks within a bonded matrix of finer texture*". The expression "geotechnically significant blocks" means that there is mechanical contrast between blocks and matrix, and the volume and size of the blocks influence the rock mass properties at the scales of engineering interest. Consequently, bimrocks may have considerable spatial, lithological, and mechanical variability. The weakest elements in bimrocks are the contacts between blocks and matrix. In mélanges, matrix shears generally pass around blocks with intense shearing adjacent to the larger blocks. The overall strength of bimrocks is independent of the strength of the individual blocks and depends more on the strength of the matrix between the blocks. Subsurface exploration may not reveal the size and distribution of strong blocks and the extent of weaker matrix in mélange. Consequently, the overall strength of Franciscan bedrock buried beneath the project site may not be fully characterized by even a significant number of borings. Interpolation between even closely spaced borings can lead to an overly simplistic representation of the rock mass strength.

Franciscan Complex bedrock is exposed in the hills surrounding the project site and is buried beneath approximately 60 feet to 80 feet of younger alluvium and Bay Mud at the site. The bedrock consists of greywacke sandstone that was metamorphosed during subduction. Franciscan greywacke is a variety of sandstone generally characterized by its significant hardness, dark color, and poorly sorted angular grains of quartz, feldspar, and small rock fragments or lithic fragments set in a compact, clay-fine matrix. The cementing material between the grains may be siliceous or argillaceous and is sometimes calcareous. Component particles are usually not very rounded or polished, and the rocks are often considerably indurate by re-crystallization. When subjected to increasing metamorphism, greywacke frequently passes into mica-schist, chloritic schist and sedimentary gneisses. Veins of white quartz are commonly found in Franciscan greywacke.

Rock core samples encountered at a depth of 70 feet below the ground surface in Boring R-11-NO-001 and approximate depth of 55 feet below the ground surface in Boring R-12-NO-003, consist of very hard, medium to dark gray colored greywacke sandstone that is fine-grained and well-cemented. For the rock core samples recovered from Boring R-11-NO-001, the upper few feet of the rock is stained light orange-brown from iron oxide,

indicating that it was previously exposed to near surface oxidation, prior to being buried by Bay Mud and alluvium. The presence of planar fractures in the in-place rock is evidenced by the fact that the cores broke into ¼ to ½ inch fragments that were subsequently rounded by the rotating drill bit. A few pieces of intact core that were not rounded by the drill bit exhibit very sharp edges. Pieces of white quartz appear to be remnants of ¼ inch-thick quartz veins. At a depth of 89 feet, a several inch thick zone of pulverized rock appears to be sheared matrix situated between two large blocks of intact greywacke sandstone. The same disrupted zone was encountered in Boring R-12-NO-003 between 86.5 feet and 91.5 feet below the ground surface.

8.0 EARTHQUAKE CONSIDERATIONS

8.1 Seismic Sources

The project is located in a seismically active part of northern California. Many faults exist in the regional area. These faults are capable of producing earthquakes and may cause strong ground shaking at the site. Faults in the vicinity of the site with a moderate to high potential for surface rupture include the Rogers Creek Fault Zone and San Andreas Fault Zone/North Coast Section. The attached Fault Map (Plate 4) presents the locations of the fault systems relative to the project site.

Maximum moment magnitudes (M_{max}) of some of the major faults in the area are determined by the Caltrans' recently developed online ARS tool (2007 Caltrans Deterministic PGA Map and ARS Online Report). These maximum credible earthquake magnitudes represent the largest earthquake a fault is capable of generating and is related to the seismic moment. The earthquake data of the active faults in the project vicinity are summarized in the table below.

TABLE 1: EARTHQUAKE DATA

Fault (Fault ID)	Maximum Moment Magnitude of Fault, M_{Max}	Fault Type	Site-to-Fault Distance
Rodgers Creek Fault (157)	7.1	Right Lateral Strike Slip	7 mi.
San Andreas Fault Zone (North Coast section) (308)	7.9	Right Lateral Strike Slip	13 mi.

8.2 Seismic Design Criteria

The recommended response spectrum was determined based on the new 2007 Caltrans Deterministic PGA Map and the Caltrans ARS Online (Ver. 1.0.4) for the development of response spectra for design. The development of the design ARS curve is based on several input parameters, including site location (longitude/latitude), average shear wave velocity for the top 30m/100 feet (Vs_{30m}), and other site parameters, such as fault characteristics, site-to-fault distances.

Based on the 2007 Caltrans Deterministic PGA Map and ARS Online tool, the Rogers Creek Fault (Mmax = 7.1, RLSS, at 7 miles) and the San Andreas Fault Zone (North Coast Section) (Mmax = 7.9, RLSS, at 13 miles) are considered for design.

The new design methods incorporate both the deterministic and the probabilistic seismic hazards to produce the Design Response Spectrum. According to the design manual, we have also reviewed and compared the probabilistic response spectrum from 2008 USGS Deaggregation Hazard (beta) website for the 5% in 50 years probability of exceedance (or 975 year return period).

Average shear wave velocity for the top 30m (100 feet) at the site was estimated by using established correlations and the procedure provided in the Design Manual (Ver. 1.0, August 2009). Based on the subsurface soil data, it is our opinion that the subsurface soil can be categorized as Soil Type D per NEHRP criteria. The site location and the relevant parameters are summarized as follows, and the recommended design curve is presented on Plates 5A and 5B.

- Site Location: 38.1220ºN/122.5658ºW
- Estimated V_{S30m} = 230 m/s
- The recommended ARS curve is governed by the USGS 2008 Deaggregation (Beta) method.
- Anticipated Peak Ground Acceleration (PGA): 0.60 g
- No adjustments were made for basin effect or near fault effect.

Calculation for the V_{S30m} is included in Appendix C.

8.3 Seismic Hazards/Liquefaction Potential

Potential seismic hazards may arise from three sources: surface fault rupture, ground shaking and liquefaction. Since no active faults pass through the site, the potential for fault rupture is relatively low. As shown on the Fault Map, Plate No. 4, the closest active fault is Rodgers Creek fault located approximately 7 miles northeast from the project site. Based on available geological and seismic data, the possibility of the site to experience strong ground shaking may be considered high.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

Based on the field logs and available data, the subsurface soil encountered in the as-built borings (Boring B-4, B-5 and B-8) consists of interbedded layers of loose to medium dense silty sand and firm to very stiff silt/lean clay, underlain by dense to very dense sand/gravel, underlain by decomposed Greywacke Franciscan Formation. Occasional pockets/lenses of medium dense silty/clayey sand were encountered at approximate depths of 20 feet in Borings R-11-NO-002 and 60 feet in Borings R-11-NO-001 and R-11-NO-002. Groundwater was measured at the approximate depths between 2 feet (approximate Elev. 2.5 feet) and 6 feet (approximate Elev. -1.5 feet) during the field exploration in November 1968. Groundwater was encountered at approximate depths between 11 feet (Elev. +1.0 feet) in Boring R-11-NO-001 during the field exploration in 2011 and 6.5 feet (Elev. +6.0 feet) in Boring R-12-NO-003 during the field exploration in 2012.

The liquefaction potential was evaluated in accordance with the methods proposed by Youd, et al. (2001). The evaluation was primarily using the boring data of borings which encountered loose to medium dense sand, on the nearby San Andreas Fault (North Coast Section) with a Magnitude 7.9 earthquake and a peak ground

acceleration of about 0.63 g (from the USGS 2008 Deaggregation (Beta) method). This method compares the estimates of the earthquake-induced shear stress to the susceptibility of soil liquefaction. As indicated by recent advances in soil liquefaction engineering (Bray, 2006), for soils with sufficient fines content so as to separate the coarser particles and control behavior, liquefaction appears to occur in soils where these fines are ether non-plastic or are low plasticity silts and/or silty clays (PI<12%, and LL<37%), and with high water content relative to their liquid limit (w>0.85 LL).

The boring number, location, approximate thickness, and approximate top and bottom elevation of the sand pockets/lenses/layers and estimated post-liquefaction settlement are summarized in the Table 2 below.

TABLE 2: SUMMMARY OF POST-LIQUEFACTION SETTLEMENT

Boring No.	For Foundation Design of	Approx. Soil Thickness) (ft)	Estimated Soil Top Elev.(ft)	Estimated Soil Bottom Elev.(ft)	Estimated Post-liquefaction Settlement (inches)	Residual Undrained Strength (psf)
B-4	Bents 3 & 4 and Abutment 5	4.5	-7.0	-11.5	0.7	875
B-8	Abutment 1 & Bent 2	2.5	-6.0	-8.5	0.5	440
		6.5	-16.5	-23.0	1.7	300
R-11-NO-001	-	5.5	-45.0	-50.5	0.7	875
R-11-NO-002	Abutment 1	6.0	-28.0	-34.0	0.7	1,540

Based on the results of the evaluation of liquefaction potential for the above soil borings, the estimated post-liquefaction settlements may be on the order of 0.5 inches to 1.7 inches.

The estimated top and bottom elevations and the thickness of the potential liquefiable soils vary significantly as shown in the above table. Based on this, it appears that the liquefiable soil exists in the form of isolated pocket and lens. The liquefaction potential at the project site is anticipated to be moderate to high for the isolated pocket/lens of loose to medium dense sand.

The post-liquefaction settlement can cause downdrag and reduce the load carrying

capacity of the piles. These loads have been considered in the calculations of the vertical pile capacities.

Lateral Spreading

Liquefaction-induced spreading has been defined as the *"lateral displacement of large surficial blocks of soil as a result of liquefaction in a subsurface layer"*. Lateral spreading refers to the more moderate movements of gently sloping ground due to soil liquefaction. As described by Bartlett and Youd (1992a; 1992b), liquefaction-induced lateral spreading occurs on mild slopes of 0.3 to 5% underlain by loose sand and shallow water. The geologic conditions conducive to lateral spreading (gentle surface slope, shallow water table, and liquefiable cohesionless soils) are frequently found along streams and other waterfronts in recent alluvial or deltaic deposits, as well as in loosely-packed, saturated, sandy fills.

In our opinion, lateral spreading is unlikely to occur at the project site because:

- The loose to medium dense sand occurs in the form of isolated pockets/lenses at various depths, not in the form of continuous sloping soil layer based on the available boring information.
- Majority of the potentially liquefiable soil pockets/lenses (approximately 2.5 feet to 6.5 feet thick) below approximate depths of 17 feet to 67 feet, not at the shallow depth or open space.
- Slope stability analysis was performed on an embankment slope with assumed undrained residual strength for the assumed potentially liquefiable soil layer. The pseudo-static factor of safety of the embankment slope under seismic condition was found to be 1.1, which is considered to be acceptable according to Caltrans Guidelines for Structures Foundation Report – Section 3.10 (March 2006 Version 2.0).
- None of the potentially liquefiable soil pockets/lenses appear to daylight along the free surface.

9.0 FINDINGS AND RECOMMENDATIONS

9.1 General

This report was prepared specifically for the proposed project according to the plans provided to us. Normal construction procedures were assumed throughout our analysis and represent one of the bases of recommendations presented herein. Our design criteria have been based upon the materials and subsurface soil conditions encountered in the soil borings at the project site. Therefore, we should be notified in the event that these conditions are changed, so as to modify or amend our recommendations.

9.2 Earthwork and Grading

The project requires engineered fill behind the abutments. Areas to receive engineered fill should be excavated to remove any loose/soft soil materials. The resulting surface upon which fill is to be placed should be observed by the Geotechnical Engineer. Areas receiving fill should be scarified, moisture conditioned and compacted in accordance with Caltrans standard specifications.

In general, engineered fill imported to the site should be relatively non-expansive granular material having a Plasticity Index (P.I.) less than 15, a minimum Sand Equivalent of 10, and should be reviewed by the engineer. Engineered fill should have a minimum 90-percent relative compaction per Caltrans standard except that 95-percent compaction is recommended for the upper 6-inch of subgrade. The on-site materials exposed after the excavation may be used for engineered fill provided that they meet the above criteria (P.I. and Sand Equivalent) and are not contaminated.

9.3 Bridge Foundations

Based on the available boring information, the subsurface soils consist of very stiff lean clay/medium dense to dense sand, underlain by stiff lean clay, underlain by hard intensely fractured metamorphic rock.

For the proposed bridge structure widening, different foundation systems have been evaluated with respect to their design capacity and construction considerations. Based on the available boring information and considering the drivability of the pile through the dense to very dense sand/gravel layers and decomposed Greywacke Franciscan Complex at the project site, Cast-In-Situ-Steel Shell (CISS) Concrete piles are recommended to be the foundation system for the abutments and Caltrans Standard Class 200 Alternate "W" piles are recommended to be the foundation system for the bents of the proposed structure widening.

9.3.1 Pile Design

The piles are subject to compression and lateral loads at the abutments and compression, tension and lateral loads at the bents. According to the Biggs Cardosa Associates (Structural Designer), the planned pile cap/bottom of footing elevations are Elev. +33.64 feet and Elev. +32.14 feet at the abutments and between Elev. -3.86 feet and Elev. +1.14 feet at the bents. Pertinent foundation design information provided by the structural designer, including Foundation Design Data and Foundation Loads, are presented in the following tables.

TABLE 3: FOUNDATION DESIGN DATA

Support No	Design Method	Pile Type	Finish Grade Elev. (ft)	Pile Cut-off Elev. (ft)	Pile Cap Size(ft)		Permissible Settlement (in)	No. of Piles per Support
					B	L		
Abut 1	WSD	72" Dia. CISS	41.14	33.31	N/A	N/A	1	2
Bent 2 Column Footing	LRFD	Class 200 Alt "W"	7.64±	-2.44	12	27	1	19
Bent 2 Grade Beam	LRFD	Class 200 Alt "W"	7.64±	0.06	4.00	42.33	1	3
Bent 3 Column Footing	LRFD	Class 200 Alt "W"	7.64±	-3.44	12	27	1	19
Bent 3 Grade Beam	LRFD	Class 200 Alt "W"	7.64±	-0.94	4.00	40	1	3
Bent 4 Column Footing	LRFD	Class 200 Alt "W"	10.64±	1.56	12	27	1	19
Bent 4 Grade Beam	LRFD	Class 200 Alt "W"	10.64±	4.06	4.00	40	1	3
Abut 5	WSD	72" Dia. CISS	42.14	31.81	N/A	N/A	1	2

TABLE 4: FOUNDATION DESIGN LOADS

Support No.	Service-I Limit State (kips)			Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Per Pile	Per Support	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.
Abut 1	1025	520	755	N/A	NA	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2 Column Footing	1660	N/A	1535	2375 (II)	210 (II)	No Tens.	-	-	390	-	240
Bent 2 Grade Beam	412	N/A	412	515 (I)	172 (I)	No Tens.	-	-	138	-	No Tens.
Bent 3 Column Footing	1720	N/A	1520	2335 (II)	200 (II)	No Tens.	-	-	390	-	240
Bent 3 Grade Beam	408	N/A	408	509 (I)	170 (I)	No Tens.	-	-	136	-	No Tens.
Bent 4 Column Footing	1560	N/A	1460	2110 (II)	200 (II)	No Tens.	-	-	400	-	250
Bent 4 Grade Beam	202	N/A	202	252 (I)	84 (I)	No Tens.	-	-	68	-	No Tens.
Abut 5	1120	570	875	N/A	NA	N/A	N/A	N/A	N/A	N/A	N/A

Consistent with Caltrans requirements, Working Stress Design (WSD) is used for the abutment foundations. The abutment foundations are evaluated for the foundation design data and loading condition using Caltrans November 2003 Bridge Design Specifications for foundations, using Working Stress Design (WSD) methods with "LRFD Service-I Loads", based upon WSD is presented in Table 4 above.

The evaluation of Load Demands on the piles, based upon WSD and LRFD is presented in Table 3 above. The estimated specified tip elevations for the anticipated design loading of the piles are shown in Tables 5A and 5B below. The pile cut-off elevations are shown in Table 3.

TABLE 5A: FOUNDATION RECOMMENDATIONS FOR ABUTMENTS

Location	Pile Type	Cut-off Elevation (ft)	LRFD Service-I Limit State Total Load (kips) per Support		LRFD Service-I Limit State Total Load (kips) per Pile (Compression)	Nominal Resistance (kips)	Design Tip Elev. (ft)	Specified Tip Elev. (ft)
			Total	Permanent				
Abut 1	72" Dia. CISS Pile	33.64	1025	755	520	1040	-51.61 (a), -46.36 (b)	-51.61
Abut 5	72" Dia. CISS Pile	32.14	1120	875	570	1140	-38.11 (a), -52.86 (b)	-52.86

Notes: (i) Design tip elevations are controlled by (a) Compression, (b) Lateral Load, respectively.

TABLE 5B: FOUNDATION RECOMMENDATION FOR BENTS

Location	Pile Type	Cut-off Elev. (ft)	Service-I Limit State Load (kips) per Support	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elev.[(1)] (ft)	Specified Tip Elev. (ft)[(i)]	Nominal Driving Resistance Required (kips)[(ii)]
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1.0)	Tension (φ=1.0)			
Bent 2 Column Footing	Class 200 Alt "W"	-2.61	1660	1	210	No. Tens.	390	240	-69.36 (a), -83.86 (c), -69.36 (d), -37.86 (e)	-83.86	520
Bent 2 Grade Beam	Class 200 Alt "W"	-0.11	412	1	172	No. Tens.	138	No. Tens.	-72.36 (a), -49.36 (c), -35.36 (e)	-72.36	410
Bent 3 Column Footing	Class 200 Alt "W"	-3.61	1720	1	200	No. Tens.	390	240	-58.86 (a), -67.36 (c), -66.36 (d), -38.86 (e)	-67.36	450
Bent 3 Grade Beam	Class 200 Alt "W"	-1.11	408	1	170	No. Tens.	136	No. Tens.	-51.86 (a), -33.86 (c), -36.36 (e)	-51.86	310
Bent 4 Column Footing	Class 200 Alt "W"	1.39	1560	1	200	No. Tens.	400	250	-51.86 (a), -66.86 (c), -65.86 (d), -33.86 (e)	-66.86	480
Bent 4 Grade Beam	Class 200 Alt "W"	3.89	202	1	84	No. Tens.	68	No. Tens.	-24.86 (a), -33.86 (c), -31.36 (e)	-33.86	240

Notes

(i) Design tip elevations are controlled by (a) Compression (Strength Limit), (b) Tension (Strength Limit), (c) Compression (Extreme Event), (d) Tension (Extreme Event), (e) Lateral Load, (f) Settlement respectively.

(ii) The nominal driving resistance required is equal to the nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the design resistance.

TABLE 6: PILE DATA TABLE

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elev.[(i)] (ft)	Specified Tip Elevation[(ii)] (ft)	Nominal Driving Resistance Required (kips)
		Compression	Tension			
Abutment 1	72" Dia. CISS Pile	1040	0	-51.61 (a), -46.36 (b)	-51.61	2190
Bent 2 Column Footing	Class 200 Alt "W"	390	240	-83.86 (a), -69.36 (b), -37.86 (c)	-83.86	520
Bent 2 Grade Beam	Class 200 Alt "W"	250	0	-72.36 (a), -35.36 (c)	-72.36	410
Bent 3 Column Footing	Class 200 Alt "W"	390	240	-67.36 (a), -58.86 (b), -38.86 (c)	-67.36	450
Bent 3 Grade Beam	Class 200 Alt "W"	245	0	-51.86 (a), -36.36 (c)	-51.86	310
Bent 4 Column Footing	Class 200 Alt "W"	400	250	-66.86 (a), -65.86 (b), -33.86 (c)	-66.86	480
Bent 4 Grade Beam	Class 200 Alt "W"	120	0	-33.86 (a), -31.36 (c)	-33.86	240
Abutment 5	72" Dia. CISS Pile	1140	0	-38.11 (a), -52.86 (b)	-52.86	2220

Notes

(i) Design tip elevations for the ***Abutments*** are controlled by (a) Compression (b) Lateral Load. Design tip elevations for the ***Bents*** are controlled by (a) Compression, (b) Tension, (c) Lateral Load.

(ii) The specified tip elevation shall not be raised above the design tip elevations for tension and lateral load.

(iii) Unsuitable soil layer (liquefiable) that does not contribute to the design nominal resistance exist between Elev. -6.0' and -8.5' and between Elev. -16.5' and -23.0' at Abutment 1 (72 "Dia. CISS Pile) and Bent 2 (Class 200 Alt "W" pile), between Elev. -7.0' and -11.5' at Bent 3 (Class 200 Alt "W" pile) and Bent 4 (Class 200 Alt "W" pile) and at Abutment 5 (72 "Dia. CISS Pile). The estimated driving resistance from the unsuitable penetrated soil is approximately 12 kips for the upper zone and 44 kips for the lower zone at Abutment 1 (72 "Dia. CISS Pile) and Bent 2 (Class 200 Alt "W" pile), is approximately 19 kips at Bent 3 and Bent 4 (Class 200 Alt "W" pile) and at Abutment 5 (72 "Dia. CISS Pile).

The estimation of the driven pile capacity of the Alt "W" pile at the bents is based on the U.S. Army Corps Method by which the skin friction of piles in sand increases linearly to an assumed critical depth and then remains constant below the depth. The estimation of the driven pile capacity of the CISS concrete pile at the abutments is based on the American Petroleum Institute Method. The pile capacity will be derived from both frictional resistance along the pile shafts and end bearing at the bents and only frictional resistance along the pile shafts at the abutments. A factor of safety of 2 was used to estimate the allowable pile capacity at the abutments. Based on the Pile Data Table 5, the pile tip elevation is controlled by the demand in compression on the pile, except at Abutment 5 which is controlled by the demand in the lateral load on the pile.

The design tip elevations and specified tip elevations are based on the "pile cut-off" elevation provided by the structural designer. In the event that the "pile cut-off" elevations are changed, the design pile tip elevations may have to be revised accordingly.

The piles should not be spaced closer than 3 times the pile diameter measured center-to-center. For piles spaced at center-to-center distance greater than or equal to 3 times the pile diameter, there is no group effect for pile vertical capacity. A "P-Y" Curve Modification Factor" of 0.6 should be adopted in the lateral pile capacity analyses for pile spacing of 3 times the pile diameter.

Available boring information indicates that dense to very dense sands are likely to be encountered at depth during pile driving. Relatively hard driving conditions may be anticipated during installation of the piles. We recommended that driving shoes be used for the pile driving at the bents. We recommend that the piles be driven to the specified elevations.

It is anticipated that the pile capacity at the bents will develop after driving as a result of soil "freeze" and dissipation of excess pore water pressures. The final pile capacity at the bents can be verified and the gain of pile capacity after initial driving may be evaluated based on "re-driving" after 24-hour (min.) set up. Caltrans Standard Specifications (Section 49-1.08) may be used as the pile driving acceptance criteria for the Caltrans Standard Class 200 Alternate "W" piles.

Groundwater was encountered between Elev. -1.5 feet in Boring B-5 and Elev. +6.0 feet in Boring R-12-NO-003 at the time of drilling. Groundwater encountered at Elev. +21.5 feet in Boring R-11-NO-002 at the time of drilling is likely to be perched water. Groundwater level could vary, and groundwater should be anticipated during construction.

9.4 Lateral Design for Piles

Under seismic loading conditions, lateral pile capacity analyses will be performed for the foundation piles at the abutments and bents using the LPILE program by the

structural designer. A "p-y Curve Modification Factor" of 0.6 should be adopted in the lateral pile analysis for pile spacing of 3 times the pile diameter. A "p-y Curve Modification Factor" of 0.1 should be applied to the potentially liquefiable layers.

The recommended geotechnical parameters for L-PILE analyses are summarized in the following tables. Undrained residual strength has been recommended for the potentially liquefiable soils based on the standard blow count $(N_1)_{60, CS}$.

"Passive Resistance Mobilization against Pile Caps", Plate 6, is included in this report.

Abutment 1 – Boring R-11-NO-002 (ground elevation ≈ +38.5 feet)/As-built Boring B-8 (ground elevation ≈ +2.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 3.5	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.067
3.5 to 14	Sand (dense)	$\phi = 37°$; c= 0 psf	Sand	225	-	0.067
14 to 17(1)	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.067
17 to 18	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
18 to 23	Sand (medium dense)	$\phi = 34°$; c= 0 psf	Sand	60	-	0.036
23 to 32	Clay (very stiff)	$\phi = 0°$; c=2250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
32 to 36	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
36(3) to 42	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
42 to 44.5	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
44.5 to 47	Sand (loose)(2)	$\phi = 0°$; c= 440 psf(4)	Liquefiable Sand	-	0.05	0.036
47 to 55	Clay (stiff)	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
55 to 61.5	Sand (loose)(2)	$\phi = 0°$; c= 300 psf(4)	Liquefiable Sand	-	0.05	0.036
61.5 to 65	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
65 to 70.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
70.5 to 75.5	Clay (soft)	$\phi = 0°$; c=625 psf	Soft Clay	-	0.01	0.036
75.5 to 81	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
81 to 88	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +2.64 feet of Boring B-8.
(4) Residual undrained strength.

Bents 2 - As-built Boring B-8 (ground elevation ≈ +2.64 feet) and As-built Boring B-5

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 6(1)	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.067
6 to 8.5	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
8.5 to 11	Sand (loose)(2)	$\phi = 0°$; c= 440 psf(4)	Liquefiable Sand	-	0.05	0.036
11 to 19	Clay (stiff)	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
19 to 25.5	Sand (loose)(2)	$\phi = 0°$; c= 300 psf(4)	Liquefiable Sand	-	0.05	0.036
25.5 to 29	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
29 to 34.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
34.5 to 39.5	Clay (soft)	$\phi = 0°$; c=625 psf	Soft Clay	-	0.01	0.036
39.5 to 45	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
45 to 52	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036
52(3) to 63.5	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
63.5 to 75	Clay (stiff)	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
75 to 86	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
86 to 92	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +49.36 feet of Boring B-5.
(4) Residual undrained strength.

Bents 3 and 4 - As-built Boring B-4 (ground elevation ≈ +9.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
Abutment Fill	Clay	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.067
0 to 6[(1)]	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.067
6 to 7.5	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
7.5 to 12	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
12 to 16.5	Clay (stiff)	$\phi = 0°$; c=1750 psf	Stiff Clay w/o Free Water	-	0.007	0.036
16.5 to 21	Sand (loose)[(2)]	$\phi = 0°$; c= 875 psf[(3)]	Liquefiable Sand	-	0.05	0.036
21 to 25	Clay (very stiff)	$\phi = 0°$; c=2000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
25 to 29	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
29 to 34.5	Clay (very stiff)	$\phi = 0°$; c=2750 psf	Stiff Clay w/o Free Water	-	0.005	0.036
34.5 to 40	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
40 to 43.5	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
43.5 to 49	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
49 to 55.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
55.5 to 61.5	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
61.5 to 75.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
75.5 to 78.5	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Residual undrained strength.

Abutment 5 – Boring R-11-NO-002 (ground elevation ≈ +38.5 feet)/As-built Boring B-4 (ground elevation ≈ +9.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 3.5	Clay (very stiff)	ϕ = 0°; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.067
3.5 to 14	Sand (dense)	ϕ = 37°; c= 0 psf	Sand	225	-	0.067
14 to 17(1)	Clay (very stiff)	ϕ = 0°; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.067
17 to 18	Clay (very stiff)	ϕ = 0°; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
18 to 23	Sand (medium dense)	ϕ = 34°; c= 0 psf	Sand	60	-	0.036
23 to 29	Clay (very stiff)	ϕ = 0°; c=2250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
29 (3) to 35	Clay (soft)	ϕ = 0°; c=750 psf	Soft Clay	-	0.01	0.036
35 to 36.5	Clay (soft)	ϕ = 0°; c=750 psf	Soft Clay	-	0.01	0.036
36.5 to 41	Clay (stiff)	ϕ = 0°; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
41 to 45.5	Clay (stiff)	ϕ = 0°; c=1750 psf	Stiff Clay w/o Free Water	-	0.007	0.036
45.5 to 50	Sand (loose)(2)	ϕ = 0°; c= 875 psf(4)	Liquefiable Sand	-	0.05	0.036
50 to 54	Clay (very stiff)	ϕ = 0°; c=2000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
54 to 58	Sand (dense)	ϕ = 38°; c= 0 psf	Sand	125	-	0.036
58 to 63.5	Clay (very stiff)	ϕ = 0°; c=2750 psf	Stiff Clay w/o Free Water	-	0.005	0.036
63.5 to 69	Clay (very stiff)	ϕ = 0°; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
69 to 72.5	Sand (dense)	ϕ = 40°; c= 0 psf	Sand	125	-	0.036
72.5 to 78	Sand (dense)	ϕ = 40°; c= 0 psf	Sand	125	-	0.036
78 to 84.5	Clay (stiff)	ϕ = 0°; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
84.5 to 90.5	Clay (very stiff)	ϕ = 0°; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
90.5 to 104.5	Clay (stiff)	ϕ = 0°; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
104.5 to 107.5	Clay (hard)	ϕ = 0°; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +9.64 feet of Boring B-4.
(4) Residual undrained strength.

9.5 Lateral Earth Pressures and Friction Coefficient

Abutment walls and wing walls should be designed to resist the following Applied Lateral Earth Pressures (Equivalent Fluid Pressures-EFP) and live load. These values assume no hydrostatic pore pressure buildup behind the wall and are based on well-drained backfill behind the walls supported in native soil.

(a) Active Condition — Recommended active pressure is 36 pcf EFP for the engineered fill.

(b) At-Rest Condition — Recommended at-rest pressure is 55 pcf EFP for the engineered fill.

(c) Passive Resistance — Recommended passive pressure is 350 EFP with a maximum value of 3500 psf.

5.0 ksf (ultimate) for seismic design of the abutment wall (5.5 feet or greater); for activated height less than 5.5 feet, modify proportionally i.e. 5.0x (H/5.5) ksf per Caltrans SDC v.1.6. A minimum lateral wall movement of 2% of wall height to mobilize the full ultimate passive resistance is required.

(d) A coefficient of friction of 0.3 may be used to estimate the frictional resistance along the bottom of the footing. Only dead loads should be used to estimate the frictional resistance at the bottom of footings.

(e) Sliding resistance should be calculated using not more than 50% of the available passive lateral earth pressure in determining the factor of safety against sliding.

(f) The effect of any surcharge (dead or live load) should be added to the preceding lateral earth pressures. Use equivalent earth pressure of not less than 2 feet of uniform soil weight at 125 pcf if the traffic (HS20 loading) is within a horizontal distance of one half of the wall height.

Cantilever walls, which are free to rotate by at least 0.005 radian, may be assumed flexible and designed for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition. The effect of

any surcharge (dead, live, or traffic load) should be added to the preceding lateral earth pressures. A coefficient of 0.4 and 0.5 may be used to determine the additional lateral earth pressures resulting from the surcharge for cantilever walls and rigid walls, respectively.

The above values assume no hydrostatic pore pressure build up behind the wall and are based on well-drained backfill behind the walls. A minimum 1-foot thick compact clay cover or concrete cap should be placed over the well-drained material. If hydrostatic pressures are allowed to build up behind the walls, additional lateral loads should be considered in the design.

9.6 Embankment Settlement & Waiting Period

Based on our understanding, minimum excavation and backfill with engineered fill will be required for the foundation construction. No embankment fill will be required. The subsurface soil conditions at the project consist of mainly stiff to very stiff lean clay and medium dense to dense sand/gravel. No soft clay/silt was retrieved from the borings that have been recently drilled. It appears that the majority of the consolidation settlement of the soft clay/silt shown in the as-built borings might have already been completed. It is our opinion that settlement should not be a geotechnical concern and waiting period is not required for this project.

9.7 Embankment Stability

There is no new embankment proposed for this project. Embankment stability should not be a geotechnical concern.

9.8 Corrosion

Chemical tests were performed on soil samples from R-11-NO-001, R-11-NO-002, R-12-NO-003 and additional roadway borings (A-11-101 and A-11-103) to evaluate the corrosion potential of the subsoil. The test results are as follows:

TABLE 7 SUMMARY OF CORROSION TEST RESULT

Boring No.	Station & Offset	Depth (ft)	Min. Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
R-11-NO-001	"J1R" 402+50, 85 feet Right	15.0	510	8.11	40.4	149.4
R-11-NO-002	"J1R" 396+50, 0 feet Right	15.0	1,210	7.71	44.6	200.1
R-12-NO-003	"J1R" 399+77, 12 feet Right	21.0	1,210	7.72	71.6	19.8
A-11-101	"J1R" 394+00 (median)	0-5	2,680	7.13	33.2	28.9
A-11-103	"J1R" 412+00 (median)	0-5	940	7.72	475.4	72.1

According to Caltrans Corrosion Guidelines, September 2003 (Version 1.0), Caltrans considers a site to be corrosive to foundation element if one of the following conditions exists for the representative soil samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm,
- Sulfate concentration is greater than or equal to 2000 ppm,
- pH is 5.5 or less.

Based on the corrosion test results, the native subsurface soils in the borings as shown in Table 7 are considered non-corrosive per Caltrans corrosion design guidelines. Standard Type II modified or Type I-P (MS) modified cement may be used for the concrete substructure. The minimum cement factor and cover thickness should be per Section 5.12 of California Amendments to AASHTO LRFD Bridge Design Specifications – Fourth Edition (December 2008).

As discussed in Section 6.0 "Subsurface Soil Conditions", an additional boring is proposed on Rushing Landing Road. Additional corrosion tests will be arranged to investigate the corrosion status at the project site.

10.0 PLAN REVIEW

This report is prepared for the proposed "North Novato Overhead Widen (Bridge No. 27-0094R)". We recommend that final foundation plans for the proposed project to be reviewed by PARIKH prior to construction so that the intent of our recommendations is included in the

project plans and specifications and to further see that no misunderstandings or misinterpretations have occurred. However, design-build elements should be reviewed only from overall compliance standpoint.

11.0 CONSTRUCTION OBSERVATION

To a degree, the performance of any structure is dependent upon construction procedures and quality control measures. Hence, geotechnical observation and testing of grading operations, foundation excavations, and observation of pile installations should be carried out by the Geotechnical Engineer. If the subsurface conditions different from those forming the basis of our recommendations are encountered, this office should be informed in order to assess the need for design changes. Therefore, the recommendations presented in this report are contingent upon good quality control and these geotechnical observations during construction.

12.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our site reconnaissance and the assumption that the subsurface conditions do not deviate from observed conditions. All work done is in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater or air, below or around this site. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require that additional expenditures be made during construction to attain a properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed project as described earlier, to assist the engineer in the design of this project. In the event any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our conclusions and recommendations shall not be considered valid unless the changes or variations are reviewed and our recommendations modified or approved by us in writing.

This report is issued with the understanding that it is the designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the project and that necessary steps are also taken to see that the recommendations are carried out in the field.

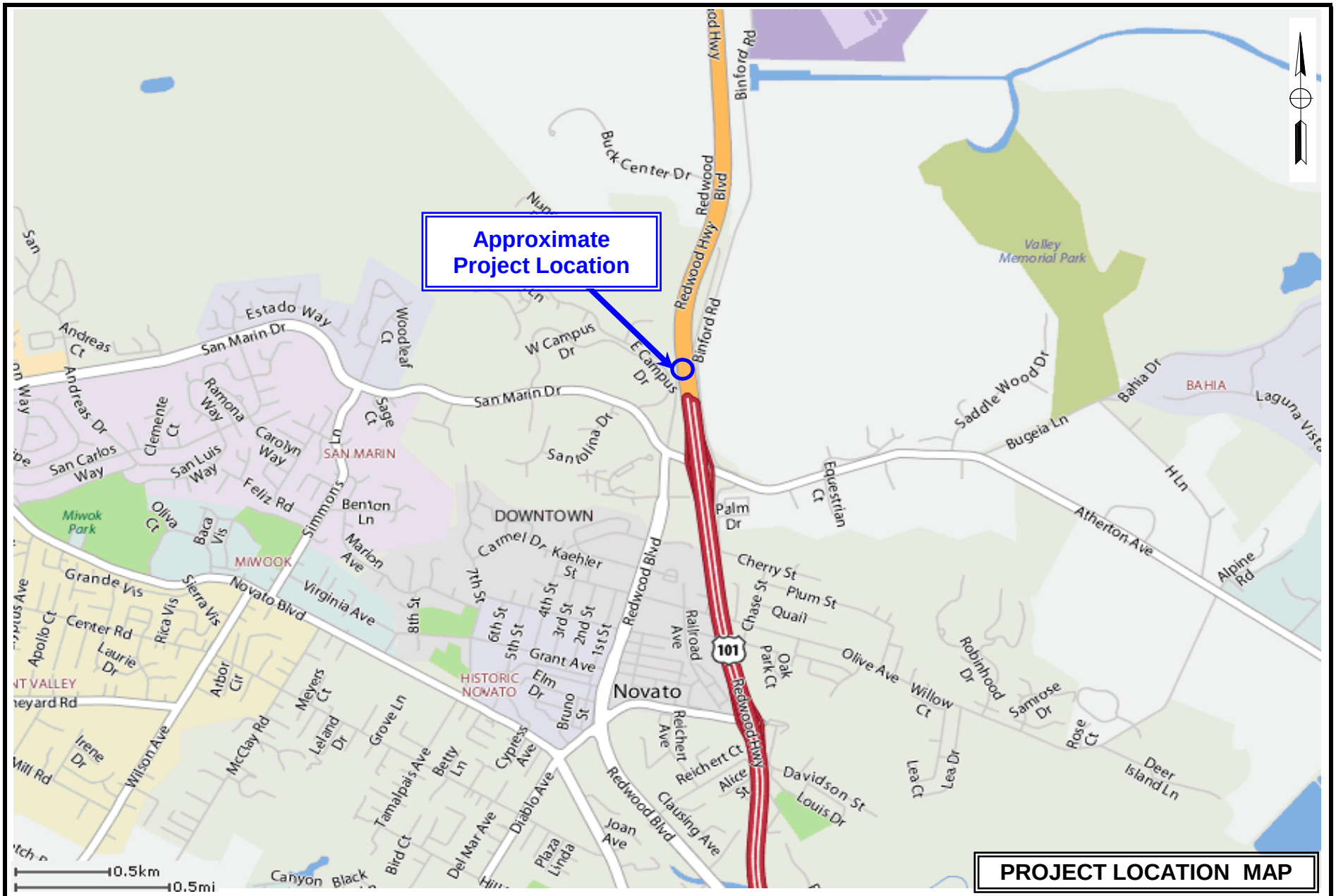
The findings in this report are valid as of the present date. However, changes in the subsurface conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

Alston Lam, P.E., G.E. 2605
Project Engineer

Gary Parikh, P.E., G.E. 666
Project Manager

S:\Ongoing Projects\Alston Lam\2011-145-MSN A3\Bridge Foundation\North Novato Overhead Widen Foundation Report (6/2012)

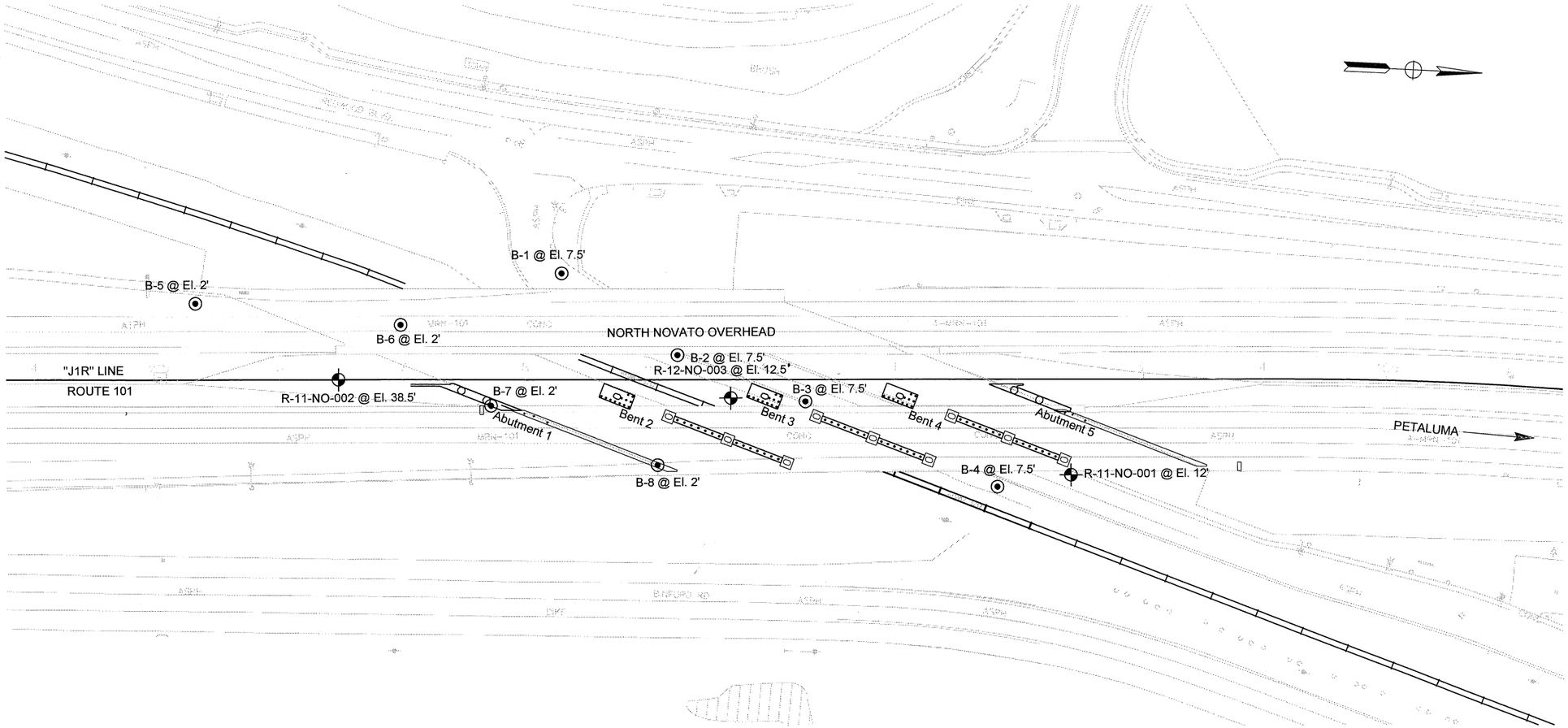


PROJECT LOCATION MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG	PLATE NO.: 1



LEGEND

- R-12-NO-003 Boring: drilled by Parikh Consultants Inc. in April, 2012.
- Borings drilled by Parikh Consultants Inc. in October & November, 2011.
- Borings drilled by Caltrans in October & November, 1968.

SCALE 1 inch = 100 feet

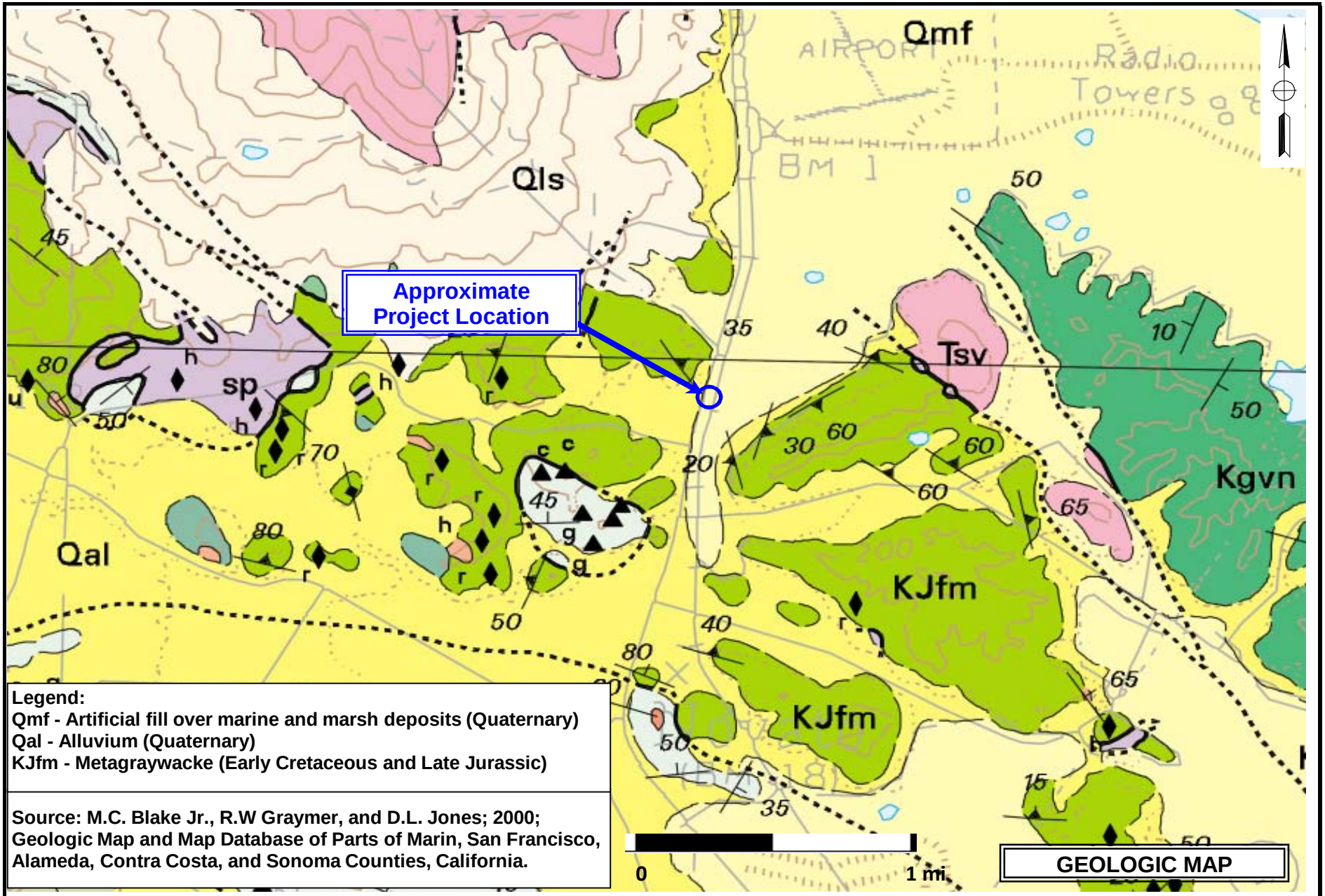
Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

SITE PLAN

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT- NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

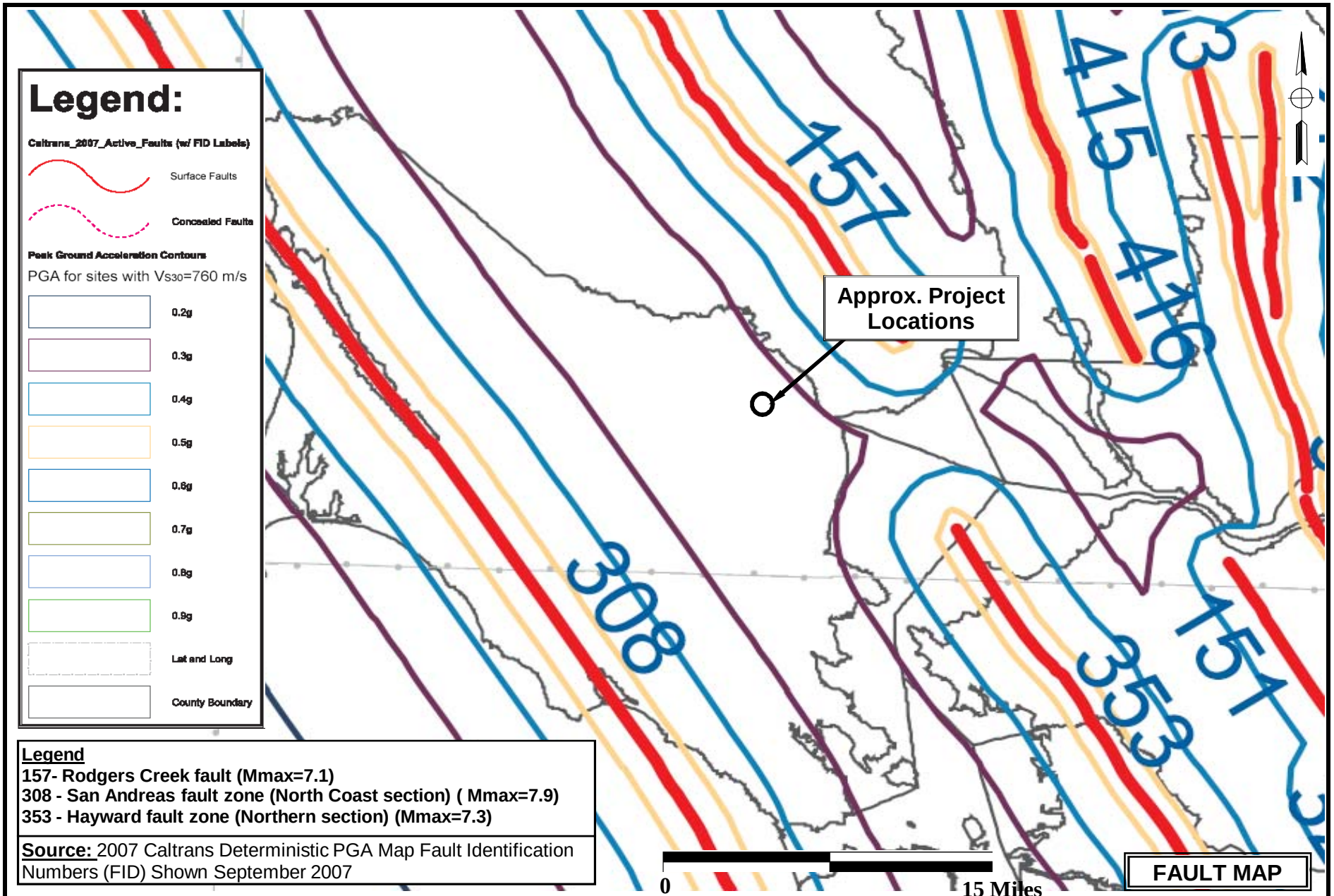
JOB NO.:2011-145-BRG | PLATE NO: 2



PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG	PLATE NO.: 3



Legend
157- Rodgers Creek fault (Mmax=7.1)
308 - San Andreas fault zone (North Coast section) (Mmax=7.9)
353 - Hayward fault zone (Northern section) (Mmax=7.3)

Source: 2007 Caltrans Deterministic PGA Map Fault Identification Numbers (FID) Shown September 2007

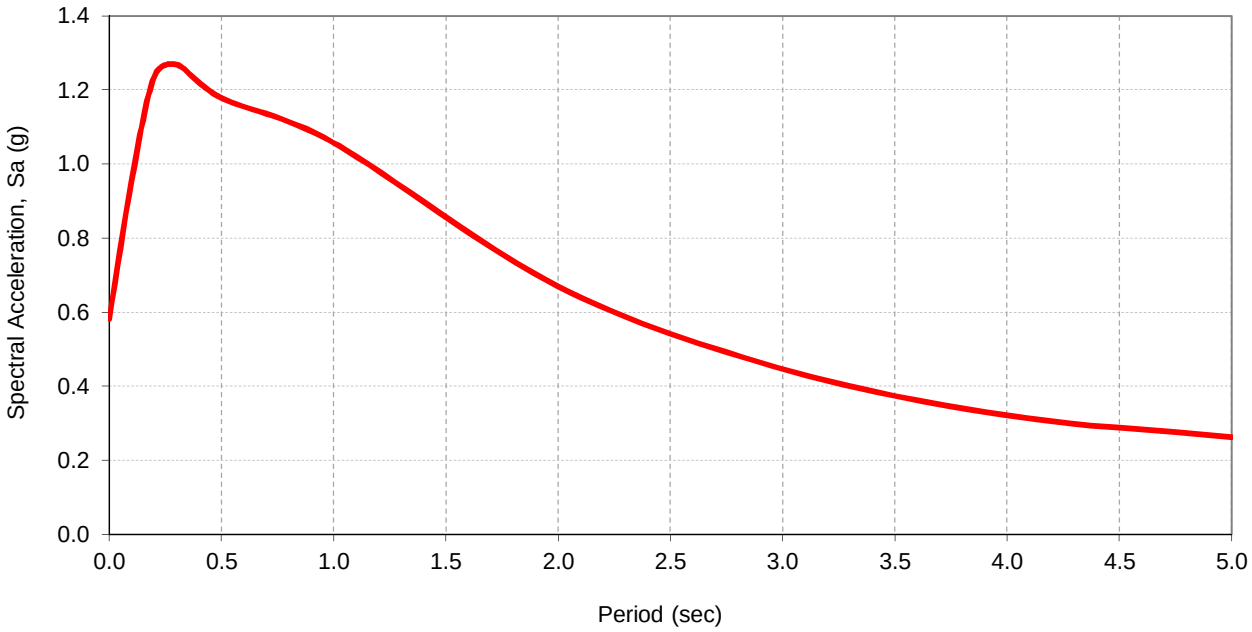
FAULT MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG | **PLATE NO.: 4**

RECOMMENDED ACCELERATION RESPONSE SPECTRUM



Site Information

Latitude:	38.1220
Longitude	-122.5658
V_{S30} (m/s) =	230
$Z_{1.0}$ (m) =	N/A
$Z_{2.5}$ (km) =	N/A
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1

Governing Curve:

USGS Deaggregation 2008 (beta)

Recommended Response Spectrum

Period (sec)	USGS Deagg. Spectral Acceleration (g)	Adjusted for Near Fault Effect	Adjusted For Basin Effect	Final Adjusted Spectral Acceleration (g)
0.0	0.5816	1.000	1.000	0.582
0.1	0.9563	1.000	1.000	0.956
0.2	1.236	1.000	1.000	1.236
0.3	1.2684	1.000	1.000	1.268
0.5	1.1783	1.000	1.000	1.178
1.0	0.8809	1.200	1.000	1.057
2.0	0.5579	1.200	1.000	0.669
3.0	0.3722	1.200	1.000	0.447
4.0	0.2677	1.200	1.000	0.321
5.0	0.2184	1.200	1.000	0.262

Source:

1. Caltrans ARS Online tool (V.1.0.4, http://dap3.dot.ca.gov/shake_stable/)
2. USGS Deaggregation 2008 beta (http://eqint.cr.usgs.gov/deaggint/2008/index.php)
3. Caltrans Geotechnical Services Design Manual (Version 1.0)

Note:

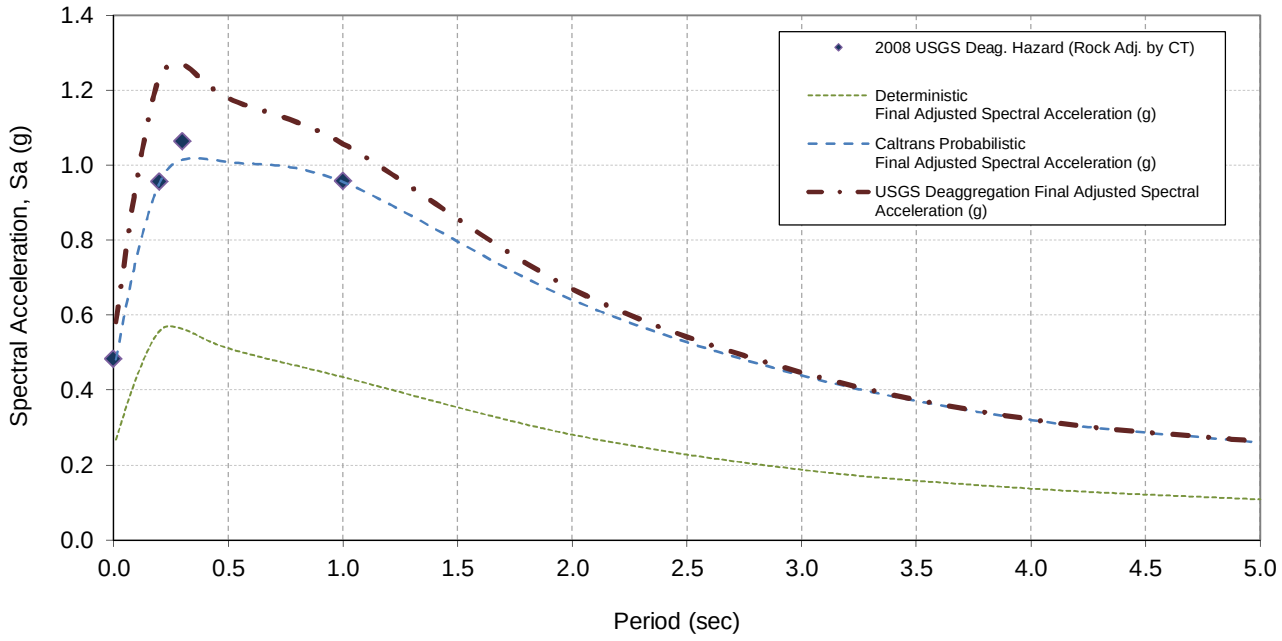
Refer to "ARS Spreadsheet" (attached) for development of the recommended ARS curve.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
MATERIALS TESTING

MSN A3 - NB HOV WIDENING PROJECT -
NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

Project No.: 2011-145-BRG | **Plate No.: 5A**

ACCELERATION RESPONSE SPECTRUM COMPARISONS



Site Information

Latitude:	38.1220
Longitude	-122.5658
V_{S30} (m/s) =	230
$Z_{1.0}$ (m) =	N/A
$Z_{2.5}$ (km) =	N/A
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1

Period (sec)	Deterministic Final Adjusted Spectral Acceleration (g)	Caltrans Probabilistic Final Adjusted Spectral Acceleration (g)	USGS Deaggregation Final Adjusted Spectral Acceleration (g)
0.0	0.268	0.482	0.582
0.1	0.435	0.754	0.956
0.2	0.557	0.952	1.236
0.3	0.563	1.014	1.268
0.5	0.511	1.008	1.178
1.0	0.434	0.955	1.057
2.0	0.281	0.640	0.669
3.0	0.187	0.439	0.447
4.0	0.137	0.320	0.321
5.0	0.108	0.260	0.262

Source:

1. Caltrans ARS Online tool (V.1.0.4, http://dap3.dot.ca.gov/shake_stable/)
2. USGS Deaggregation 2008 beta (http://eqint.cr.usgs.gov/deaggint/2008/index.php)
3. Caltrans Geotechnical Services Design Manual (Version 1.0)

Note:

Refer to "ARS Spreadsheet" (attached) for development of the recommended ARS curve.

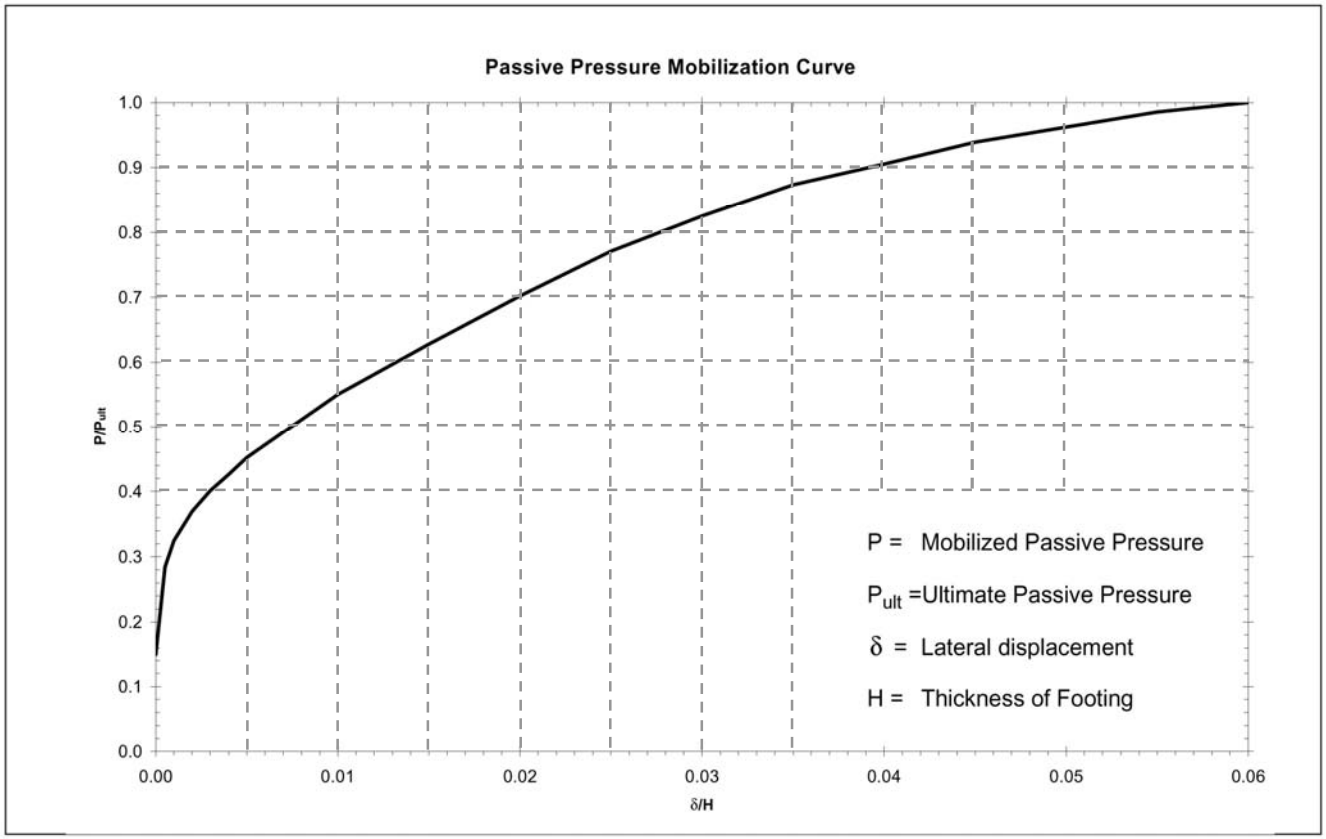


Figure 4-6 Passive Pressure Mobilization Curve

Reference: Chapter 4, Foundation and Geologic Site Hazards, FEMA 356, November 2000

For North Novato OH (Widen), the recommened passive resistance against the vertical sic
of the pile caps is 3.5 ksf. This is a uniformly distributed resistance for seismic & ultimate conditio

PASSIVE PRESSURE MOBILIZATION AGAINST PILE CAPS

PARIKH
Practicing in the Geosciences

NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG | **Plate No.: 6**

APPENDIX A

APPENDIX A

FIELD EXPLORATION

All the test borings were drilled with a truck-mounted drill rig using 4-inch diameter rotary-wash drilling method. The soil samples were obtained from the borings during drilling at various depths by driving a 2.5 inches Inside Diameter (I. D.) Modified California Sampler or a 1.375 inches I.D. Standard Penetration Sampler (ASTM Test Method No. 1586). The sampler was driven into the subsurface soils under the impact of a 140 pounds hammer having a free fall of 30 inches. The blow counts required to drive the sampler for the last 12 inches are presented on the Logs of Test Borings, Appendix A. (When correlating standard penetration data in similar soils, the blow counts for the Modified California sampler can be taken as roughly twice that for the Standard Penetration Test sampler in similar soils.). Pocket penetration tests were also performed on clay samples to evaluate their consistency. Upon completion of drilling, the boreholes were backfilled with cement grout.

The borings were drilled under the technical supervision of our engineers, who classified and continuously logged the soils encountered during drilling and supervised the collection of soil samples at various depths for visual examination and laboratory testing. The soil samples were visually classified in the field according to the Unified Soil Classification System and then transported to our laboratory for further evaluation and testing.

The descriptions of the soils encountered and relevant boring information are presented on the Log of Test Borings attached in Appendix A. The laboratory test methods and results are presented in Appendix B. The logs presented in Appendix A were prepared from the field logs which were edited after visual re-examination of the soil samples in the laboratory and results of classification tests on selected soil samples as indicated on the logs.

The descriptions and related information presented on these logs of test borings depict subsurface conditions only at the locations indicated on the plan and on the particular date noted on the logs. Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the locations explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental changes.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

GEOTECHNICAL PROFESSIONAL — 5/31/12 DATE

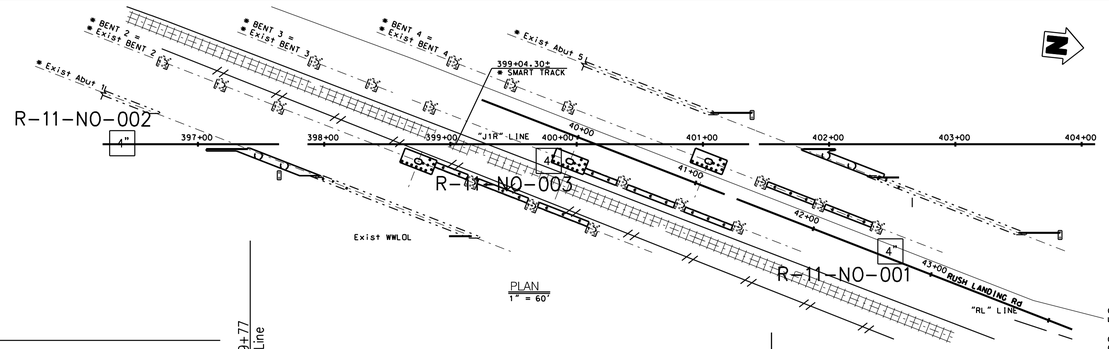
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131



0.00' Rt Sta 396+50 "J1R" Line

R-11-NO-002

Elev. 38.5'

4"

26 2.5 — SANDY lean CLAY (CL); very stiff; brown; moist; some fine SAND; low plasticity fines.

32 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); medium dense; gray; moist; fine SAND; little fine GRAVEL; 31% fines.

36 2.5 — Dense; gray/brown.

31 2.5 — SANDY lean CLAY with GRAVEL (CL); very stiff; gray; moist to wet; some fine SAND; little fine GRAVEL; low plasticity fines.

GWS Elev. 21.5'

23 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); medium dense; brownish gray; wet; 51% fine SAND fine; 29% fine GRAVEL; 20% fines.

21 1.4 — SANDY lean CLAY with GRAVEL (CL); very stiff; brownish gray; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

24 2.5 (PI) — (LL=32; PI=12).

49 2.5 (PA) — Poorly graded SAND with CLAY and GRAVEL (SP-SC); medium dense; gray; wet; 47% fine SAND; 41% fine GRAVEL; 13% fines.

38 2.5 (UC) — SANDY lean CLAY with GRAVEL (CL); hard; gray; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

67 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); very dense; gray; wet; 49% fine SAND; 30% fine GRAVEL; 21% fines.

16 2.5 (UC) — Lean CLAY with SAND (CL); stiff; brown; wet; little fine SAND; low plasticity fines, PP<0.5 tsf.

32 1.4 — SANDY lean CLAY (CL); hard; brown; wet; some fine SAND; low plasticity fines.

51 2.5 (PA) — Well-graded SAND with SILT (SW-SM); dense; brown; wet; 85% fine SAND; 6% fine GRAVEL; 9% fines.

23 2.5 (PA) — SILTY SAND (SM); medium dense; brown; wet; fine SAND; 24% fines.

19 2.5 (PI) — ORGANIC fat CLAY (OH); stiff; grayish black; wet; high plasticity fines.

22 2.5 (UC) — PP=1.25 tsf (LL=94; PI=55).

60/5 1.4 — SANDY Lean CLAY with GRAVEL (CL); very stiff; grayish black; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

Hard; gray.

10-19-11
Terminated at Elev -57.5'
ERi = 84%

12.00' Rt Sta 399+77 "J1R" Line

R-12-NO-003

Elev. 12.5'

4"

ASPHALT 6" AC over 6" AB & 6" Concrete.

GWS Elev. 6.0'

15 2.5 (M UW PA) — SILTY SAND with GRAVEL (SM); medium dense; reddish brown; moist; 44% fine SAND; 38% fine GRAVEL; 18% fines.

4 2.5 (C) — Fat CLAY (CH); soft; dark gray; wet; high plasticity fines; PP=0.5 tsf.

16 2.5 (M UW PI UC) — SANDY lean CLAY (CL); stiff; brown; moist; fine SAND; low plasticity fines; (LL=33; PI=17).

22 2.5 (M UW CR) — Very stiff; PP=2.0 tsf..

25 1.4 (M) — CLAYEY GRAVEL (GC); dense; brown; moist.

7 1.4 (M) — SANDY lean CLAY (CL); stiff; brown; wet; low plasticity fines; PP=1.3 tsf.

25 2.5 (M UW UC) — Lean CLAY (CL); very stiff; gray with orange brown mottling; moist; low plasticity fines.

24 2.5 (M UW PI UC) — (LL=32; PI=14).

22 2.5 (M UW PA) — CLAYEY SAND (SC); medium dense; brown; moist; 59% fine SAND; 3% fine GRAVEL; 38% fines.

60 2.5 (M UW) — Lean CLAY with GRAVEL (CL); hard; mottled orange brown & gray; moist; (Weathered METASEDIMENTARY ROCK); PP>4.5 tsf.

50/4 2.5 (M UW) — METAMORPHIC ROCK, (METASANDSTONE), hard, brown, intensely weathered, intensely fractured.

50/4 1.4 (M) — METAMORPHIC ROCK, (METASHALE), hard, dark greenish gray, moderately weathered, intensely fractured.

2.4" — METAMORPHIC ROCK, (METASANDSTONE), hard, gray, fresh.

REC=75% RQD=50% — METAMORPHIC ROCK, (METASANDSTONE/ METASHALE), gray, fresh, very intensely fractured/crushed.

REC=100% RQD=100% — METAMORPHIC ROCK, (METASANDSTONE/ METASHALE), gray, fresh, very intensely fractured/crushed.

REC=100% RQD=100%

REC=100% RQD=86%
REC=73% RQD=53% — Very intensely fractured/crushed.

REC=68% RQD=100%
REC=100% RQD=63%
REC=100% RQD=92% — Gray, very intensely fractured/crushed.

REC=100% RQD=100%

REC=100% RQD=100%

REC=87% RQD=87%

REC=86% RQD=64%
REC=100% RQD=56%
REC=90% RQD=67%
REC=80% RQD=57%
REC=100% RQD=100%

04-30-12
Terminated at Elev -108'
ERi = 77%

85.00' Rt Sta 402+50 "J1R" Line

R-11-NO-001

Elev. 12.0'

4"

ASPHALT.

21 2.5 — CLAYEY SAND with GRAVEL (SC); brown; moist; fine SAND; little fine GRAVEL; some fines (FILL).

9 2.5 (PI) — SANDY lean CLAY (CL); very stiff; brown; moist; some fine SAND; trace fine GRAVEL; low plasticity fines.

GWS ▽ ELEV. =1.0' = 11-04-11

10 2.5 — Fat CLAY (CH); soft; gray; moist to wet; high plasticity fines; PP=1.0 tsf. (LL=68; PI=47).

24 2.5 (UC) — Lean CLAY (CL); stiff; brown; wet; low plasticity fines.

21 2.5 (UC) — Very stiff ; PP=1.5 tsf.

36 2.5 — Mottled dark brown; little fine SAND; PP=2.0 tsf.

52 2.5 — CLAYEY SAND (SC); dense; brown; wet; coarse to fine SAND; little fines.

79 2.5 — SILTY SAND (SM); very dense; brownish gray; wet; fine SAND; some fines.

109/8 2.5 — SILTY SAND with GRAVEL (SM); very dense; brown; wet; fine SAND; little fine GRAVEL; some fines.

50/6 2.5 — Lean CLAY (CL); stiff; gray; wet; medium plasticity fines.

14 2.5 (PI) — (LL=45; PI=23).

16 2.5 (PA) — Well-graded SAND with CLAY and GRAVEL (SW-SC); medium dense; gray; wet; 60% fine SAND; 33% fine GRAVEL; 7% fines.

Lean CLAY (CL); stiff; gray; wet; low plasticity fines.

16 2.5 (C) — SILTY SAND with GRAVEL (SM); very dense; gray; wet; fine SAND; little fine GRAVEL; some fines.

REC=50% RQD=0% — 50/4 2.5 — 2.4" — METAMORPHIC ROCK, (METASILTSTONE), very thinly bedded, gray, hard, very intensely fractured, (slightly weathered).

REC=10% RQD=0% — METAMORPHIC ROCK, (METASILTSTONE / METASANDSTONE), gray, hard, very intensely fractured, (fresh).

REC=45% RQD=0%
REC=33% RQD=0%
REC=50% RQD=0%
REC=25% RQD=0%
REC=25% RQD=0%
REC=13% RQD=0% — METAMORPHIC ROCK, (METASANDSTONE), gray, hard, very intensely fractured, (fresh).(Gougy).

METAMORPHIC ROCK, (METAHALE / METASANDSTONE), dark gray/gray, hard, very intensely fractured, (fresh).

11-04-11
Terminated at Elev -89'
ERi = 84%

Notes:
Standard Penetration Test Sampler: I.D. = 1.4"; O.D. = 2"
Modified California Sampler: I.D. = 2.5"; O.D. = 3"
Hammer Assembly: A 140 lb hammer with a 30" drop (Automatic Hammer)
This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock, Logging, Classification, and Presentation Manual (2010)
All dimensions are in feet unless otherwise shown

BENCH MARK

BM GPS30 1" IRON PIPE WITH PLASTIC PLUG AT NORTHBOUND SHOULDER OF HIGHWAY 101 AT THE BEGINNING OF OFFRAMP TO ATHERTON AVENUE/SAN MARIN DRIVE. THE VALUES FOR GPS30 WERE PROVIDED BY CALTRANS PER JOB No. 00071, MRN-101, PM18.6/23.0 EA 8200K, JUNE 27,2000.
N 2234473.120 E 5967838.330
ELEVATION = 17.98

PROFILE
Vert. : 1" = 10'
Hor. : 1" = 40'

"J1R" LINE

396+00 397+00 398+00 399+00 400+00 401+00 402+00 403+00 404+00 405+00

ELEVATION (feet)

DESIGN OVERSIGHT	DRAWN BY	E. ORTAKCI	L.S. BHANGOO	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ALSTON LAM PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	A. LAM	FIELD INVESTIGATION BY: DATE: OCTOBER & NOVEMBER, 2011		

BRIDGE NO. 27-0094R
POST MILES R22.3

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES

SHEET 27 OF 28

DGN FILE=>270094rzltb01.dgn

CONTRACT NO.: 04-2640L4 PROJECT ID: 0412000337

27-0094r-z-ltb01.dgn Default 6/6/2012 3:07:56 PM

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIVISION OF ENGINEERING SERVICES – GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	Sheet No.	Total Sheets
04	Mrn	101	R22/24.3		

Gary Parikh 5/31/12
REGISTERED CIVIL ENGINEER — DATE

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

BRIDGE No.	Sheet	of
27-0094R	28	28

REGISTERED PROFESSIONAL ENGINEER
GARY PARIKH
No. G.E. 666
Exp. 12/31/13
GEOTECHNICAL
STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	Sheet No.	Total Sheets
04	Mrn	101	10.2 / 23.3	3/2	3/2

R E Hawkamp
DESIGN COORDINATION SUPERVISOR — REGISTERED CIVIL ENGINEER NO. 8396
DATE APPROVED: November 8, 1971

AS BUILT NONE 4-5-72
CORRECTIONS BY C.S. Foster
CONTRACT NO. 04-120373
DATE: 10-27-75

LEGEND OF BORING OPERATIONS

PENETROMETER: 2½" Cone Penetrometer; Standard Penetration Boring; 1" Soil Tube
SAMPLER BORING (only): Rotary Boring (only); Auger Boring (only)
JET BORING; AUGER BORING (only); CORE BORING
TEST PIT

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

Diagram showing the size ranges of coarse and fine soil fractions used in determining the classification of material. If gravel is present in appreciable quantities, the term "gravelly" precedes the soil name, viz. "gravelly sand". The terms "trace" and "with" are used to indicate small and moderate amounts respectively of a soil fraction not governing the classification. Standard grade size limits.

LEGEND OF EARTH MATERIALS

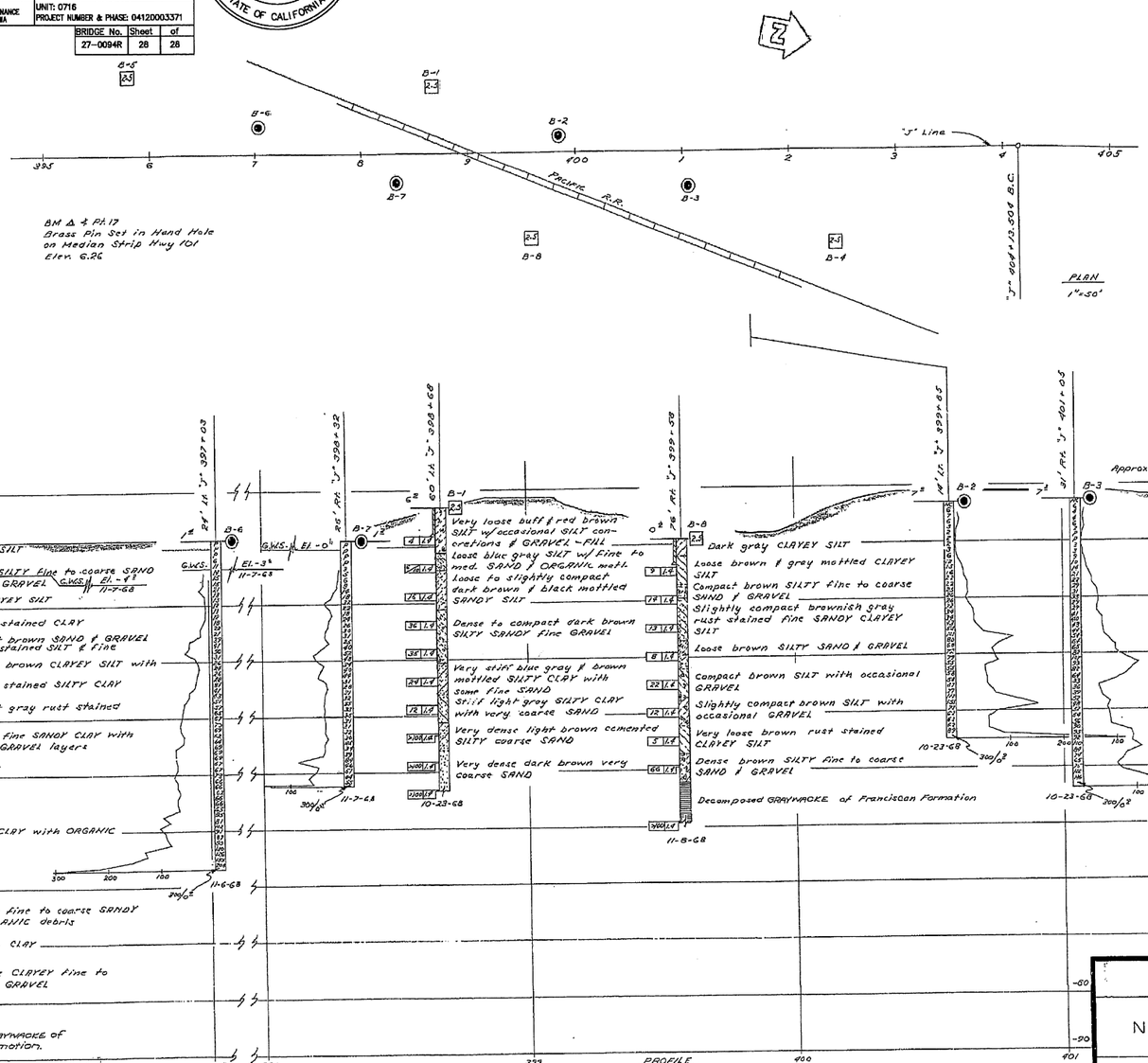
Silty Clay or Clayey Silt; Organic Matter; Fill Material; Igneous Rock; Sedimentary Rock; Metamorphic Rock
Gravel; Sand; Silt; Clay; Sandy Clay or Silty Clay; Gravelly Sand or Silty Sand

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

	by	Date
FIELD STUDY		
DRAWN		
CHECKED		
QUANTITIES		
Approved Recommended by		

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

3/2



STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NORTH NOVATO OVERHEAD

LOG OF TEST BORINGS

BRIDGE NO.	27-94 R/L	POST MILE	22.3	DRAWING NO.		SHEET	15	OF	15

REVISION DATES (PRELIMINARY STAGE ONLY)

WO 120371 PR-2794-2
CU 09219

Disregard prints bearing earlier revision dates →

AS BUILT PLANS
Contract No. 04-120374
Date Completed —
Document No. 4000 SURF

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL, ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 6/28/76 — SIGNATURE Dick Measham — TITLE Electrician Supervisor III

CliboPDF - www.fastio.com

APPENDIX B

APPENDIX B

LABORATORY TESTS

Classification Tests

The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in "Log of Test Borings", Appendix A.

Moisture-Density

The natural moisture contents and dry unit weights were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-98. This information was used to classify and correlate the soils. The results are presented on Plate B-2A and Plate B-2B, Appendix B.

Atterberg Limits

The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-00. The results of these tests are presented on" Plasticity Chart", Plate B-3, Appendix B.

Grain Size Classification

Grain size classification tests (ASTM Test Method D 420) were performed on selected samples of granular soil to aid in the classification. The results are presented on "Grain Size Distribution Curves", Plate B-4A and Plate B-4B, Appendix B.

Unconfined Compression Tests

Strength tests were performed on selected undisturbed samples using unconfined compression machine. Unconfined compression tests were performed in general accordance with ASTM Test Method D 2166-00. The results are presented on Plate B-5A through Plate B-5H, Appendix B.

Corrosion Tests

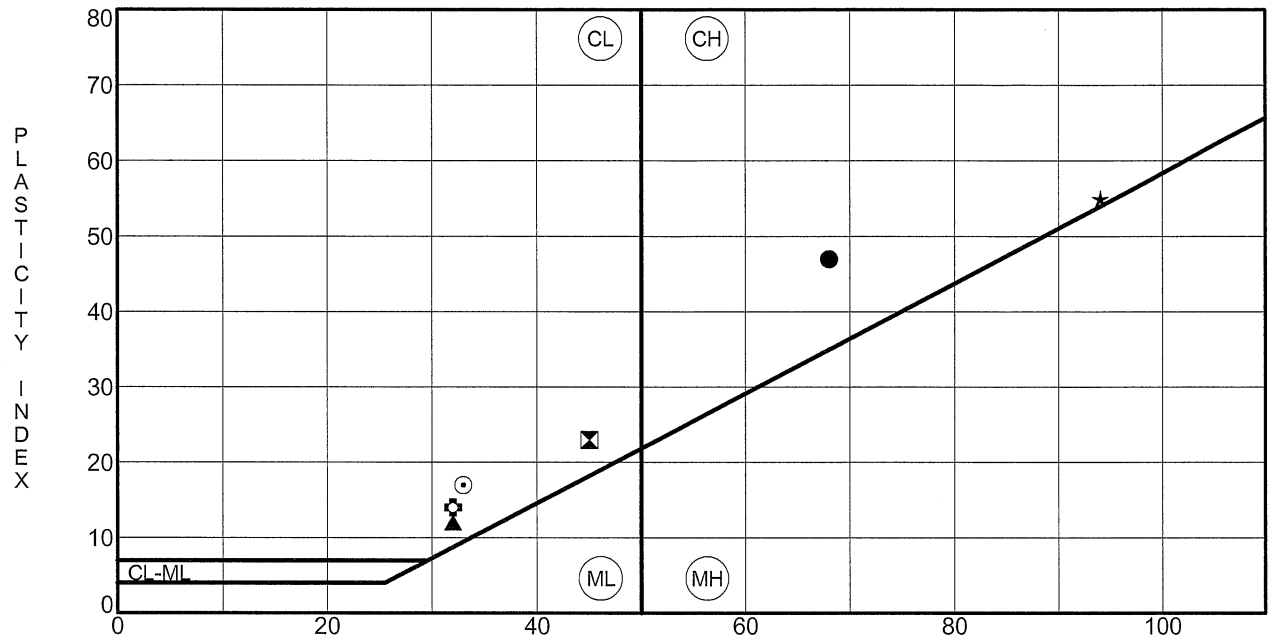
Corrosion tests were performed on selected samples to determine the corrosion potential of the soils. The pH and minimum resistively tests were performed according to California Test Method T643. The tests were performed by Sunland Analytical. The test results are presented on Plate B-6A through Plate B-6C, Appendix B.

Consolidation Test

Consolidation tests (ASTM Test Method D 2435) were performed on selected relatively undisturbed sample. The test results are presented on Plate B-7, Appendix B.

Borehole	Sample Number	Depth	Classi-fication	Water Content	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	% > Sieve 4	% < Sieve 200	Unconfined Compressive Strength (tsf)
R-11-NO-001	1	2.5	SC	6.3	-						
R-11-NO-001	2	5.0	CL	9.9	-						
R-11-NO-001	3	10.0	CH	32.0	91.8	68	21	47			
R-11-NO-001	4	15.0	CL	26.9	98.2						
R-11-NO-001	5	20.0	CL	28.4	89.4						1.6
R-11-NO-001	6	25.0	CL	21.8	106.6						2.4
R-11-NO-001	7	30.0	SC	-	-						
R-11-NO-001	8	35.0	SM	11.5	-						
R-11-NO-001	9	40.0	SM	14.4	152.5						
R-11-NO-001	10	45.0	SM	9.6	-						
R-11-NO-001	11	50.0	SM	12.4	-						
R-11-NO-001	12	55.0	CL	28.6	-	45	22	23			
R-11-NO-001	13	60.0	SW-SC	29.6	95.7				33.4	7.0	
R-11-NO-001	14	70.0	CL	-	-						
R-11-NO-001	15	74.5	SM	7.8	-						
R-11-NO-002	1	2.0	CL	9.4	120.2						
R-11-NO-002	2	4.5	SC	9.2	-					31.0	
R-11-NO-002	3	10.0	SC	8.1	-						
R-11-NO-002	4	15.0	CL	9.8	130.0						
R-11-NO-002	5	20.0	SC	8.3	-				28.6	20.4	
R-11-NO-002	6	25.0	CL	14.5	-						
R-11-NO-002	7	30.0	CL	11.6	-	32	20	12			
R-11-NO-002	8	35.0	SP-SC	11.5	-				41.4	11.8	
R-11-NO-002	9	40.0	CL	17.2	118.8						0.27
R-11-NO-002	10	45.0	SC	10.8	-				30.1	21.2	
R-11-NO-002	11	50.0	CL	24.6	99.9						0.68
R-11-NO-002	12	55.0	CL	17.8	-						
R-11-NO-002	13	60.0	SW-SM	19.1	110.4				5.6	9.1	
R-11-NO-002	14	70.0	SM	25.2	100.6					23.9	
R-11-NO-002	15	80.0	OH	56.5	65.6	94	39	55			
R-11-NO-002	16	90.0	CL	18.6	114.8						1
R-11-NO-002	17	95.5	CL	10.9	-						
R-12-NO-003	1	6.0	SM	11.7	129.4				37.6	17.9	
R-12-NO-003	2	11.0	CH	-	-						
R-12-NO-003	3	16.0	CL	18.7	112.5	33	16	17			0.95
R-12-NO-003	4	21.0	CL	23.6	103.2						
R-12-NO-003	5	26.0	GC	13.2	-						
R-12-NO-003	6	31.0	CL	33.7	-						
R-12-NO-003	7	36.0	CL	22.7	104.6						1.4
R-12-NO-003	8	41.0	CL	22.2	106.2	32	18	14			1.1
R-12-NO-003	9	46.0	SC	19.0	118.3				3.1	37.7	
R-12-NO-003	10	51.0	CL	20.5	109.0						
R-12-NO-003	11	55.5	-	10.0	136.1						

Borehole	Sample Number	Depth	Classi-fication	Water Content	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	% > Sieve 4	% < Sieve 200	Unconfined Compressive Strength (tsf)
R-12-NO-003	12	60.5	-	9.0	-						



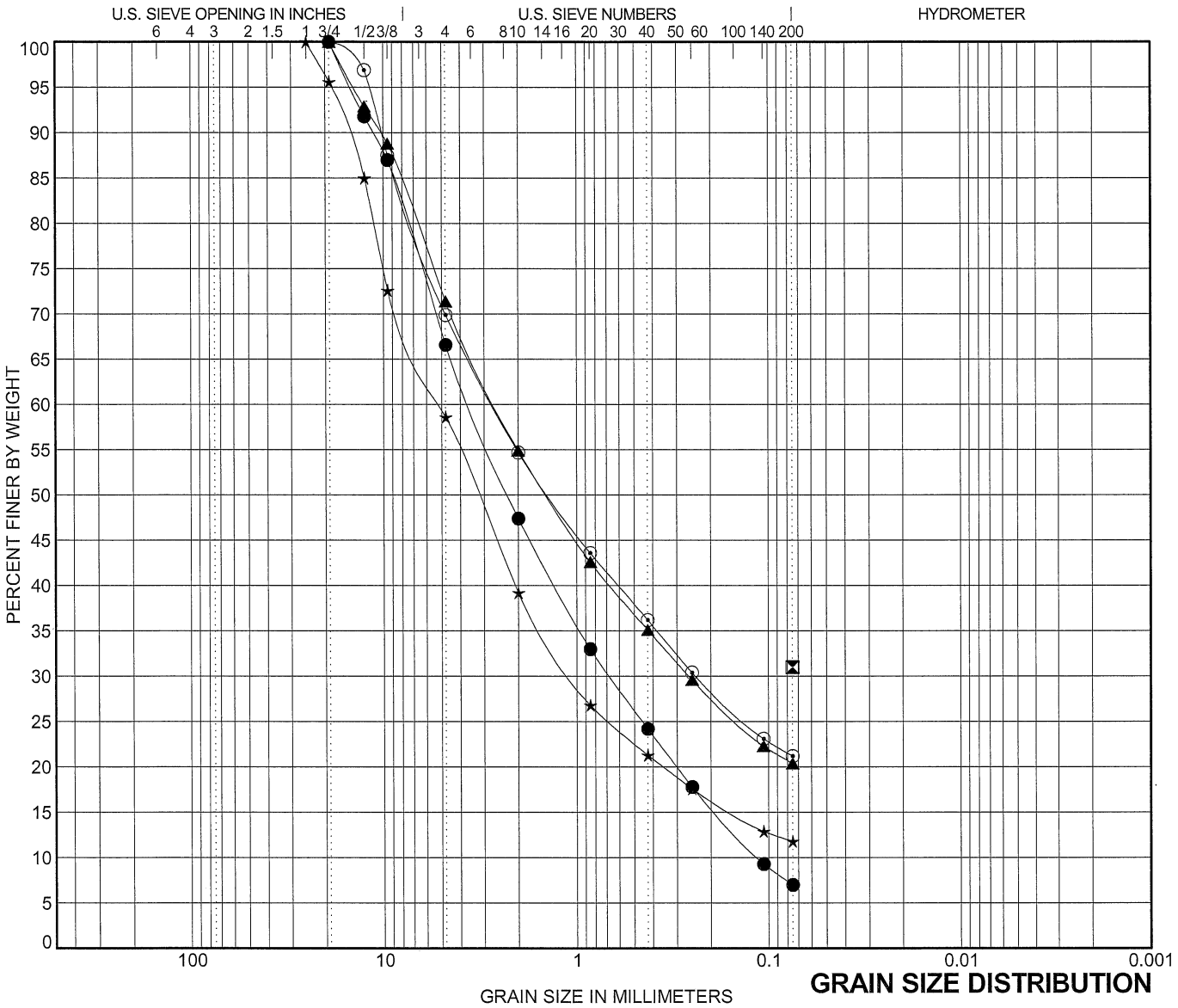
PLASTICITY

	BOREHOLE	SAMPLE #	DEPTH (ft)	LL	PL	PI	Fines	USCS Classification
●	R-11-NO-001	3	10.0	68	21	47		Fat CLAY
⧓	R-11-NO-001	12	55.0	45	22	23		Lean CLAY
▲	R-11-NO-002	7	30.0	32	20	12		SANDY lean CLAY with GRAVEL
★	R-11-NO-002	15	80.0	94	39	55		ORGANIC fat CLAY
⊙	R-12-NO-003	3	16.0	33	16	17		SANDY lean CLAY
✿	R-12-NO-003	8	41.0	32	18	14		Lean CLAY

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV WIDENING PROJECT-N NOVATO OH WIDEN
NOVATO, MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG | PLATE NO: B-3



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING SAMPLE #	DEPTH (ft)	Classification	LL	PL	PI	Cc	Cu
●	R-11-NO-001 13	60.0	Well-graded SAND with CLAY and GRAVEL				1.12	31.01
⧓	R-11-NO-002 2	4.5	CLAYEY SAND with GRAVEL					
▲	R-11-NO-002 5	20.0	CLAYEY SAND with GRAVEL					
★	R-11-NO-002 8	35.0	Poorly graded SAND with CLAY and GRAVEL				5.18	119.56
⊙	R-11-NO-002 10	45.0	CLAYEY SAND with GRAVEL					

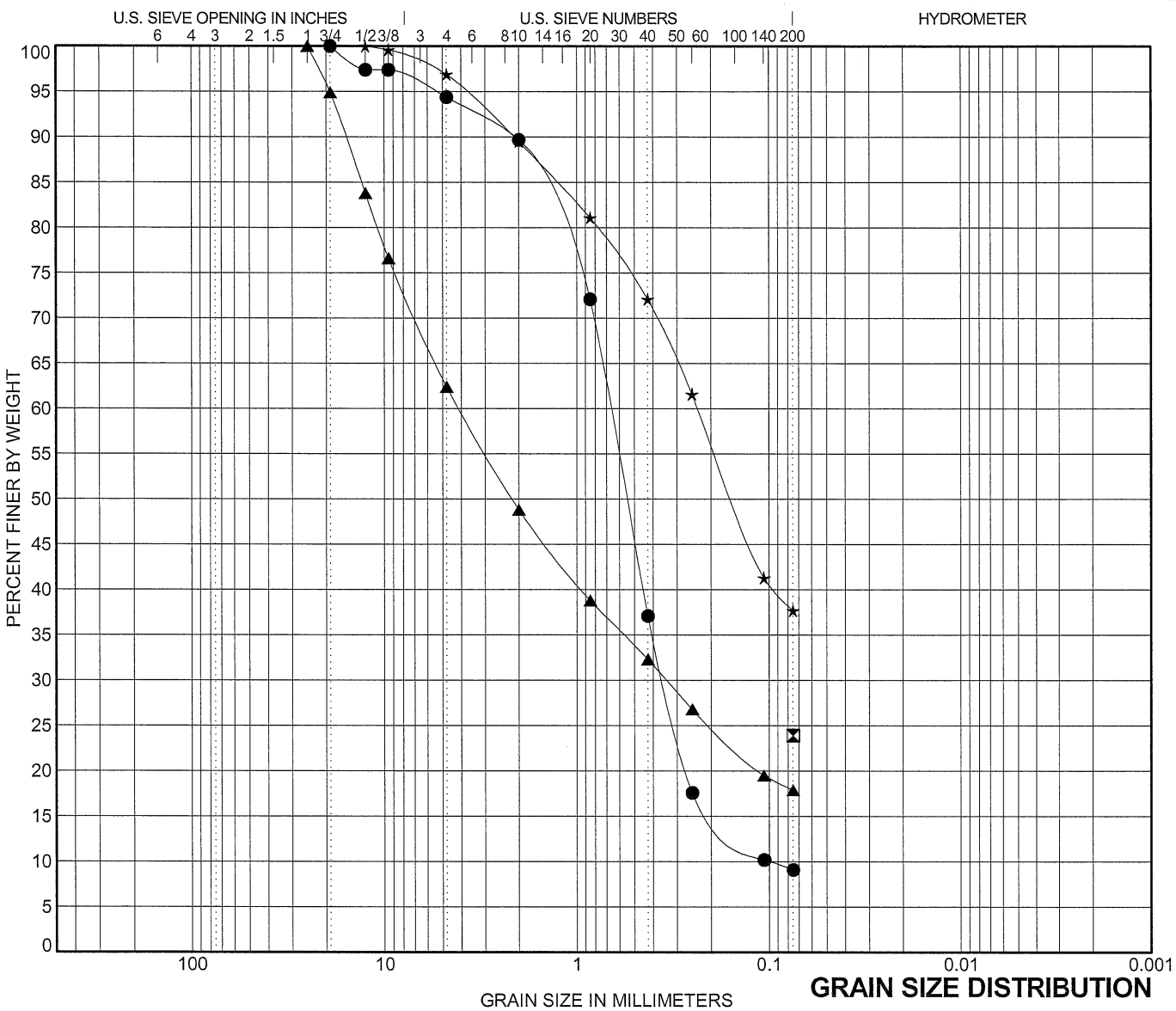
	BORING SAMPLE #	DEPTH (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-11-NO-001 13	60.0	19	3.528	0.671	0.114	33.4	59.6	7.0	
⧓	R-11-NO-002 2	4.5	0.075						31.0	
▲	R-11-NO-002 5	20.0	19	2.613	0.26		28.6	51.0	20.4	
★	R-11-NO-002 8	35.0	25	5.091	1.06		41.4	46.8	11.8	
⊙	R-11-NO-002 10	45.0	19	2.704	0.239		30.1	48.7	21.2	

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV WIDENING PROJECT-N NOVATO OH WIDEN
NOVATO, MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG

PLATE NO: B-4A



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING SAMPLE #	DEPTH (ft)	Classification	LL	PL	PI	Cc	Cu
●	R-11-NO-002 13	60.0	Well-graded SAND with SILT				1.84	6.72
⧓	R-11-NO-002 14	70.0	SILTY SAND					
▲	R-12-NO-003 1	6.0	SILTY SAND with GRAVEL					
★	R-12-NO-003 9	46.0	CLAYEY SAND					

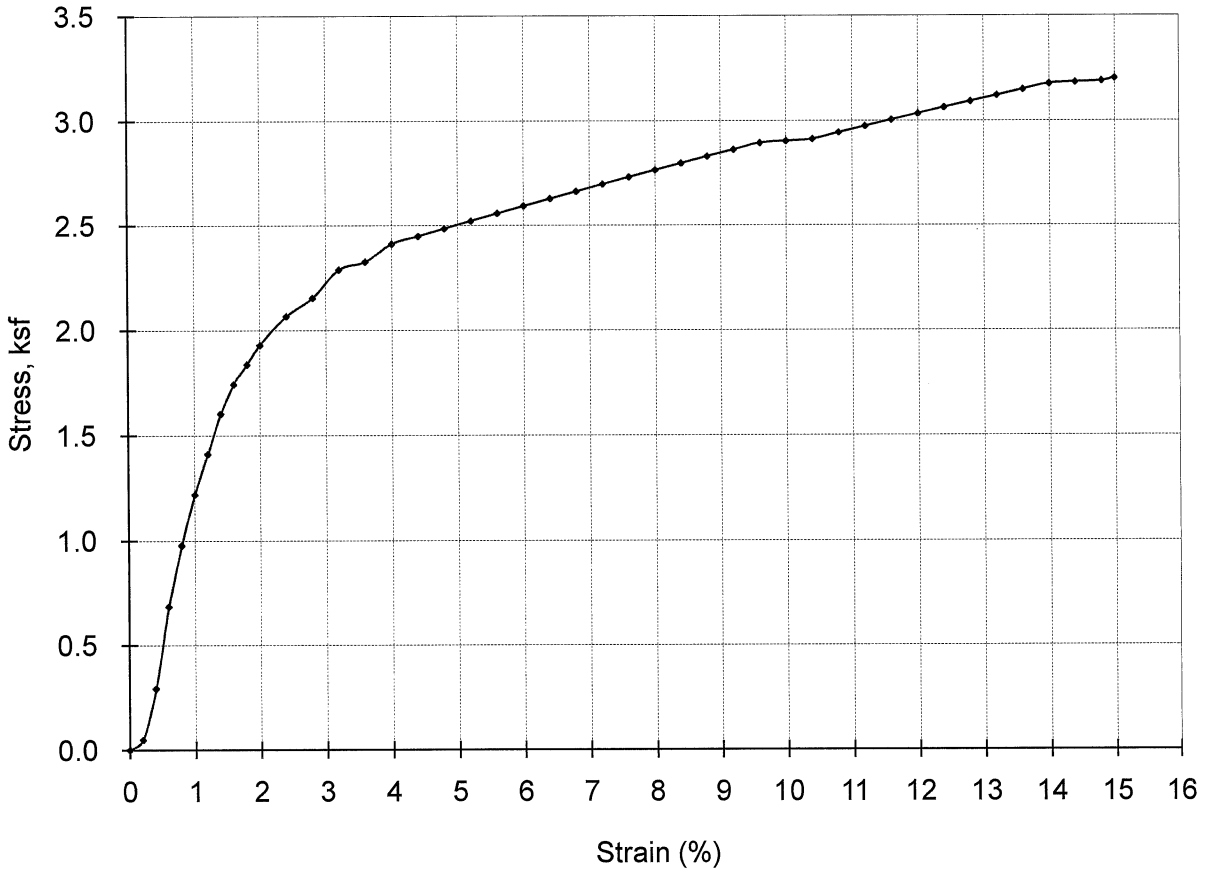
	BORING SAMPLE #	DEPTH (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-11-NO-002 13	60.0	19	0.669	0.35	0.1	5.6	85.3	9.1	
⧓	R-11-NO-002 14	70.0	0.075						23.9	
▲	R-12-NO-003 1	6.0	25	4.078	0.34		37.6	44.5	17.9	
★	R-12-NO-003 9	46.0	12.5	0.234			3.1	59.2	37.7	

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV WIDENING PROJECT-N NOVATO OH WIDEN
NOVATO, MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG | PLATE NO: B-4B

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-001

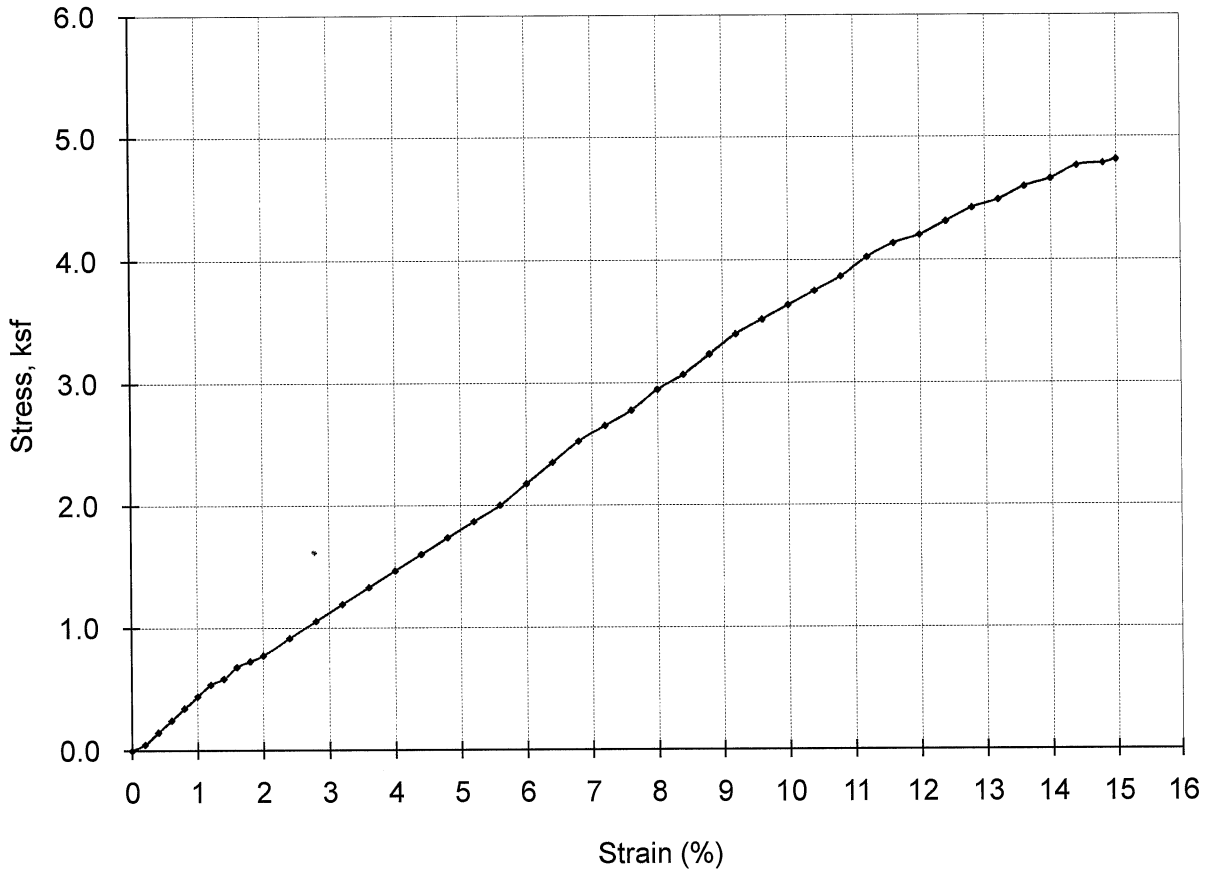
Sample No. : 5 **Strength (ksf):** 3.20

Depth (feet): 20 **Strain (%):** 15.00

Material Description:
Very Stiff, Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN** **NOVOTO, MARIN COUNTY, CALIFORNIA**	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5A

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-001

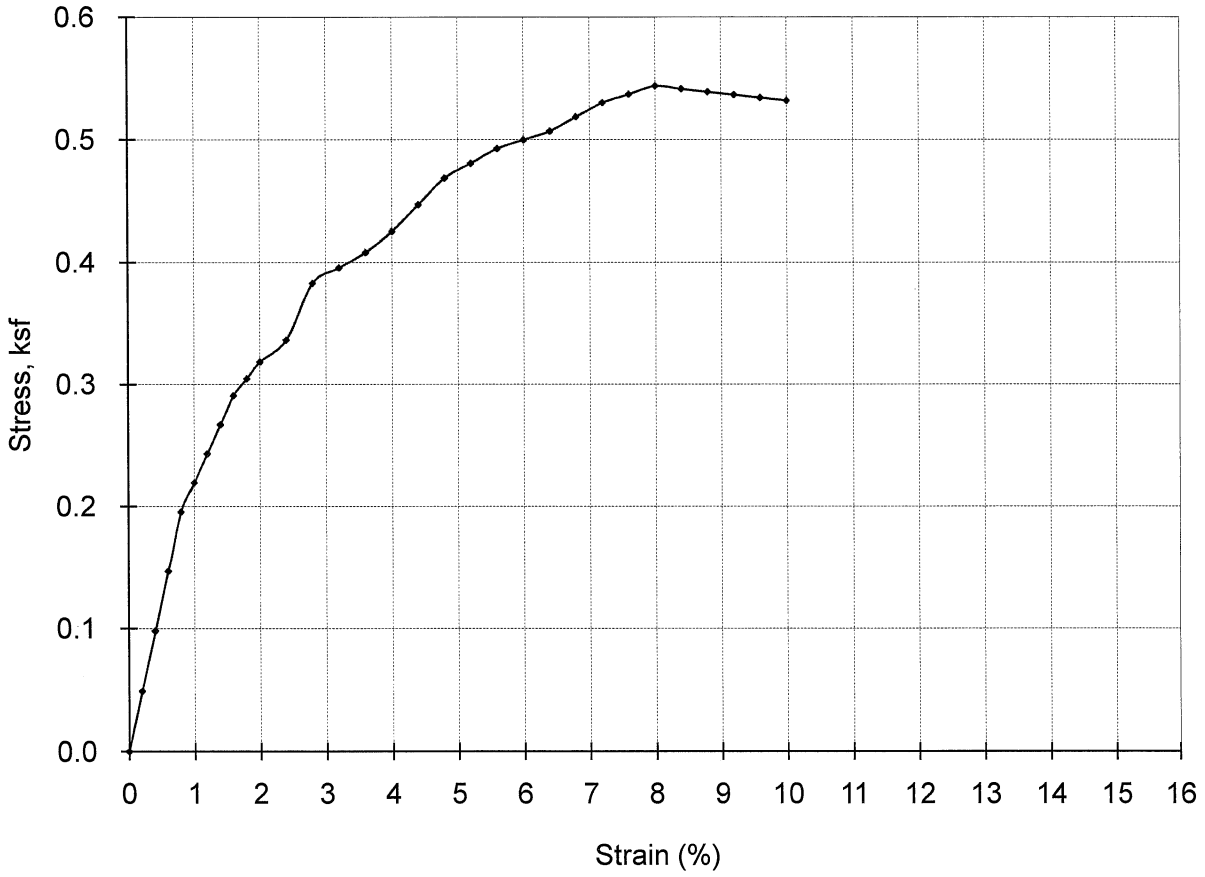
Sample No. : 6 **Strength (ksf):** 4.81

Depth (feet): 25 **Strain (%):** 15.00

Material Description:
Hard, Sandy Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5B

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

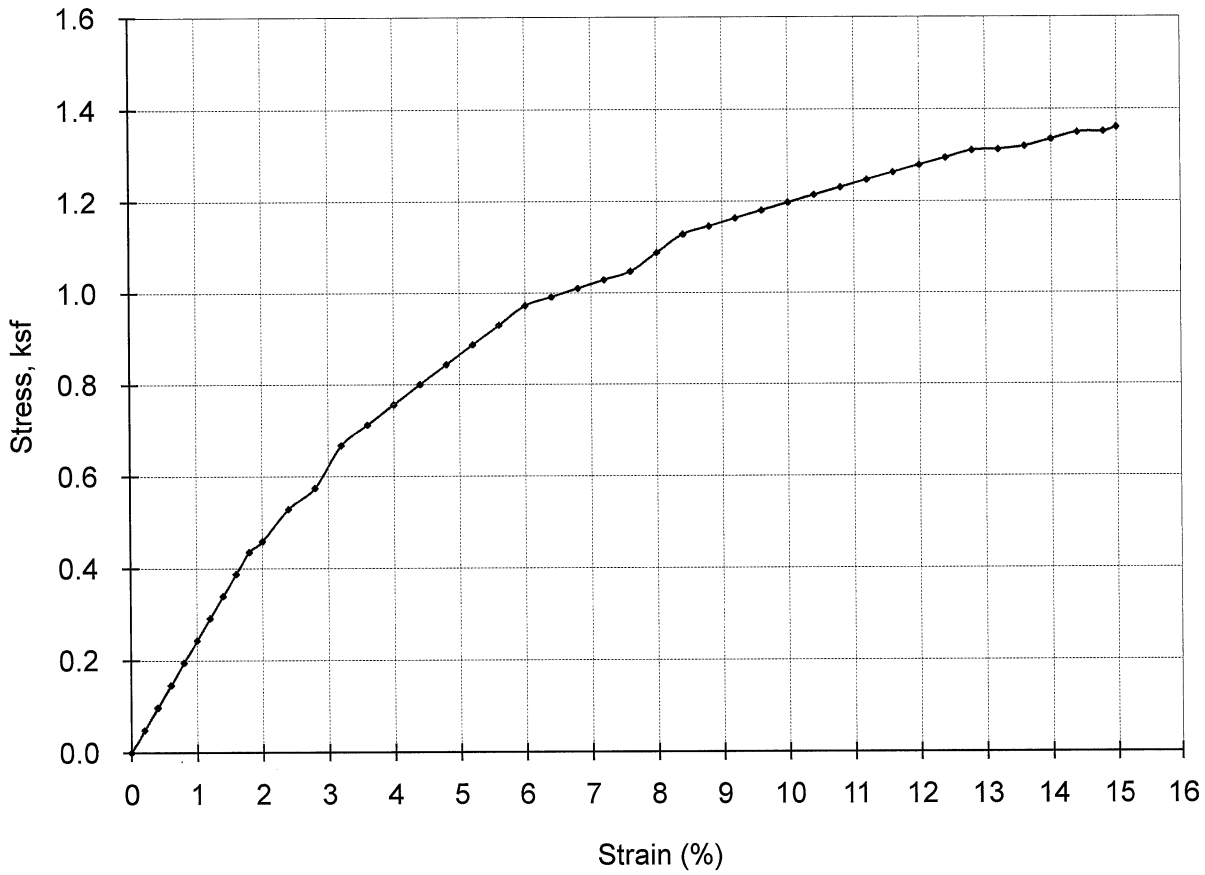
Sample No. : 9 **Maximum Strength (ksf):** 0.54

Depth (feet): 40 **Strain @ Failure (%):** 7.60

Material Description:
Solf, Lean Clay with Gravel

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN** **NOVOTO, MARIN COUNTY, CALIFORNIA**	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5C

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

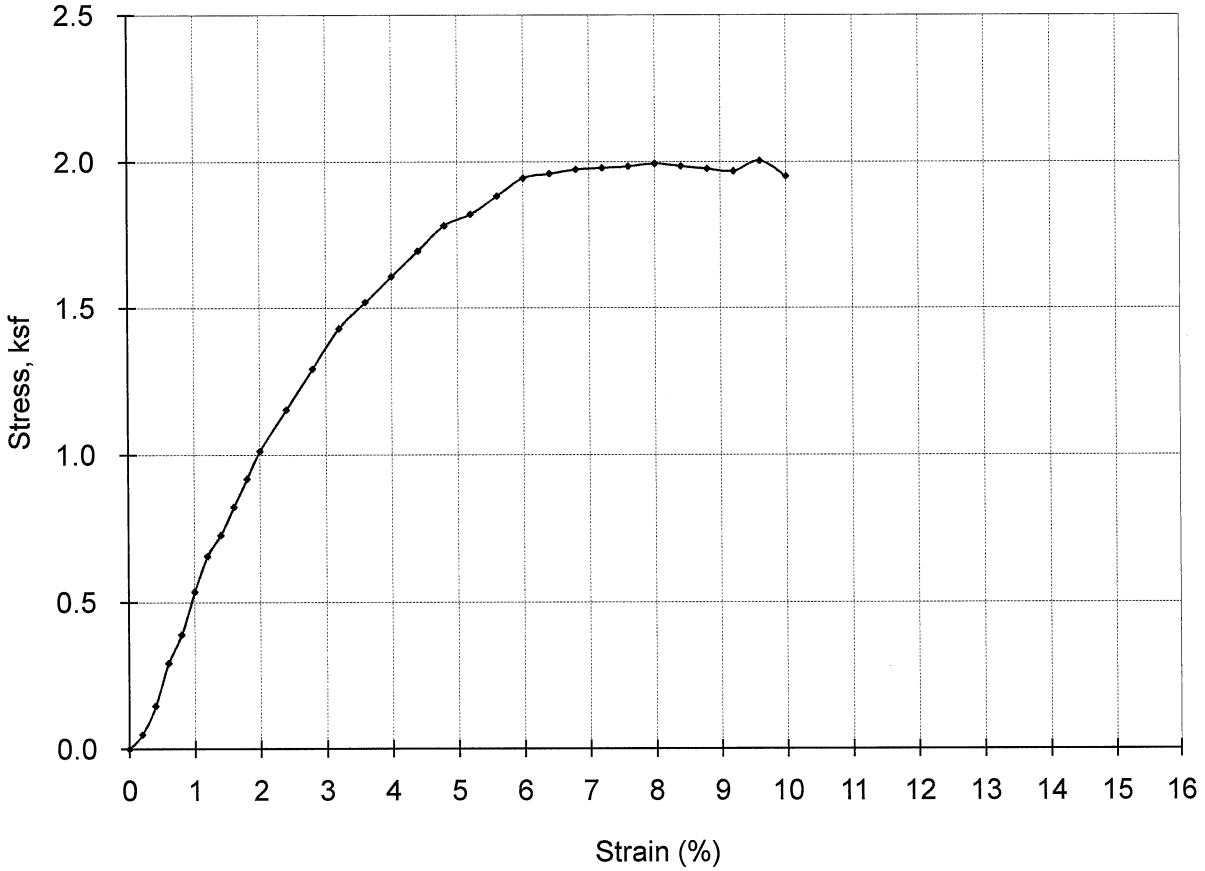
Sample No. : 11 **Strength (ksf):** 1.36

Depth (feet): 50 **Strain (%):** 15.00

Material Description:
Firm, Lean Clay with Sand

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5D

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

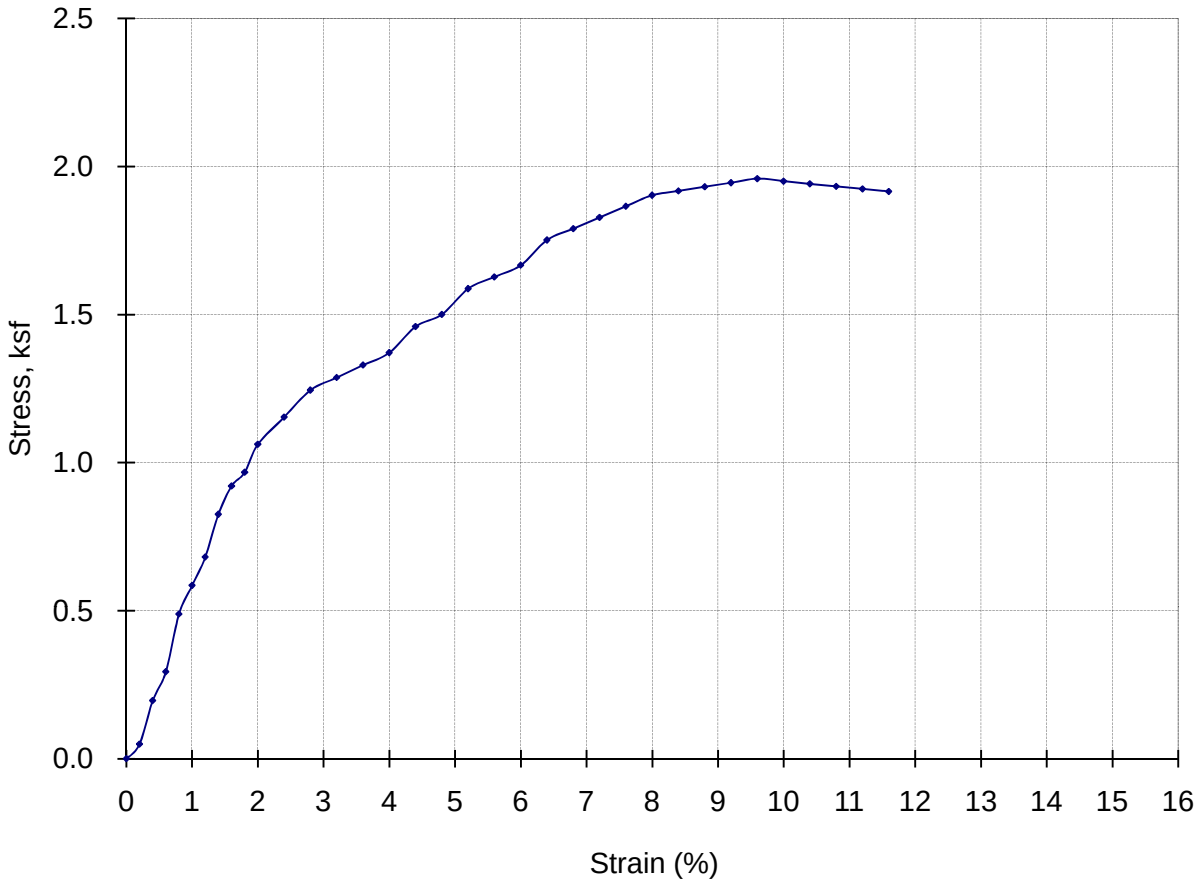
Sample No. : 16 **Maximum Strength (ksf):** 2.00

Depth (feet): 90' **Strain @ Failure (%):** 9.60

Material Description:
Firm, Lean Clay with Gravel

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5E

UNCONFINED COMPRESSION TEST



Boring No.: R-12-NO-003

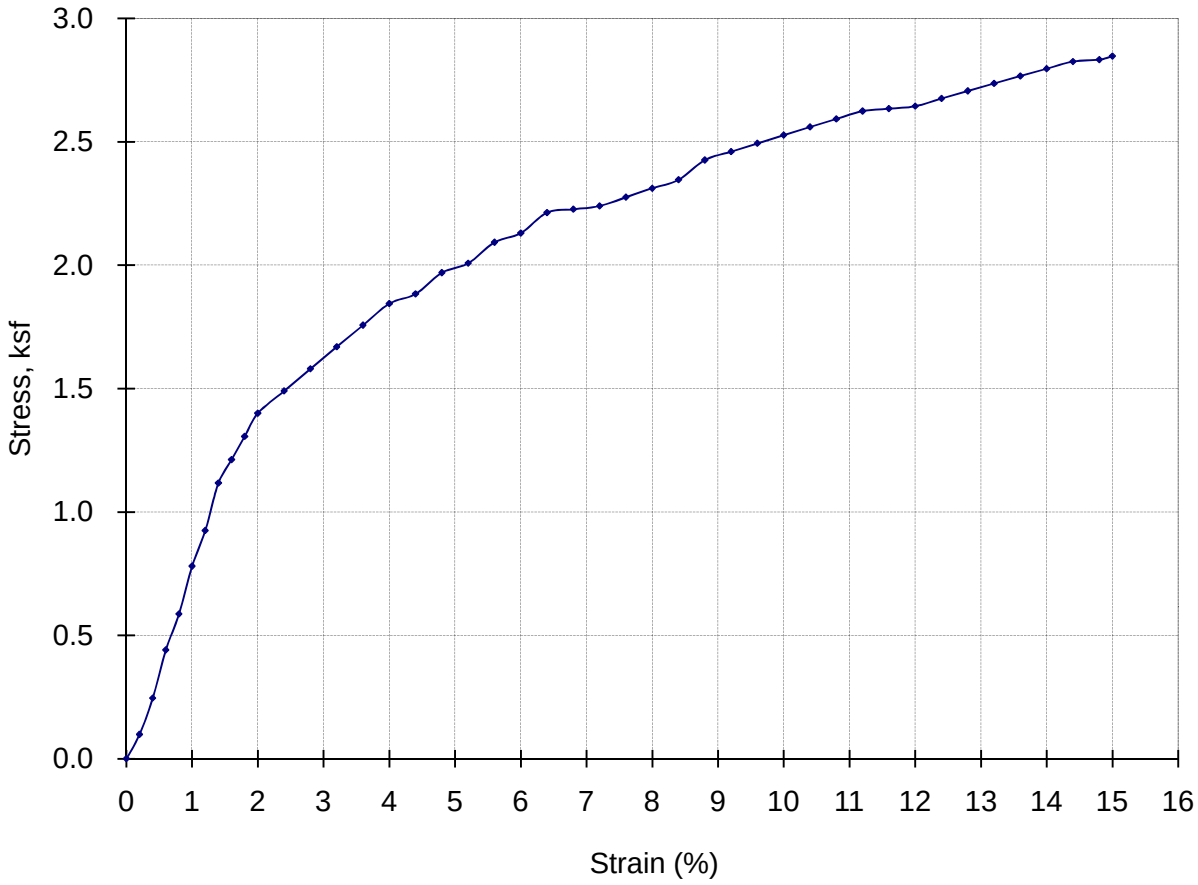
Sample No. : 3 **Maximum Strength (ksf):** 1.96

Depth (feet): 16 **Strain @ Failure (%):** 9.60

Material Description:
Firm, Sandy Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN** **NOVATO, MARIN COUNTY, CALIFORNIA**	
	JOB NO.: 2011-145-BRG	**PLATE NO.: B-5F**

UNCONFINED COMPRESSION TEST



Boring No.: R-12-NO-003

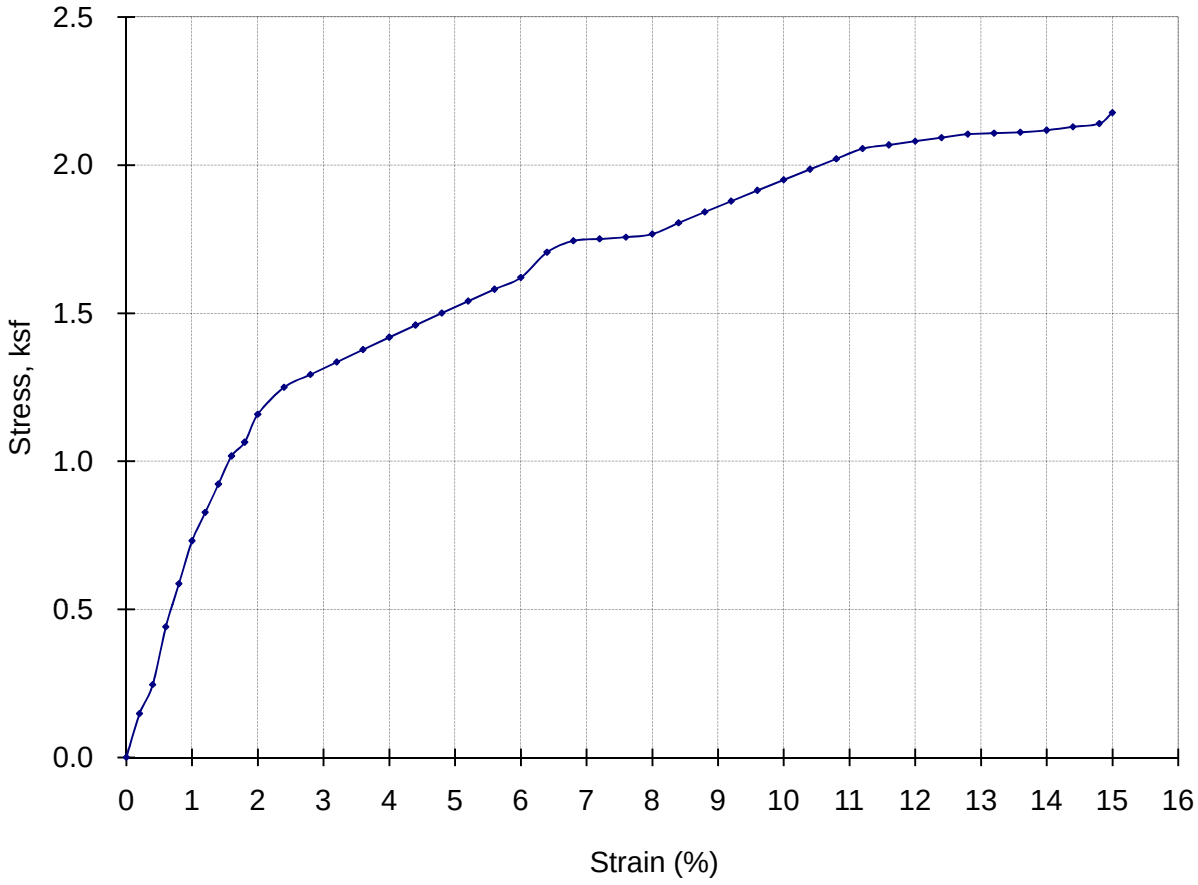
Sample No. : 7 **Strength (ksf):** 2.85

Depth (feet): 36 **Strain (%):** 15.00

Material Description:
Stiff, Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVATO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5G

UNCONFINED COMPRESSION TEST



Boring No.: R-12-NO-003

Sample No. : 8 **Strength (ksf):** 2.18

Depth (feet): 41 **Strain (%):** 15.00

Material Description:
Stiff, Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVATO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5H

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 12/16/2011
Date Submitted 12/13/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-BRG Site ID : R-11NO-001#4@15.
Thank you for your business.

* For future reference to this analysis please use SUN # 61493-126386.

EVALUATION FOR SOIL CORROSION

Soil pH	8.11		
Minimum Resistivity	0.51 ohm-cm (x1000)		
Chloride	149.4 ppm	00.01494	%
Sulfate	40.4 ppm	00.00404	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

PLATE NO. B-6A

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/04/2011
Date Submitted 11/01/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-BRG/MSN A3 Site ID : R-11NO002#4@15'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61292-125955.

EVALUATION FOR SOIL CORROSION

Soil pH	7.71	
Minimum Resistivity	1.21 ohm-cm (x1000)	
Chloride	44.6 ppm	00.00446 %
Sulfate	200.1 ppm	00.02001 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

PLATE NO. B-6B

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 06/06/2012
Date Submitted 05/30/2012

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-BRG/A3NB WD Site ID : R12104-003#4@21.
Thank you for your business.

* For future reference to this analysis please use SUN # 62379-128435.

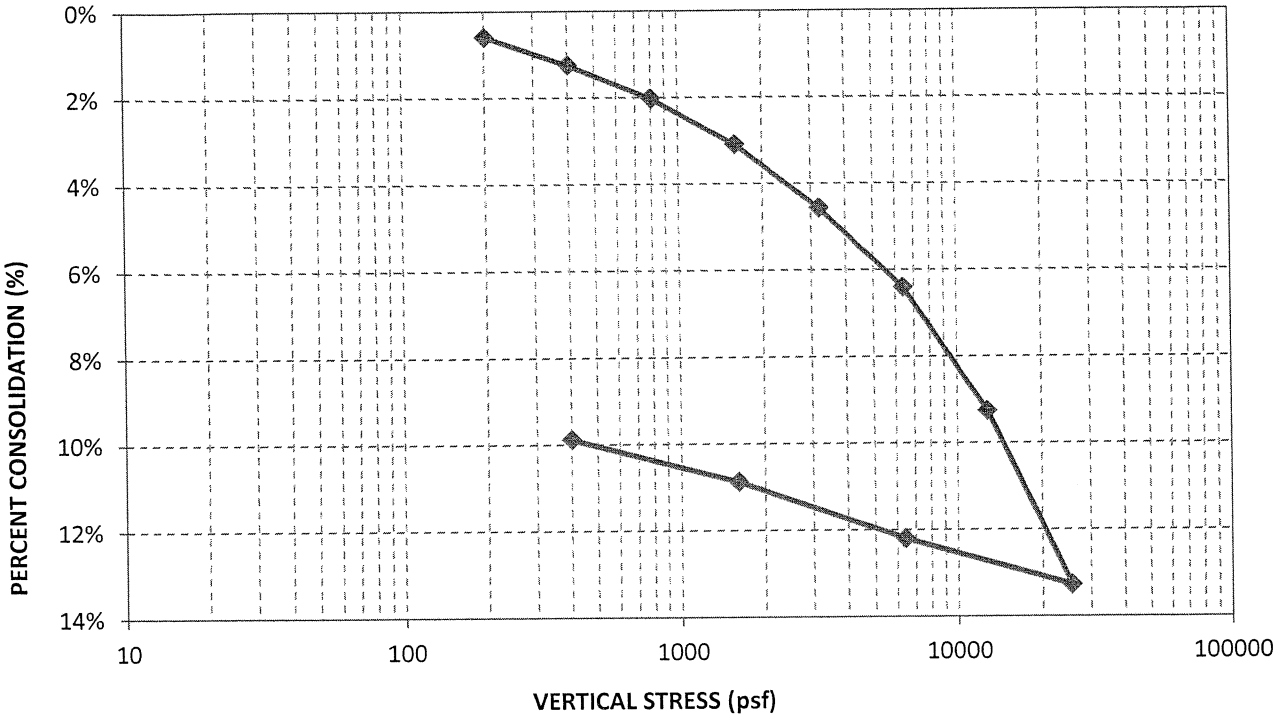
EVALUATION FOR SOIL CORROSION

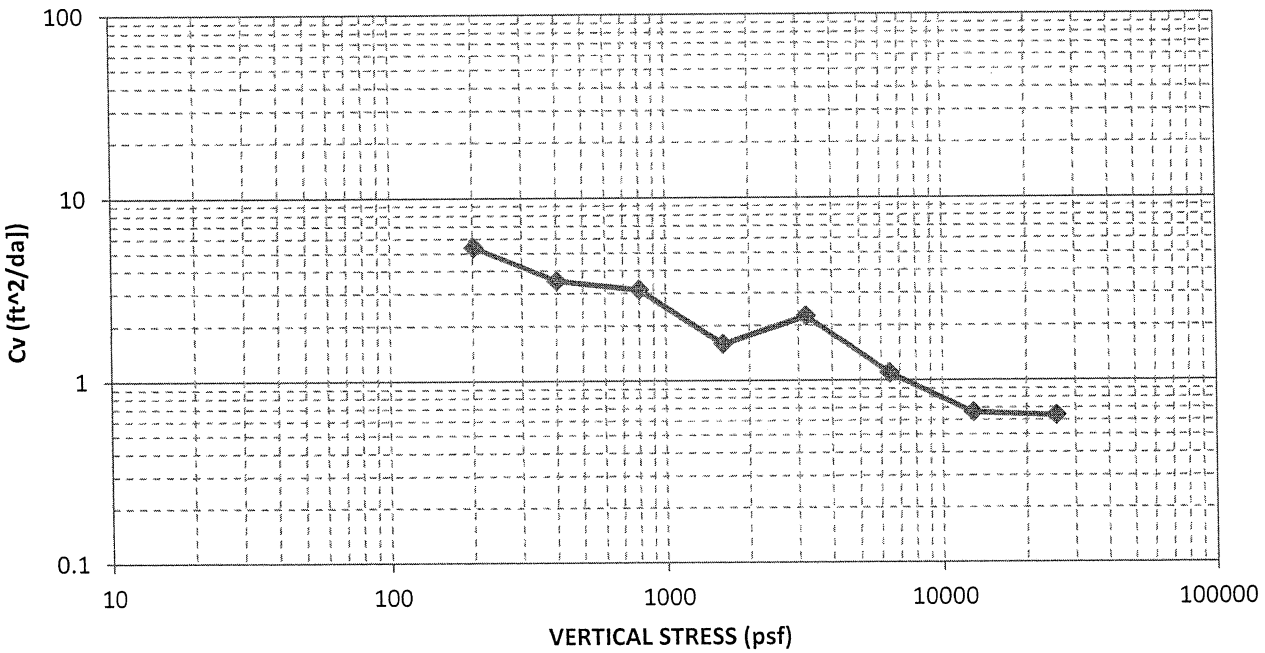
Soil pH	7.72	
Minimum Resistivity	1.21 ohm-cm (x1000)	
Chloride	19.8 ppm	00.00198 %
Sulfate	71.6 ppm	00.00716 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

PLATE NO.: B-6C

CONSOLIDATION TEST RESULT





	Moisture Content (%)	Bulk Density (psf)	Dry Density (psf)
Initial	27.0	129.36	101.85
Final	21.8	137.64	113.01

Boring No.	R-11-N0-001
Sample No.	14
Depth (ft)	70.0'
Soil Description:	LEAN CLAY (CL), dark gray

PARIKH

Practicing in the Geosciences

MNS A3 WIDENING PROJECT - NORTH NOVATO OVERHEAD, NOVATO, CA.

JOB NO.: 2011-145-BRG | PLATE NO.: B-7

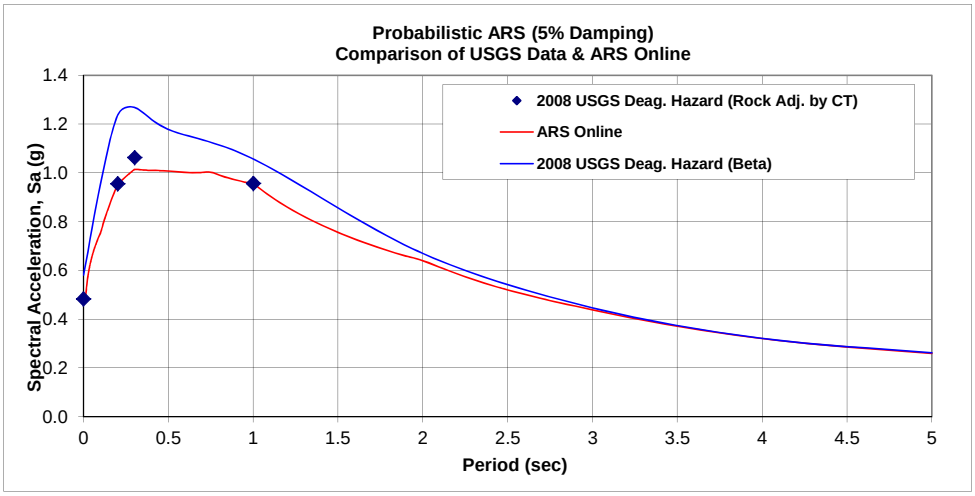
APPENDIX C

ARS Calculated Spectra Deterministic and Probabilistic Input Data

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data (unlock spreadsheet "shmi")
Spectral Accelerations Points from USGS Website at http://earthquake.usgs.gov/research/hazmaps/products_data/2008/data/

*** Note: This spreadsheet uses the given latitude and longitude data provided by the user to estimate spectral acceleration values with a probability of exceedence 5% in 50 yrs (or 975 yr return period). The four spectral acceleration data points plotted on the graph are from the USGS website and are based on a 0.05 degree grid. Basic interpolation is used to estimate intermediate values inside each grid. Raw Data points are provided in the tabs of this spreadsheet. Corner grid spectral acceleration data are shown in the "calculation" tab.**

Input Site Information	
Latitude	Longitude
38.1220	-122.5658
V_{S30} (m/s) =	230
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1
$Z_{1.0}$ (m) =	335
$Z_{2.5}$ (km) =	2.00



Place ARS Online Probabilistic Data Here "Paste"

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.482	1	1	0.482
0.02	0.551	1	1	0.551
0.022	0.561	1	1	0.561
0.025	0.576	1	1	0.576
0.029	0.593	1	1	0.593
0.03	0.596	1	1	0.596
0.032	0.604	1	1	0.604
0.035	0.615	1	1	0.615
0.036	0.618	1	1	0.618
0.04	0.631	1	1	0.631
0.042	0.637	1	1	0.637
0.044	0.643	1	1	0.643
0.045	0.645	1	1	0.645
0.046	0.648	1	1	0.648
0.048	0.654	1	1	0.654
0.05	0.659	1	1	0.659
0.055	0.671	1	1	0.671
0.06	0.683	1	1	0.683
0.065	0.693	1	1	0.693
0.067	0.697	1	1	0.697
0.07	0.703	1	1	0.703
0.075	0.713	1	1	0.713
0.08	0.722	1	1	0.722
0.085	0.731	1	1	0.731
0.09	0.739	1	1	0.739
0.095	0.746	1	1	0.746
0.1	0.754	1	1	0.754
0.11	0.779	1	1	0.779
0.12	0.802	1	1	0.802
0.13	0.823	1	1	0.823
0.133	0.83	1	1	0.83
0.14	0.844	1	1	0.844
0.15	0.864	1	1	0.864
0.16	0.883	1	1	0.883
0.17	0.901	1	1	0.901
0.18	0.919	1	1	0.919
0.19	0.935	1	1	0.935
0.2	0.952	1	1	0.952
0.22	0.966	1	1	0.966
0.24	0.979	1	1	0.979
0.25	0.986	1	1	0.986
0.26	0.992	1	1	0.992
0.28	1.003	1	1	1.003
0.29	1.009	1	1	1.009

Analysis of ARS Online Results vs USGS Deaggregation Hazard (Adj. By CT)

Period (sec)	USGS Interpolated Spectral Accel.	Adj. for Near Fault Effect	Adj. for Soil Amplification	Adj. For Basin Effect	Final Adj. USGS Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.590	1.000	0.818	1.000	0.483	0.482	0.2%
0.2	1.476	1.000	0.648	1.000	0.956	0.952	0.4%
0.3	1.232	1.000	0.863	1.000	1.063	1.014	4.6%
1	0.484	1.200	1.649	1.000	0.957	0.955	0.2%

Max % Difference = **4.6%**

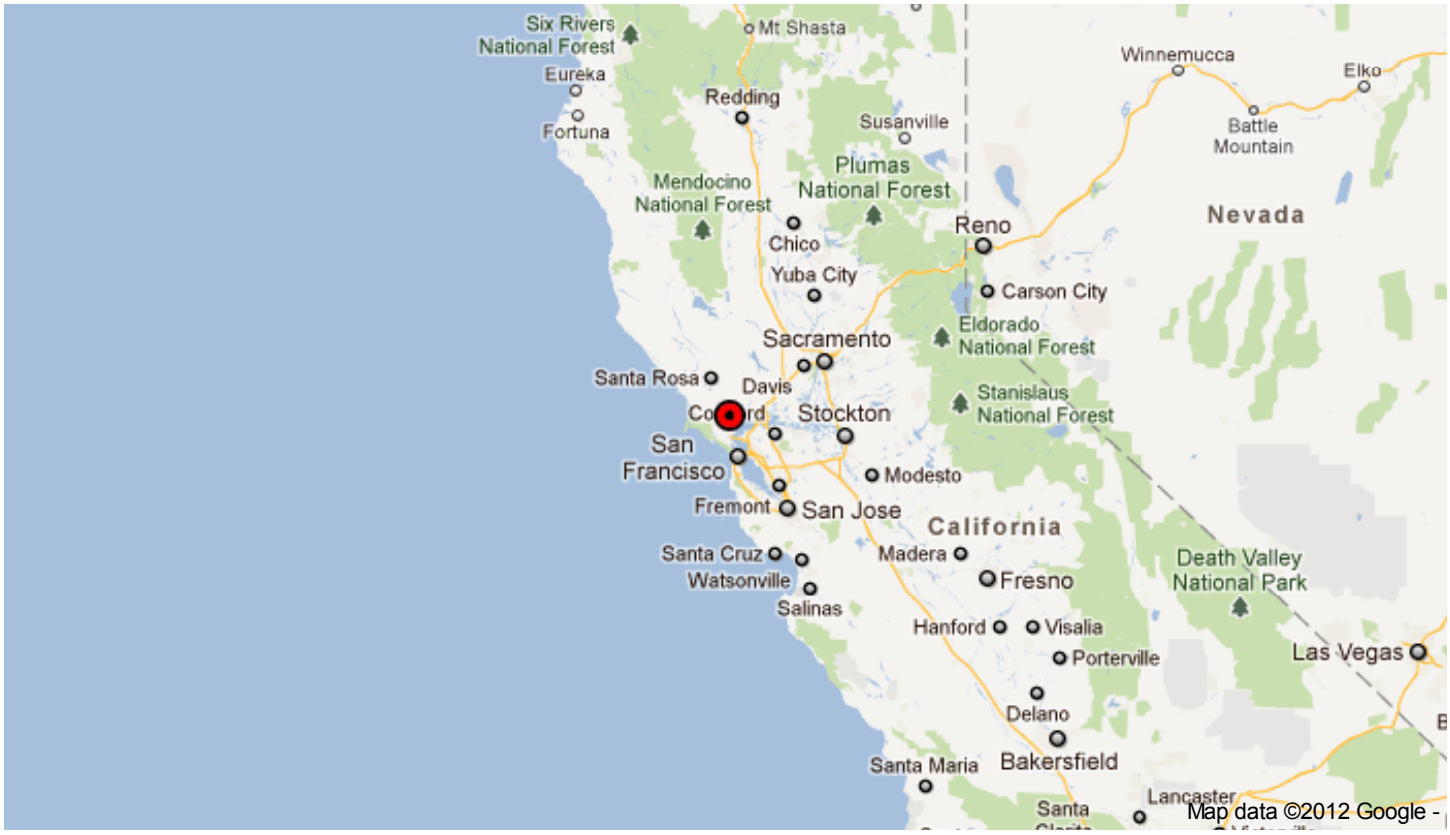
USGS Deaggregation Hazard (Beta) with Near Field and Basin Factors

Period (sec)	INPUT USGS Deagg. Spec Accel	Adj. for Near Fault Effect	Adj. For Basin Effect	Final Adj. USGS Deagg Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.5816	1.000	1.000	0.582	0.482	*17.1%*
0.1	0.9563	1.000	1.000	0.956	0.754	*21.2%*
0.2	1.236	1.000	1.000	1.236	0.952	*23.0%*
0.3	1.2684	1.000	1.000	1.268	1.014	*20.1%*
0.5	1.1783	1.000	1.000	1.178	1.008	14.5%
1	0.8809	1.200	1.000	1.057	0.955	9.7%
2	0.5579	1.200	1.000	0.669	0.64	4.4%
3	0.3722	1.200	1.000	0.447	0.439	1.7%
4	0.2677	1.200	1.000	0.321	0.32	0.4%
5	0.2184	1.200	1.000	0.262	0.26	0.8%

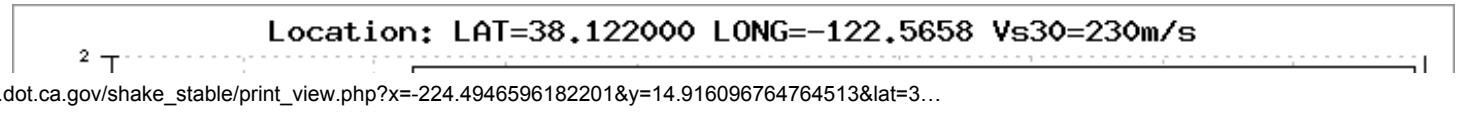
Max % Difference = **14.5%**

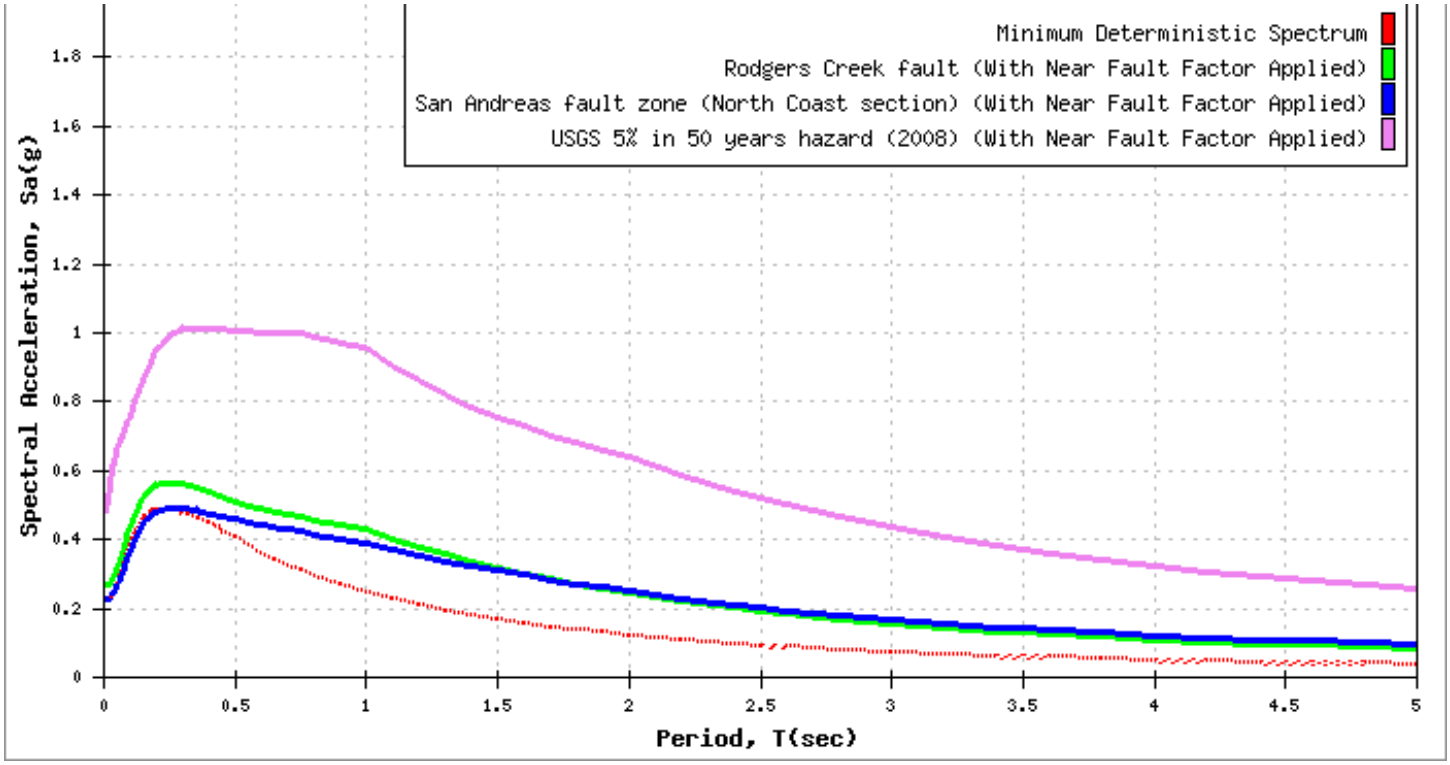
0.3	1.014	1	1	1.014
0.32	1.014	1	1	1.014
0.34	1.013	1	1	1.013
0.35	1.012	1	1	1.012
0.36	1.012	1	1	1.012
0.38	1.011	1	1	1.011
0.4	1.011	1	1	1.011
0.42	1.01	1	1	1.01
0.44	1.01	1	1	1.01
0.45	1.009	1	1	1.009
0.46	1.009	1	1	1.009
0.48	1.009	1	1	1.009
0.5	1.008	1	1	1.008
0.55	0.985	1	1.02	1.004
0.6	0.964	1	1.04	1.002
0.65	0.945	1	1.06	1.001
0.667	0.939	1	1.067	1.001
0.7	0.927	1	1.08	1.002
0.75	0.912	1	1.1	1.003
0.8	0.884	1	1.12	0.991
0.85	0.86	1	1.14	0.98
0.9	0.837	1	1.16	0.971
0.95	0.816	1	1.18	0.962
1	0.796	1	1.2	0.955
1.1	0.754	1	1.2	0.904
1.2	0.717	1	1.2	0.86
1.3	0.684	1	1.2	0.821
1.4	0.656	1	1.2	0.787
1.5	0.63	1	1.2	0.756
1.6	0.607	1	1.2	0.728
1.7	0.586	1	1.2	0.703
1.8	0.567	1	1.2	0.68
1.9	0.55	1	1.2	0.659
2	0.534	1	1.2	0.64
2.2	0.488	1	1.2	0.586
2.4	0.45	1	1.2	0.54
2.5	0.434	1	1.2	0.52
2.6	0.418	1	1.2	0.502
2.8	0.39	1	1.2	0.468
3	0.366	1	1.2	0.439
3.2	0.341	1	1.2	0.409
3.4	0.319	1	1.2	0.383
3.5	0.309	1	1.2	0.371
3.6	0.3	1	1.2	0.36
3.8	0.282	1	1.2	0.339
4	0.267	1	1.2	0.32
4.2	0.255	1	1.2	0.306
4.4	0.244	1	1.2	0.293
4.6	0.234	1	1.2	0.281
4.8	0.225	1	1.2	0.27
5	0.217	1	1.2	0.26

SELECT SITE LOCATION



CALCULATED SPECTRA





SITE DATA

Shear Wave Velocity, Vs_{30}:	230 m/s
Latitude:	38.122000
Longitude:	-122.565800
Depth to Vs = 1.0 km/s:	335 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Rodgers Creek fault

Fault ID:	157
Maximum Magnitude (MMax):	7.1
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	12.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	11.23 km
Rjb:	11.23 km
Rx:	11.23 km
Fnorm:	0

Frev: 0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.268	1.000	1.000	0.268
0.02	0.271	1.000	1.000	0.271
0.022	0.273	1.000	1.000	0.273
0.025	0.276	1.000	1.000	0.276
0.029	0.280	1.000	1.000	0.280
0.03	0.281	1.000	1.000	0.281
0.032	0.284	1.000	1.000	0.284
0.035	0.289	1.000	1.000	0.289
0.036	0.291	1.000	1.000	0.291
0.04	0.297	1.000	1.000	0.297
0.042	0.300	1.000	1.000	0.300
0.044	0.304	1.000	1.000	0.304
0.045	0.305	1.000	1.000	0.305
0.046	0.307	1.000	1.000	0.307
0.048	0.311	1.000	1.000	0.311
0.05	0.314	1.000	1.000	0.314
0.055	0.326	1.000	1.000	0.326
0.06	0.337	1.000	1.000	0.337
0.065	0.349	1.000	1.000	0.349
0.067	0.354	1.000	1.000	0.354
0.07	0.361	1.000	1.000	0.361
0.075	0.373	1.000	1.000	0.373
0.08	0.386	1.000	1.000	0.386
0.085	0.398	1.000	1.000	0.398
0.09	0.411	1.000	1.000	0.411
0.095	0.423	1.000	1.000	0.423
0.1	0.435	1.000	1.000	0.435
0.11	0.455	1.000	1.000	0.455
0.12	0.474	1.000	1.000	0.474
0.13	0.491	1.000	1.000	0.491
0.133	0.496	1.000	1.000	0.496
0.14	0.506	1.000	1.000	0.506
0.15	0.520	1.000	1.000	0.520
0.16	0.530	1.000	1.000	0.530
0.17	0.538	1.000	1.000	0.538
0.18	0.545	1.000	1.000	0.545
0.19	0.551	1.000	1.000	0.551
0.2	0.557	1.000	1.000	0.557
0.22	0.561	1.000	1.000	0.561
0.24	0.564	1.000	1.000	0.564

0.25	0.564	1.000	1.000	0.564
0.26	0.564	1.000	1.000	0.564
0.28	0.564	1.000	1.000	0.564
0.29	0.563	1.000	1.000	0.563
0.3	0.563	1.000	1.000	0.563
0.32	0.559	1.000	1.000	0.559
0.34	0.554	1.000	1.000	0.554
0.35	0.551	1.000	1.000	0.551
0.36	0.549	1.000	1.000	0.549
0.38	0.543	1.000	1.000	0.543
0.4	0.538	1.000	1.000	0.538
0.42	0.532	1.000	1.000	0.532
0.44	0.527	1.000	1.000	0.527
0.45	0.524	1.000	1.000	0.524
0.46	0.521	1.000	1.000	0.521
0.48	0.516	1.000	1.000	0.516
0.5	0.511	1.000	1.000	0.511
0.55	0.490	1.000	1.020	0.499
0.6	0.471	1.000	1.040	0.489
0.65	0.453	1.000	1.060	0.480
0.667	0.448	1.000	1.067	0.478
0.7	0.438	1.000	1.080	0.473
0.75	0.423	1.000	1.100	0.465
0.8	0.408	1.000	1.120	0.457
0.85	0.394	1.000	1.140	0.449
0.9	0.381	1.000	1.160	0.442
0.95	0.369	1.000	1.180	0.436
1	0.358	1.000	1.200	0.429
1.1	0.335	1.000	1.200	0.402
1.2	0.315	1.000	1.200	0.379
1.3	0.298	1.000	1.200	0.357
1.4	0.282	1.000	1.200	0.338
1.5	0.267	1.000	1.200	0.320
1.6	0.252	1.000	1.200	0.302
1.7	0.238	1.000	1.200	0.286
1.8	0.226	1.000	1.200	0.271
1.9	0.215	1.000	1.200	0.258
2	0.205	1.000	1.200	0.246
2.2	0.185	1.000	1.200	0.222
2.4	0.168	1.000	1.200	0.202
2.5	0.160	1.000	1.200	0.193
2.6	0.153	1.000	1.200	0.184

2.8	0.141	1.000	1.200	0.169
3	0.130	1.000	1.200	0.156
3.2	0.120	1.000	1.200	0.144
3.4	0.112	1.000	1.200	0.134
3.5	0.108	1.000	1.200	0.130
3.6	0.104	1.000	1.200	0.125
3.8	0.098	1.000	1.200	0.117
4	0.092	1.000	1.200	0.110
4.2	0.087	1.000	1.200	0.104
4.4	0.082	1.000	1.200	0.098
4.6	0.077	1.000	1.200	0.093
4.8	0.073	1.000	1.200	0.088
5	0.070	1.000	1.200	0.084

San Andreas fault zone (North Coast section)

Fault ID:	308
Maximum Magnitude (MMax):	7.9
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	11.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	21.44 km
Rjb:	21.44 km
Rx:	21.44 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.227	1.000	1.000	0.227
0.02	0.229	1.000	1.000	0.229
0.022	0.231	1.000	1.000	0.231
0.025	0.234	1.000	1.000	0.234
0.029	0.237	1.000	1.000	0.237
0.03	0.238	1.000	1.000	0.238
0.032	0.240	1.000	1.000	0.240
0.035	0.244	1.000	1.000	0.244
0.036	0.245	1.000	1.000	0.245
0.04	0.250	1.000	1.000	0.250
0.042	0.253	1.000	1.000	0.253
0.044	0.256	1.000	1.000	0.256
0.045	0.258	1.000	1.000	0.258

0.046	0.259	1.000	1.000	0.259
0.048	0.262	1.000	1.000	0.262
0.05	0.265	1.000	1.000	0.265
0.055	0.274	1.000	1.000	0.274
0.06	0.284	1.000	1.000	0.284
0.065	0.293	1.000	1.000	0.293
0.067	0.297	1.000	1.000	0.297
0.07	0.303	1.000	1.000	0.303
0.075	0.313	1.000	1.000	0.313
0.08	0.324	1.000	1.000	0.324
0.085	0.334	1.000	1.000	0.334
0.09	0.345	1.000	1.000	0.345
0.095	0.356	1.000	1.000	0.356
0.1	0.366	1.000	1.000	0.366
0.11	0.384	1.000	1.000	0.384
0.12	0.401	1.000	1.000	0.401
0.13	0.417	1.000	1.000	0.417
0.133	0.421	1.000	1.000	0.421
0.14	0.431	1.000	1.000	0.431
0.15	0.443	1.000	1.000	0.443
0.16	0.452	1.000	1.000	0.452
0.17	0.460	1.000	1.000	0.460
0.18	0.468	1.000	1.000	0.468
0.19	0.474	1.000	1.000	0.474
0.2	0.480	1.000	1.000	0.480
0.22	0.485	1.000	1.000	0.485
0.24	0.490	1.000	1.000	0.490
0.25	0.491	1.000	1.000	0.491
0.26	0.492	1.000	1.000	0.492
0.28	0.493	1.000	1.000	0.493
0.29	0.493	1.000	1.000	0.493
0.3	0.493	1.000	1.000	0.493
0.32	0.490	1.000	1.000	0.490
0.34	0.486	1.000	1.000	0.486
0.35	0.484	1.000	1.000	0.484
0.36	0.482	1.000	1.000	0.482
0.38	0.477	1.000	1.000	0.477
0.4	0.472	1.000	1.000	0.472
0.42	0.470	1.000	1.000	0.470
0.44	0.468	1.000	1.000	0.468
0.45	0.467	1.000	1.000	0.467
0.46	0.466	1.000	1.000	0.466
0.48	0.464	1.000	1.000	0.464

0.5	0.461	1.000	1.000	0.461
0.55	0.449	1.000	1.007	0.452
0.6	0.437	1.000	1.014	0.443
0.65	0.427	1.000	1.021	0.436
0.667	0.423	1.000	1.024	0.433
0.7	0.417	1.000	1.028	0.429
0.75	0.408	1.000	1.036	0.422
0.8	0.397	1.000	1.043	0.414
0.85	0.388	1.000	1.050	0.407
0.9	0.378	1.000	1.057	0.400
0.95	0.370	1.000	1.064	0.394
1	0.362	1.000	1.071	0.387
1.1	0.345	1.000	1.071	0.369
1.2	0.329	1.000	1.071	0.353
1.3	0.315	1.000	1.071	0.338
1.4	0.303	1.000	1.071	0.324
1.5	0.291	1.000	1.071	0.311
1.6	0.277	1.000	1.071	0.297
1.7	0.265	1.000	1.071	0.284
1.8	0.254	1.000	1.071	0.272
1.9	0.243	1.000	1.071	0.261
2	0.234	1.000	1.071	0.251
2.2	0.214	1.000	1.071	0.229
2.4	0.196	1.000	1.071	0.210
2.5	0.188	1.000	1.071	0.202
2.6	0.181	1.000	1.071	0.194
2.8	0.168	1.000	1.071	0.180
3	0.156	1.000	1.071	0.167
3.2	0.146	1.000	1.071	0.156
3.4	0.136	1.000	1.071	0.146
3.5	0.132	1.000	1.071	0.142
3.6	0.128	1.000	1.071	0.137
3.8	0.121	1.000	1.071	0.129
4	0.114	1.000	1.071	0.122
4.2	0.108	1.000	1.071	0.116
4.4	0.103	1.000	1.071	0.111
4.6	0.098	1.000	1.071	0.105
4.8	0.094	1.000	1.071	0.101
5	0.090	1.000	1.071	0.096

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.482	1.000	1.000	0.482
0.02	0.551	1.000	1.000	0.551
0.022	0.561	1.000	1.000	0.561
0.025	0.576	1.000	1.000	0.576
0.029	0.593	1.000	1.000	0.593
0.03	0.596	1.000	1.000	0.596
0.032	0.604	1.000	1.000	0.604
0.035	0.615	1.000	1.000	0.615
0.036	0.618	1.000	1.000	0.618
0.04	0.631	1.000	1.000	0.631
0.042	0.637	1.000	1.000	0.637
0.044	0.643	1.000	1.000	0.643
0.045	0.645	1.000	1.000	0.645
0.046	0.648	1.000	1.000	0.648
0.048	0.654	1.000	1.000	0.654
0.05	0.659	1.000	1.000	0.659
0.055	0.671	1.000	1.000	0.671
0.06	0.683	1.000	1.000	0.683
0.065	0.693	1.000	1.000	0.693
0.067	0.697	1.000	1.000	0.697
0.07	0.703	1.000	1.000	0.703
0.075	0.713	1.000	1.000	0.713
0.08	0.722	1.000	1.000	0.722
0.085	0.731	1.000	1.000	0.731
0.09	0.739	1.000	1.000	0.739
0.095	0.746	1.000	1.000	0.746
0.1	0.754	1.000	1.000	0.754
0.11	0.779	1.000	1.000	0.779
0.12	0.802	1.000	1.000	0.802
0.13	0.823	1.000	1.000	0.823
0.133	0.830	1.000	1.000	0.830
0.14	0.844	1.000	1.000	0.844
0.15	0.864	1.000	1.000	0.864
0.16	0.883	1.000	1.000	0.883
0.17	0.901	1.000	1.000	0.901
0.18	0.919	1.000	1.000	0.919
0.19	0.935	1.000	1.000	0.935
0.2	0.952	1.000	1.000	0.952
0.22	0.966	1.000	1.000	0.966

0.24	0.979	1.000	1.000	0.979
0.25	0.986	1.000	1.000	0.986
0.26	0.992	1.000	1.000	0.992
0.28	1.003	1.000	1.000	1.003
0.29	1.009	1.000	1.000	1.009
0.3	1.014	1.000	1.000	1.014
0.32	1.014	1.000	1.000	1.014
0.34	1.013	1.000	1.000	1.013
0.35	1.012	1.000	1.000	1.012
0.36	1.012	1.000	1.000	1.012
0.38	1.011	1.000	1.000	1.011
0.4	1.011	1.000	1.000	1.011
0.42	1.010	1.000	1.000	1.010
0.44	1.010	1.000	1.000	1.010
0.45	1.009	1.000	1.000	1.009
0.46	1.009	1.000	1.000	1.009
0.48	1.009	1.000	1.000	1.009
0.5	1.008	1.000	1.000	1.008
0.55	0.985	1.000	1.020	1.004
0.6	0.964	1.000	1.040	1.002
0.65	0.945	1.000	1.060	1.001
0.667	0.939	1.000	1.067	1.001
0.7	0.927	1.000	1.080	1.002
0.75	0.912	1.000	1.100	1.003
0.8	0.884	1.000	1.120	0.991
0.85	0.860	1.000	1.140	0.980
0.9	0.837	1.000	1.160	0.971
0.95	0.816	1.000	1.180	0.962
1	0.796	1.000	1.200	0.955
1.1	0.754	1.000	1.200	0.904
1.2	0.717	1.000	1.200	0.860
1.3	0.684	1.000	1.200	0.821
1.4	0.656	1.000	1.200	0.787
1.5	0.630	1.000	1.200	0.756
1.6	0.607	1.000	1.200	0.728
1.7	0.586	1.000	1.200	0.703
1.8	0.567	1.000	1.200	0.680
1.9	0.550	1.000	1.200	0.659
2	0.534	1.000	1.200	0.640
2.2	0.488	1.000	1.200	0.586
2.4	0.450	1.000	1.200	0.540
2.5	0.434	1.000	1.200	0.520
2.6	0.418	1.000	1.200	0.502

2.8	0.390	1.000	1.200	0.468
3	0.366	1.000	1.200	0.439
3.2	0.341	1.000	1.200	0.409
3.4	0.319	1.000	1.200	0.383
3.5	0.309	1.000	1.200	0.371
3.6	0.300	1.000	1.200	0.360
3.8	0.282	1.000	1.200	0.339
4	0.267	1.000	1.200	0.320
4.2	0.255	1.000	1.200	0.306
4.4	0.244	1.000	1.200	0.293
4.6	0.234	1.000	1.200	0.281
4.8	0.225	1.000	1.200	0.270
5	0.217	1.000	1.200	0.260

MINIMUM DETERMINISTIC SPECTRUM

Period	SA
0.01	0.224
0.02	0.226
0.022	0.228
0.025	0.231
0.029	0.234
0.03	0.235
0.032	0.239
0.035	0.243
0.036	0.245
0.04	0.250
0.042	0.253
0.044	0.257
0.045	0.258
0.046	0.260
0.048	0.263
0.05	0.266
0.055	0.278
0.06	0.289
0.065	0.300
0.067	0.305
0.07	0.312
0.075	0.323
0.08	0.335
0.085	0.347

0.09	0.359
0.095	0.371
0.1	0.382
0.11	0.401
0.12	0.418
0.13	0.434
0.133	0.438
0.14	0.448
0.15	0.460
0.16	0.467
0.17	0.473
0.18	0.479
0.19	0.483
0.2	0.487
0.22	0.488
0.24	0.487
0.25	0.486
0.26	0.485
0.28	0.482
0.29	0.481
0.3	0.479
0.32	0.473
0.34	0.466
0.35	0.463
0.36	0.460
0.38	0.453
0.4	0.446
0.42	0.438
0.44	0.430
0.45	0.426
0.46	0.422
0.48	0.414
0.5	0.407
0.55	0.382
0.6	0.361
0.65	0.342
0.667	0.336
0.7	0.325
0.75	0.310
0.8	0.295
0.85	0.281
0.9	0.268
0.95	0.257

0.95	0.254
1	0.246
1.1	0.226
1.2	0.209
1.3	0.194
1.4	0.180
1.5	0.168
1.6	0.157
1.7	0.147
1.8	0.137
1.9	0.129
2	0.122
2.2	0.108
2.4	0.097
2.5	0.092
2.6	0.088
2.8	0.080
3	0.073
3.2	0.067
3.4	0.062
3.5	0.060
3.6	0.057
3.8	0.053
4	0.050
4.2	0.047
4.4	0.044
4.6	0.041
4.8	0.039
5	0.037

Envelope Data

Period	SA
0.01	0.482
0.02	0.551
0.022	0.561
0.025	0.576
0.029	0.593
0.03	0.596
0.032	0.604
0.035	0.615
0.036	0.618
0.04	0.631
0.042	0.637
0.044	0.643

0.044	0.643
0.045	0.645
0.046	0.648
0.048	0.654
0.05	0.659
0.055	0.671
0.06	0.683
0.065	0.693
0.067	0.697
0.07	0.703
0.075	0.713
0.08	0.722
0.085	0.731
0.09	0.739
0.095	0.746
0.1	0.754
0.11	0.779
0.12	0.802
0.13	0.823
0.133	0.830
0.14	0.844
0.15	0.864
0.16	0.883
0.17	0.901
0.18	0.919
0.19	0.935
0.2	0.952
0.22	0.966
0.24	0.979
0.25	0.986
0.26	0.992
0.28	1.003
0.29	1.009
0.3	1.014
0.32	1.014
0.34	1.013
0.35	1.012
0.36	1.012
0.38	1.011
0.4	1.011
0.42	1.010
0.44	1.010
0.45	1.009
0.46	1.009

0.46	1.009
0.48	1.009
0.5	1.008
0.55	1.004
0.6	1.002
0.65	1.001
0.667	1.001
0.7	1.002
0.75	1.003
0.8	0.991
0.85	0.980
0.9	0.971
0.95	0.962
1	0.955
1.1	0.904
1.2	0.860
1.3	0.821
1.4	0.787
1.5	0.756
1.6	0.728
1.7	0.703
1.8	0.680
1.9	0.659
2	0.640
2.2	0.586
2.4	0.540
2.5	0.520
2.6	0.502
2.8	0.468
3	0.439
3.2	0.409
3.4	0.383
3.5	0.371
3.6	0.360
3.8	0.339
4	0.320
4.2	0.306
4.4	0.293
4.6	0.281
4.8	0.270
5	0.260

Calculation of Shear Wave Velocity

PROJECT NAME **MSN**
PROJECT NO. **2011-145-MSN**
BORING NO. **As-built Boring B-5**

SOIL GROUPS

1. GRAVELS, SANDS AND NONPLASTIC SILTS $Vs=100.5(N_{60})^{0.29}$
2. CLAYS AND PLASTIC SILTS $Vs=86.9(N_{60})^{0.333}$
3. ROCK $Vs=109(N_{60})^{0.319}$

HAMMER ENERGY 0.6

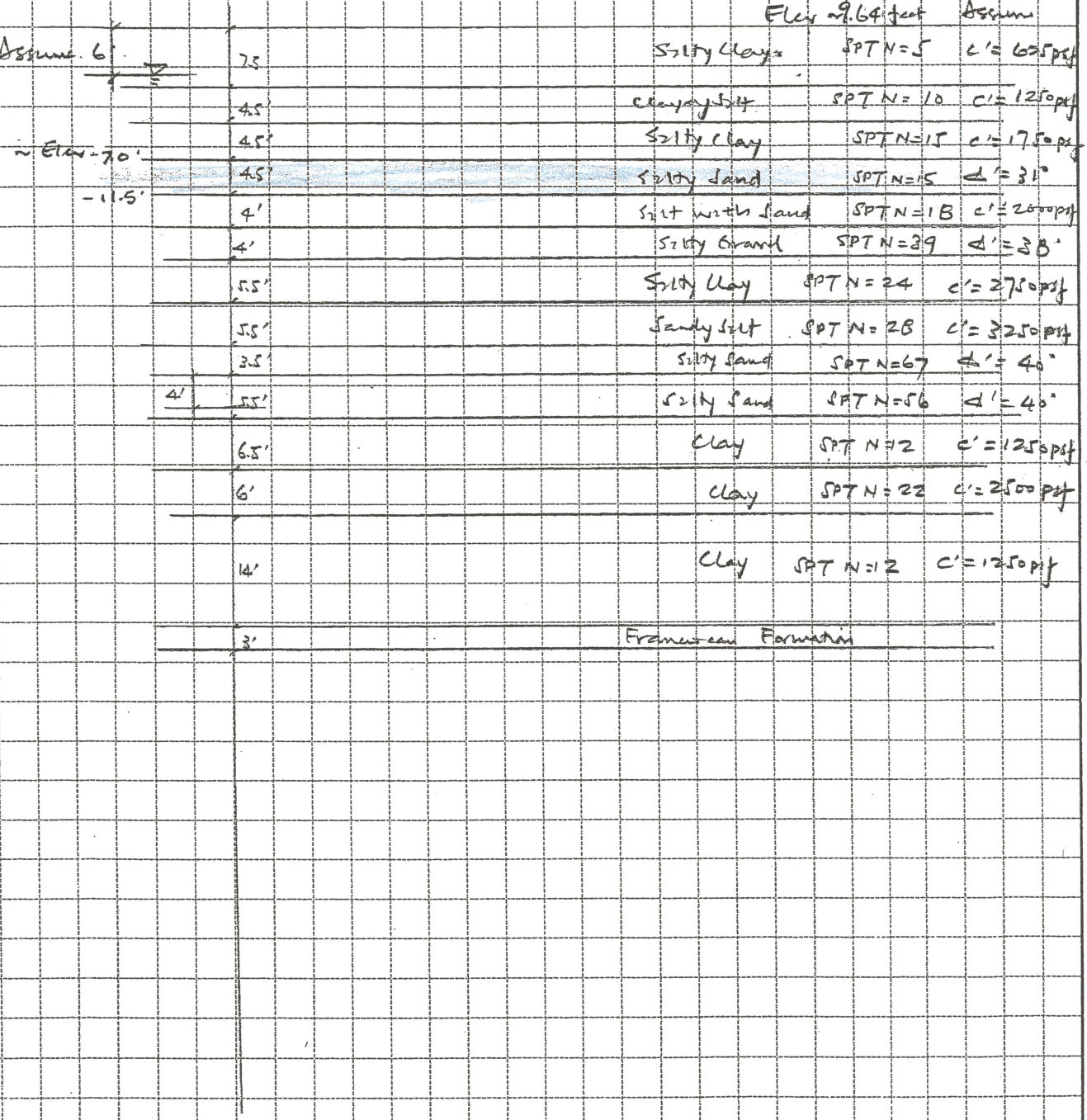
Depth (ft)		Thickness, D (ft)	Soil Type	Sample Type	N	N_{60}	Vs (m/s)	Vs (ft/s)	D/V	Vs30 (m/s)
0	8	8	1	SPT	24	24.0	252.6	828.5	0.010	229.5
8	17	9	2	SPT	12	12.0	198.8	652.0	0.014	
17	20	3	1	SPT	16	16.0	224.6	736.6	0.004	
20	29	9	2	SPT	36	36.0	286.6	940.0	0.010	
29	34	5	2	SPT	13	13.0	204.2	669.6	0.007	
34	39	5	2	SPT	25	25.0	253.8	832.5	0.006	
39	45	6	2	SPT	15	15.0	214.1	702.3	0.009	
45	50	5	2	SPT	9	9.0	180.6	592.5	0.008	
50	55	5	2	SPT	6	6.0	157.8	517.6	0.010	
55	60	5	2	SPT	5	5.0	148.5	487.1	0.010	
60	65	5	2	SPT	5	5.0	148.5	487.1	0.010	
65	77	12	2	SPT	14	14.0	209.3	686.4	0.017	
77	90	13	1	SPT	77	77.0	354.2	1161.8	0.011	
90	100	10	3	SPT	100	100.0	473.6	1553.5	0.006	

Evaluation of Liquefaction Potential

PARIKH
Practicing in the Geosciences

JOB MSN A3 Project
SHEET NO 2 OF 3
CALCULATED BY DATE 10/2021
CHECKED BY DATE
SCALE

Evaluation of Liquefaction Potential - About 5 Generalized Soil Profile (Boring B-4)



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***As-built Boring B-4***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 6

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *60%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

*F.S.=(CRR 7.5/CSR)*MSF*K σ*K α*

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*													
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	6	2	5	SPT	750	750	0.99		5.0	1.0	0.75	1.2	1.00	4.5	1.40	6.3				1.00	1	
2	7.5	2	5	SPT	937.5	850	0.98		5.0	1.0	0.75	1.2	1.15	5.2	1.35	7.0				1.00	1	
3	12	2	10	SPT	1500	1131	0.97		10.0	1.0	0.80	1.2	1.00	9.6	1.25	12.0				1.00	1	
4	16.5	2	15	SPT	2062.5	1413	0.97		15.0	1.0	0.85	1.2	1.00	15.3	1.15	17.7				1.00	1	
5	21	1	15	SPT	2625	1694	0.95	0.61	15.0	1.0	0.95	1.2	1.15	19.7	1.07	21.1	15%	24.7	0.29	1.00	1	0.44
6	25	2	18	SPT	3125	1944	0.94		18.0	1.0	0.95	1.2	1.15	23.6	1.01	23.9				1.00	1	
7	29	1	39	SPT	3625	2194	0.93	0.63	39.0	1.0	0.95	1.2	1.00	44.5	0.96	42.6	15%	47.1		0.96	1	
8	34.5	2	24	SPT	4312.5	2538	0.89		24.0	1.0	1.00	1.2	1.00	28.8	0.89	25.7				0.91	1	
9	40	2	28	SPT	5000	2881	0.85		28.0	1.0	1.00	1.2	1.00	33.6	0.83	28.0				0.86	1	
10	43.5	1	67	SPT	5437.5	3100	0.82	0.59	67.0	1.0	1.00	1.2	1.15	92.5	0.80	74.0	15%	80.0		0.84	1	
11	49	1	56	SPT	6125	3444	0.76	0.56	56.0	1.0	1.00	1.2	1.15	77.3	0.75	58.2	15%	63.5		0.80	1	
12	55.5	2	12	SPT	6937.5	3850	0.70		12.0	1.0	1.00	1.2	1.15	16.6	0.70	11.7				0.77	1	
13	61.5	2	22	SPT	7687.5	4225	0.65		22.0	1.0	1.00	1.2	1.15	30.4	0.66	20.2				0.74	1	
14	75.5	2	12	SPT	9437.5	5100	0.57		12.0	1.0	1.00	1.2	1.15	16.6	0.59	9.7				0.69	1	
15	78.5	2	50	SPT	9812.5	5288	0.55		50.0	1.0	1.00	1.2	1.15	69.0	0.57	39.5				0.68	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$

   where α and β = coefficients determined from the following relationships

   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$

   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$

   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

Evaluation of Post-Liquefaction Settlement

As-built Boring B-4

Based on the result of the liquefaction potential analysis

Sample No. 5 $(N_1)_{60-cs}$ = 24.7 CSR = 0.61

Volumetric Strain = 1.2 %

Post-liquefaction Settlement = 4.5 x 12 x 0.012

= 0.65 Inches. Say 0.7 Inches

PARIKH
Practicing in the Geosciences

JOB MSN A3 Projects
SHEET NO 2 OF 4
CALCULATED BY A Lam DATE
CHECKED BY DATE
SCALE

Evaluation of Liquefaction Potential/Abut 1/Generalized Soil Profile (Boring B-8)

Depth ≈ 31.0 Elev. ~2.6 feet

	3'	Clayey Silt	SPT N=9	Assume c'=1000 psf
~Elev -6.0'	5.5'			
-8.5'	2.5'	Silty Sand	SPT N=14	φ'=31°
		Clayey Silt	SPT N=13	
-16.5	8'			c'=1500 psf
-23.0'	6.5	Silty Sand	SPT N=8	φ'=30°
	3.5'	Silt	SPT N=22	c'=2500 psf
	5.5'	Silt	SPT N=12	c'=1250 psf
	5'	Silt	SPT N=5	c'=625 psf
	5.5'	Sand	SPT N>50	φ'=38°
Elev -52.0'	7' (5')	Franciscan Formation		

LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***As-built Boring B-8***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 6

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *60%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

*F.S.=(CRR 7.5/CSR)*MSF*Kσ*Kα*

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*												
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60,\ CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	6	2	9	SPT	750	750	0.99		9.0	1.0	0.75	1.2	1.00	8.1	1.40	11.3				1.00	1	
2	8.5	2	9	SPT	1062.5	913	0.98		9.0	1.0	0.75	1.2	1.15	9.3	1.33	12.4				1.00	1	
3	11	1	14	SPT	1375	1069	0.98	0.51	14.0	1.0	0.80	1.2	1.00	13.4	1.27	17.0	15%	20.4	0.22	1.00	1	0.40
4	19	2	13	SPT	2375	1569	0.96		13.0	1.0	0.85	1.2	1.00	13.3	1.11	14.7				1.00	1	
5	25.5	1	8	SPT	3187.5	1975	0.94	0.62	8.0	1.0	0.95	1.2	1.15	10.5	1.01	10.5	15%	13.6	0.15	1.00	1	0.22
6	29	2	22	SPT	3625	2194	0.93		22.0	1.0	0.95	1.2	1.15	28.8	0.96	27.6				0.96	1	
7	34.5	2	12	SPT	4312.5	2538	0.89		12.0	1.0	1.00	1.2	1.00	14.4	0.89	12.8				0.91	1	
8	39.5	2	5	SPT	4937.5	2850	0.86		5.0	1.0	1.00	1.2	1.15	6.9	0.84	5.8				0.87	1	
9	45	1	50	SPT	5625	3194	0.80	0.58	50.0	1.0	1.00	1.2	1.15	69.0	0.79	54.3		54.3		0.83	1	
10	52	2	50	SPT	6500	3631	0.73		50.0	1.0	1.00	1.2	1.15	69.0	0.73	50.3				0.79	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$

   where α and β = coefficients determined from the following relationships

   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$

   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$

   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

Evaluation of Post-Liquefaction Settlement

As-built Boring B-B

Based on the result of the liquefaction potential analysis

Sample No 3 $(N_1)_{60\text{-}cs}$ = 20.4 CSR = 0.51

Volumetric Strain = 1.5 %

Sample No 5 $(N_1)_{60\text{-}cs}$ = 13.6 CSR = 0.62

Volumetric Strain = 2.2 %

Post-liquefaction settlement = $2.5 \times 12 \times 0.015 + 6.5 \times 12 \times 0.022$

= 0.45 + 1.72

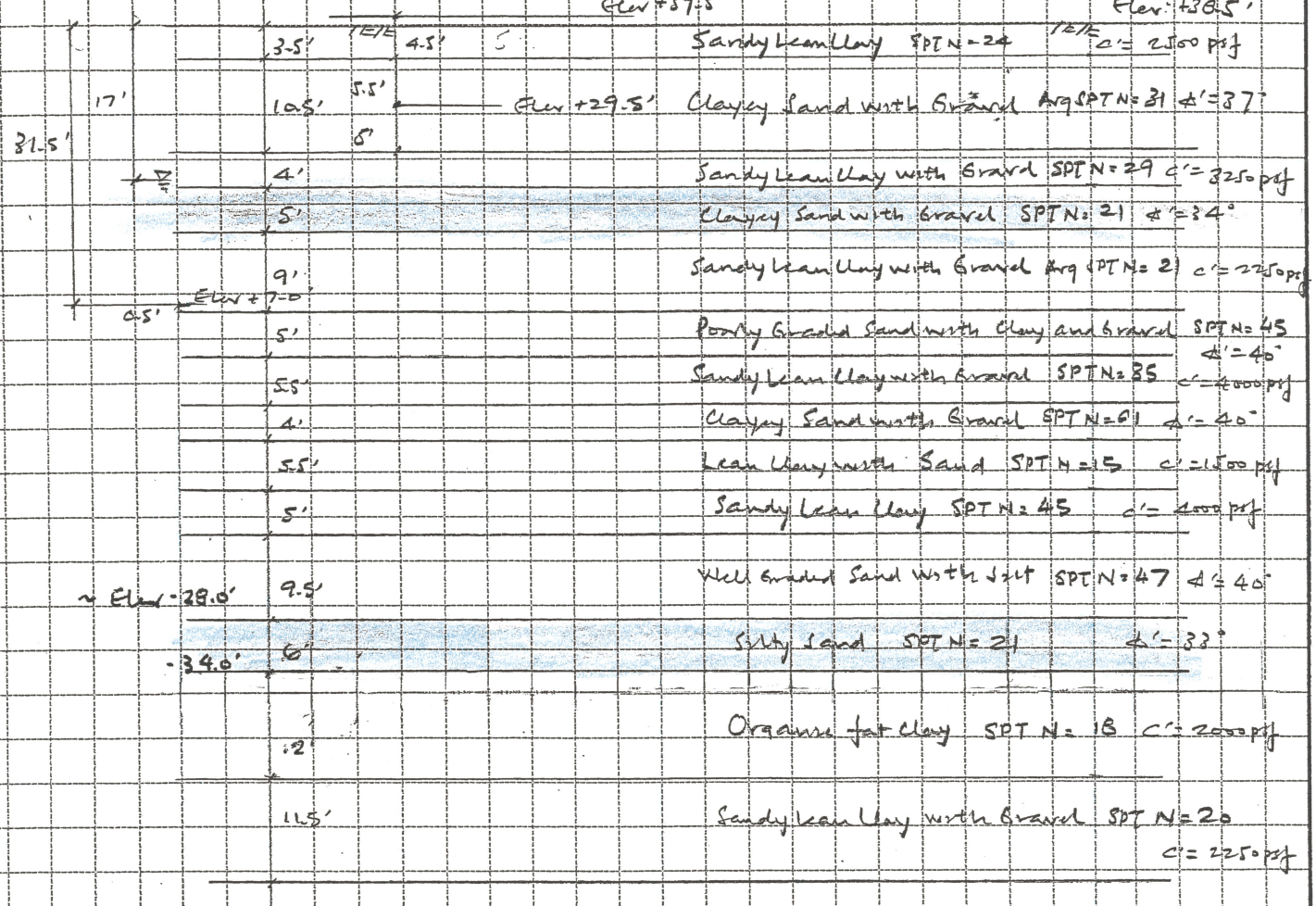
= 2.18 inches say 2.2 inches

2011-145-B1

PARIKH
Practicing in the Geosciences

JOB M&N A3 NB North Novato Overhead Widen
SHEET NO 1 OF 3
CALCULATED BY A Lam DATE 11/2011
CHECKED BY DATE
SCALE

Evaluation of
Liquefaction Potential - Abutment 3 - Generalized Soil Profile 4 (R-1-NB-002) South Side



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***R-11-NO-002***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 17

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *84%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w *=* 7.9

MSF = 0.94

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*											*F.S.=($CRR_{7.5}$/CSR)*MSF*K σ*K α*		
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	2	2	26	MC	250	250	1.00		25.4	1.4	0.75	1.0	1.00	26.6	1.66	44.2				1.00	1	
2	4.5	1	32	MC	562.5	563	0.99	0.41	31.2	1.4	0.75	1.0	1.15	37.7	1.49	56.0		56.0		1.00	1	
3	10	1	36	MC	1250	1250	0.98	0.40	35.1	1.4	0.80	1.0	1.00	39.3	1.21	47.4		47.4		1.00	1	
4	15	2	31	MC	1875	1875	0.97		30.2	1.4	0.85	1.0	1.00	36.0	1.03	37.0				1.00	1	
5	20	1	23	MC	2500	2313	0.96	0.42	22.4	1.4	0.95	1.0	1.15	34.3	0.93	32.0	20%	38.2		0.94	1	
6	25	2	21	SPT	3125	2625	0.94		21.0	1.4	0.95	1.2	1.15	38.5	0.88	33.7				0.90	1	
7	30	2	24	MC	3750	2938	0.92		23.4	1.4	1.00	1.0	1.00	32.8	0.82	27.0				0.86	1	
8	35	1	49	MC	4375	3250	0.89	0.49	47.8	1.4	1.00	1.0	1.15	76.9	0.78	59.9	41%	76.9		0.82	1	
9	40	2	38	MC	5000	3563	0.85		37.1	1.4	1.00	1.0	1.15	59.7	0.74	44.0				0.79	1	
10	45	1	67	MC	5625	3875	0.80	0.48	65.3	1.4	1.00	1.0	1.15	105.2	0.70	73.7	21%	83.9		0.77	1	
11	50	2	16	MC	6250	4188	0.75		15.6	1.4	1.00	1.0	1.15	25.1	0.67	16.8				0.74	1	
12	55	2	32	SPT	6875	4500	0.70		32.0	1.4	1.00	1.2	1.15	61.8	0.64	39.4				0.72	1	
13	60	1	51	MC	7500	4813	0.66	0.42	49.7	1.4	1.00	1.0	1.15	80.1	0.61	48.8	9%	50.2		0.70	1	
14	70	1	23	MC	8750	5438	0.59	0.39	22.4	1.4	1.00	1.0	1.15	36.1	0.56	20.3	24%	26.6	0.33	0.67	1	0.53
15	80	2	19	MC	10000	6063	0.55		18.5	1.4	1.00	1.0	1.15	29.8	0.52	15.5				0.64	1	
16	90	2	22	MC	11250	6688	0.52		21.5	1.4	1.00	1.0	1.15	34.5	0.48	16.7				0.62	1	
17	95.5	1	60	SPT	11937.5	7031	0.51	0.35	60.0	1.4	1.00	1.2	1.15	115.9	0.47	54.1		54.1		0.60	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$
   where α and β = coefficients determined from the following relationships
   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$
   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$
   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB MSN NB HOV Lane Widening A2 Project
SHEET NO ____ OF ____
CALCULATED BY A Lam DATE 5/2012
CHECKED BY ____ DATE ____
SCALE ____

Evaluation of Post-liquefaction Settlement

Boring R-11-NO-002

Based on the result of the liquefaction potential analyses

Sample No. 19 $(N1)_{60\_CS}$ = 26.6 CSR = 0.39

Volumetric Strain = 1.0%

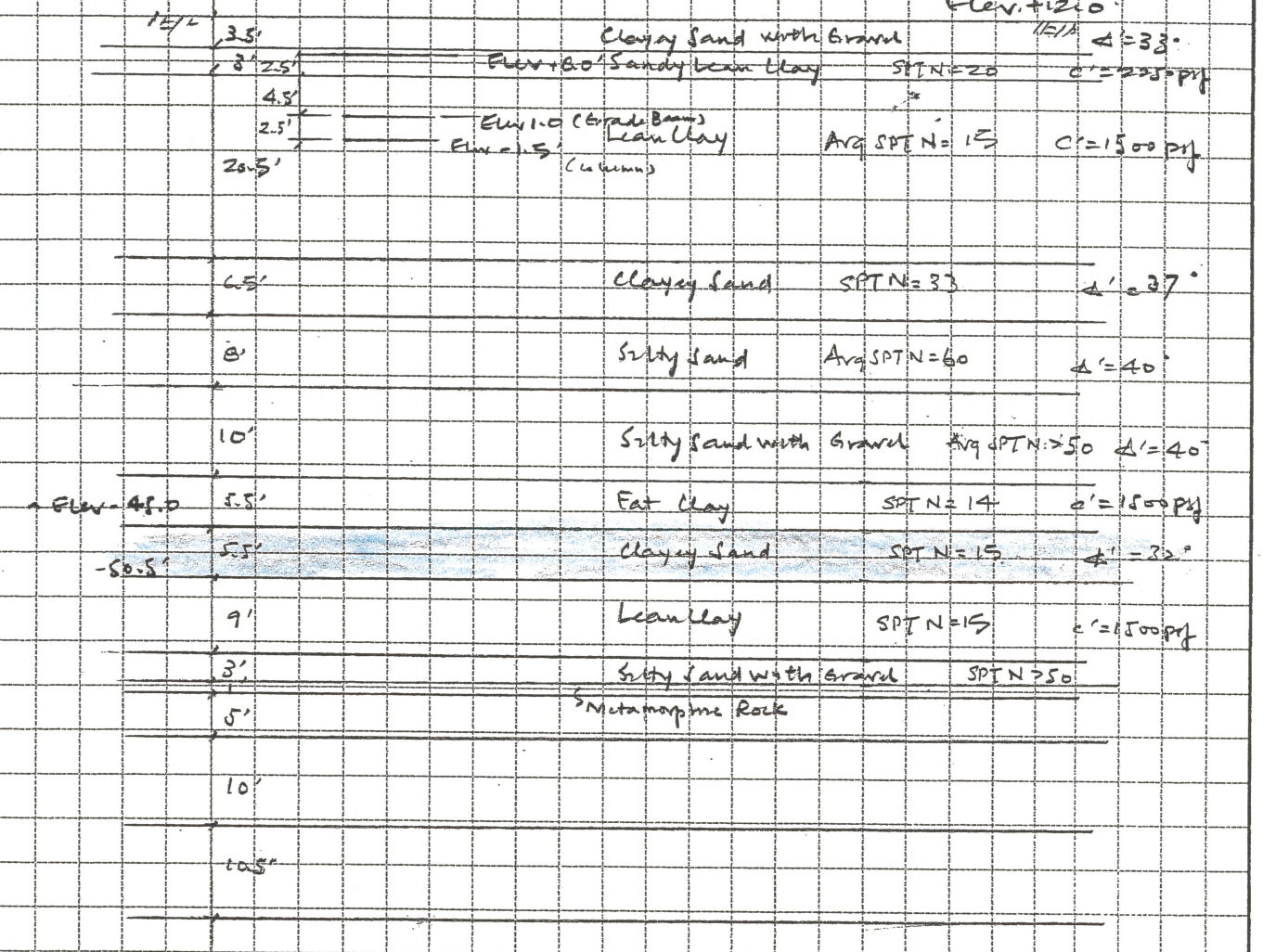
Post-liquefaction settlement = 6 x 12 x 0.01

= 0.7 inches

PARIKH
Practicing in the Geosciences

JOB M&N 43 NB North Novato Overhead Hayden
SHEET NO ____ OF ____
CALCULATED BY A-Lam DATE 11/2011
CHECKED BY ____ DATE ____
SCALE ____

Pile Capacity Analysis - Bent 4 Generalized Soil Profile (R-11-NO-001)



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***R-11-NO-001***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 11

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *84%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*											*F.S.=($CRR_{7.5}$/CSR)*MSF*K σ*K α*		
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60,\ CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	5	2	21	MC	315	625	0.99		20.5	1.4	0.75	1.0	1.15	24.7	1.45	36.0				1.00	1	
2	10	2	9	MC	630	1250	0.98		8.8	1.4	0.80	1.0	1.00	9.8	1.21	11.8				1.00	1	
3	15	2	10	MC	945	1625	0.97		9.8	1.4	0.85	1.0	1.00	11.6	1.09	12.7				1.00	1	
4	20	2	24	MC	1260	1938	0.96		23.4	1.4	0.95	1.0	1.15	35.8	1.01	36.3				1.00	1	
5	25	2	21	MC	3125	2250	0.94		20.5	1.4	0.95	1.0	1.15	31.3	0.95	29.6				0.95	1	
6	30	1	36	MC	3750	2563	0.92	0.55	35.1	1.4	1.00	1.0	1.00	49.1	0.89	43.6		43.6		0.91	1	
7	35	1	52	MC	4375	2875	0.89	0.55	50.7	1.4	1.00	1.0	1.15	81.6	0.83	68.1		68.1		0.86	1	
8	40	1	79	MC	5000	3188	0.85	0.55	77.0	1.4	1.00	1.0	1.15	124.0	0.79	97.7		97.7		0.83	1	
9	45	1	50	MC	5625	3500	0.80	0.53	48.8	1.4	1.00	1.0	1.15	78.5	0.75	58.5		58.5		0.80	1	
10	50	1	50	MC	6250	3813	0.75	0.51	48.8	1.4	1.00	1.0	1.15	78.5	0.71	55.6		55.6		0.77	1	
11	55	2	14	MC	6875	4125	0.70		13.7	1.4	1.00	1.0	1.15	22.0	0.67	14.8				0.75	1	
12	60	1	16	MC	7500	4438	0.66	0.46	15.6	1.4	1.00	1.0	1.15	25.1	0.64	16.2	7%	16.4	0.17	0.73	1	0.26
13	70	2	16	MC	8750	5063	0.59		15.6	1.4	1.00	1.0	1.15	25.1	0.59	14.8				0.69	1	
14	74.5	1	50	MC	9312.5	5344	0.57	0.41	48.8	1.4	1.00	1.0	1.15	78.5	0.57	44.6		44.6		0.67	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$
   where α and β = coefficients determined from the following relationships
   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$
   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$
   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB MSN NB HOV Lane Widening A3 Project
SHEET NO _____ OF _____
CALCULATED BY A Lam DATE 4/2012
CHECKED BY _____ DATE _____
SUBJECT _____

Evaluation of Post-Liquefaction Settlement

Boring R-11-NO-001

Based on the result of the liquefaction potential analyses

Sample No. 12 $(N_1)_{60,CS} = 16.4$ CSR = 0.46

Volumetric Strain = 1 %

Post-liquefaction Settlement = 55 × 1.2 × 0.01

= 0.66 inches ~ 0.7 inches

LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***R-12-NO-003***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 7

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *77%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE (CRR $_{7.5}$)*												*F.S.=(CRR $_{7.5}$/CSR)*MSF*K σ*K α*		
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	6	1	15	MC	378	750	0.99	0.20	14.6	1.3	0.75	1.0	1.15	16.2	1.40	22.6	18%	27.3	0.35	1.00	1	
2	11	2	4	MC	693	1094	0.98		3.9	1.3	0.80	1.0	1.00	4.0	1.26	5.0				1.00	1	
3	16	2	16	MC	1008	1406	0.97		15.6	1.3	0.85	1.0	1.00	17.0	1.16	19.7				1.00	1	
4	21	2	22	MC	1323	1719	0.95		21.5	1.3	0.95	1.0	1.15	30.1	1.07	32.1				1.00	1	
5	26	1	25	SPT	3250	2031	0.94	0.61	25.0	1.3	0.95	1.2	1.15	42.1	0.99	41.8		41.8		0.99	1	
6	31	2	7	MC	3875	2344	0.92		6.8	1.3	1.00	1.0	1.00	8.8	0.93	8.1				0.94	1	
7	36	2	25	MC	4500	2656	0.88		24.4	1.3	1.00	1.0	1.15	36.0	0.87	31.3				0.89	1	
8	41	2	24	MC	5125	2969	0.84		23.4	1.3	1.00	1.0	1.15	34.5	0.82	28.3				0.85	1	
9	46	1	22	MC	5750	3281	0.79	0.57	21.5	1.3	1.00	1.0	1.00	27.5	0.77	21.3	38%	30.6		0.82	1	
10	51	2	60	MC	6375	3594	0.74		58.5	1.3	1.00	1.0	1.15	86.3	0.73	63.4				0.79	1	
11	55.5	1	50	MC	6937.5	3875	0.70	0.51	48.8	1.3	1.00	1.0	1.15	71.9	0.70	50.4		50.4		0.77	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$
   where α and β = coefficients determined from the following relationships
   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$
   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$
   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

Kobe, Japan following the 1995 Hyogo-ken Nanbu earthquake. If sand boils are produced, postearthquake settlements are likely to be irregular. The resulting differential movement can be damaging to structures, pavements, or pipelines on or near the ground surface.

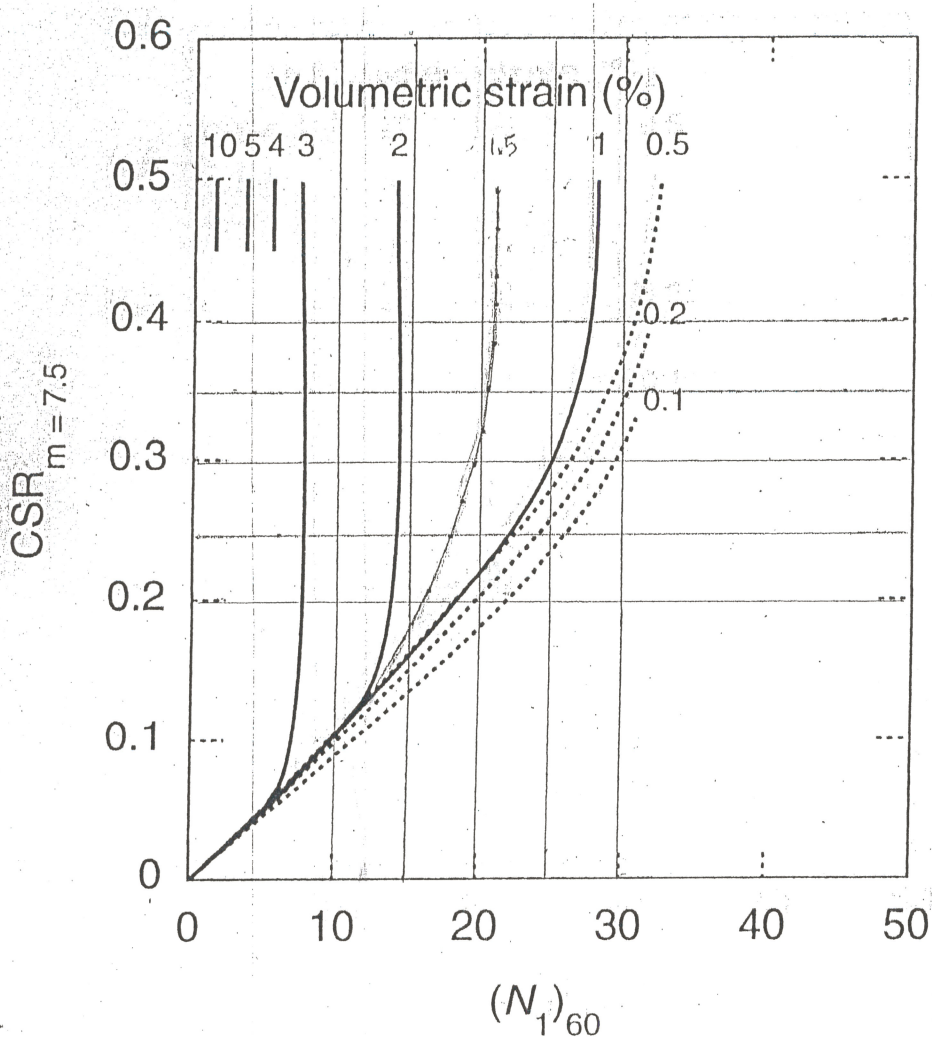


Figure 9.53 Chart for estimation of volumetric strain in saturated sands from cyclic stress ratio and standard penetration resistance. (After Tokimatsu and Seed, 1987. Evaluation of settlements in sand due to earthquake shaking, *Journal of Geotechnical Engineering,* Vol. 113, No. 8. Reprinted by permission of ASCE.)

$(N_1)_{60,CS}$

Example 9.7

Significant settlement was observed in the Marina District of San Francisco following the 1989 Loma Prieta earthquake. Much of this settlement was determined to have resulted from densi-

APPENDIX D

OSFP Review Comment & Response Form

General Project Information	Review Phase	Reviewer Information
Dist: 04 EA: 2640L1 Project Name: North Novato OH (Replace) OSFP Liaison: Tracy Bertram Phone: (916) 227-8397 e-mail: tracy_bertram@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection ☐ 65% PS&E Unchecked Details ☐ PS&E (Review No. 1) ☐ Construction Support ☒ Other: Foundation Report (Draft) **Structure Information** (Use when necessary to document comments by individual structure) Structure Name: North Novato OH (Widen) Br No: 27-0094R	Reviewer Name: John Moore Functional Unit: GS Phone Number: (510) 622-8742 e-mail: j_moore@dot.ca.gov Date of Review: 3/28/2012

Consultant Information (to be filled in by Consultant)				
Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	Foundation Report	FR	Foundation Report, MSN A3 – NB Widening Project, North Novato Overhead Widen (BR. #27-00974R), Novato, Marin County, California, (DRAFT), dated November 23, 2011, by Parikh Consultants, Inc., San Jose, CA, for BKF-Engineers, Pleasanton, CA		
	General and Foundation Plans	RP P	General and Foundation Plans for North Novato Overhead (widen), dated November 21, 2011, by Biggs Cardosa Associates, Inc., San Jose, CA, for the Transportation Authority of Marin (TAM), San Rafael, CA		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
2	Foundation Report	FR Section 12.0 Lateral Pile Design	It was stated in Section 8.3 that "…the liquefaction potential at the project site is anticipated to be moderate to high." Have the strength parameters included in the recommended geotechnical parameters for L-PILE analysis been corrected for residual undrained strength? Have any blowcount corrections been made? Has lateral spreading and its effects on the bridge foundation been considered?	Comment has been incorporated. Recommended geotechnical parameters for L-PILE analysis have been corrected for residual undrained strength with the blow count correction. Lateral spreading has been discussed in the report. It is our opinion that the loose to medium dense sand exists in form of isolated pockets or lenses (approximately 2.5 feet to 6.5 feet) and lateral spreading is unlikely to occur. We will confirm this conclusion from the additional boring that has been planned.	
3	Foundation Report	FR Section 5.0 Field Exploration in 2011	In addition to the borings that have already been drilled, we recommend adding at least one additional boring, preferably two along the extents of the bridge widening alignment on Rush Landing Road. Drill the additional boring to a minimum depth of 100-feet; expect to recover intact rock and perform unconfined compressive strength tests on selected rock samples.	Comment has been incorporated. Additional boring is planned.	
4	Foundation Report	FR Page 14 P Foundation Plan	The Specified Tip Elevations between Table 5: Pile Data Table in the foundation report and the Pile Data Table on the Foundation Plan are not the same. Please check for and rectify any inconsistencies.	Comment has been incorporated. The cause of the difference has been checked and rectified.	
5	Foundation Report	FR	Section 9.8 Corrosion. Please explicitly state Caltrans' corrosion guidelines in determining what is corrosive, i.e. resistivity less than 1000 Ω-cm, pH,	Comment has been incorporated. Caltrans' corrosion guidelines in	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

			etc.	determining what is corrosive have been stated in the Foundation Report.	
			The following comments have been provided by Rifaat Nashed/A. Suja of GS-GDW.		
6	Foundation Report	FR Section 3.0 Existing Bridge and Proposed Construction Page 2	Proposed Construction The bridge number is incorrect. It is 27-0094R, not 27-00974R.	Comment has been incorporated. The bridge number has been corrected.	
#	**Doc.** **(See Note 1)**	**Page, Section, or SSP**	**Review Comments**	**Consultant Responses**	
7	Foundation Report	FR Section 5.0 Field Exploration And Laboratory Testing Page 4	Field Exploration in 2011 Laboratory test result for boring No. R-11-001 should be added in the final foundation report	Comment has been incorporated. Laboratory test result for Boring No. R-11-NO-001 has been added in the Foundation report.	
8	Foundation Report	FR Section 6.0 Subsurface Soil Conditions Page 6	The LOTB's didn't show any pocket pen measurements upon which the consistency of the clayey material identified as soft, stiff, or hard	Comment has been incorporated. Pocket penetration measurements of the clayey soil material have been shown in the LOTB.	
9	Foundation Report	FR Section 7.0 Geology Page 7	Please discuss the constituents and the engineering characteristics of each geologic unit (especially the metagraywacke of Franciscan Complex) underlies the project site.	Comment has been incorporated. The constituents and the engineering characteristics of each geologic unit underlie the project site	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

				have been discussed.	
10	Foundation Report	FR Section 9.8 Corrosion Page 7	It is not reliable to draw a conclusion of the corrosion status depending on one single sample from one single point to apply for the whole project site.	Corrosion test results of the soil sample from Boring R-11-NO-001 and the adjacent two roadway shallow borings have been included in the report. Additional corrosion test may be performed on the soil sample obtained in the additional boring proposed.	
			The following comments have been provided by Hossain Salimi of GS-GDW.		
11	Foundation Report	FR	The bridge number is incorrect on the cover. It is 27-0094R, not 27-0974R.	Comment has been incorporated. The bridge number has been corrected.	
#	**Doc.** **(See Note 1)**	**Page, Section, or SSP**	**Review Comments**	**Consultant Responses**	
12	Foundation Report	FR	The report is marked as "Draft". The Final Report needs to be submitted.	Comment has been incorporated.	
13	Foundation Report	FR	Parikh shall produce a plate containing the Probabilistic and Deterministic Response Spectra generated from Caltrans ARS On-line (V1.0.4). In addition, the ARS curve generated from the 2008 USGS Interactive Deaggregation Site with 20% increase for directivity shall also be added for comparison. This Plate shall be titled Acceleration Response Spectrum Comparisons. Parikh shall submit a plate as requested showing all the response spectra. Once that is done, a separate plate containing the governing spectrum and titled "Recommended Acceleration Response Spectrum" shall be generated. Parikh has a Recommended ARS curve, but no comparisons.	Comment has been incorporated. Plate (Plate No.: 5B) for the comparisons of acceleration response spectrum and plate (Plate No.: 5A) for the governing spectrum have been included in the final foundation report.	
14	Foundation Report	FR	A Vs30=230m/s was chosen to represent the subsurface. Assuming that new borings will be drilled for the final	A Vs_{30}=230m/s is still governing the design after	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

			report, the calculations and/or documents supporting the Vs30 values chosen shall be included in the report. Parikh shall include documents and calculations showing how the Vs30=230m/s was derived. I looked through the report and could not find any supporting document(s).	checking the Boring R-11-NO-001. Calculation for the Vs_{30} has been included in the final foundation report.	
15	Foundation Report	FR	On Page 10, the liquefaction potential at the project site is anticipated to be moderate to high. Parikh shall include documents and calculations supporting this conclusion.	Comment has been incorporated. Calculations for the evaluation of liquefaction potential have been included in the report.	
16	Foundation Report	FR	I cannot approve this report until these changes are made and the required documents are added to the final report.		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

FOUNDATION REPORT

MSN A3 – NB HOV LANE WIDENING PROJECT
NORTH NOVATO OVERHEAD WIDEN (BR. # 27-0094R)
NOVATO, MARIN COUNTY, CALIFORNIA

For

BKF-ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94588

PARIKH CONSULTANTS, INC.

2360 Qume Drive, Suite A, San Jose, CA 95131
(408) 452-9000

April 16, 2012

Job No. 2011-145-BRG

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 1
2.0 PURPOSE AND SCOPE 1
3.0 EXISTING BRIDGE AND PROPOSED CONSTRUCTION 2
4.0 SITE CONDITIONS 3
5.0 FIELD EXPLORATION AND LABORATORY TESTING 3
6.0 SUBSURFACE SOIL CONDITIONS 5
7.0 GEOLOGY 7
8.0 EARTHQUAKE CONSIDERATIONS 9
8.1 Seismic Sources 9
8.2 Seismic Design Criteria 10
8.3 Seismic Hazards/Liquefaction Potential 11
9.0 FINDINGS AND RECOMMENDATIONS 14
9.1 General 14
9.2 Earthwork and Grading 14
9.3 Bridge Foundations 15
9.3.1 Pile Design 15
9.4 Lateral Design for Piles 21
9.5 Lateral Earth Pressures and Friction Coefficient 26
9.6 Embankment Settlement & Waiting Period 27
9.7 Embankment Stability 27
9.8 Corrosion 27
10.0 PLAN REVIEW 28
11.0 CONSTRUCTION OBSERVATION 29
12.0 INVESTIGATION LIMITATIONS 29

PLATE

PROJECT LOCATION MAP ..... Plate 1

SITE PLAN ..... Plate 2

GEOLOGIC MAP ..... Plate 3

FAULT MAP ..... Plate 4

ARS DESIGN CURVE ..... Plates 5A and 5B

PASSIVE PRESSURE MOBILIZATION AGAINST PILE CAPS ..... Plate 6

APPENDICES

APPENDIX A

Log of Test Borings, As-Built Log of Test Borings

TABLE OF CONTENTS (Continued)

APPENDIX B

Laboratory Test ..... Plate B-1

Summary ..... Plate B-2
Plasticity Chart ..... Plate B-3
Grain Size Distribution Curves ..... Plates B-4A and B-4B
Unconfined Compression Test ..... Plates B-5A through B-5C
Corrosion Tests ..... Plates B-6A and B-6B
Consolidation Test ..... Plate B-7

APPENDIX C

ARS – Calculated Spectra Deterministic and Probabilistic Input Data

Calculation of Shear Wave Velocity

Evaluation of Liquefaction Potential

APPENDIX D

OSFP Technical Comment Review and Reponses (North Novato Overhead Widen)

FOUNDATION REPORT
MSN A3 - NB HOV LANE WIDENING PROJECT
NORTH NOVATO OVERHEAD WIDEN (BRIDGE NO. 27-0094R), NOVATO
MARIN COUNTY, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed "MSN A3 - NB HOV Lane Widening Project – North Novato Overhead Widen" in City of Novato, Marin County, California, hereinafter referred to as "PROJECT". The work was performed in general accordance with the scope of work outlined in our proposal to BKF-Engineers (Designer). The approximate location of the project site and its vicinity are shown on the Project Location Map, Plate 1.

The geotechnical recommendations presented in this report are intended for design input and are not intended to be used as specifications. In addition, the data provided in this report including these geotechnical recommendations should not be used for bidding purposes or for construction cost estimates. If the report is provided as a reference document, any interpretation of the data and recommendations should be the sole responsibility of the user and PARIKH Consultants, Inc. (PARIKH) shall not be liable for any consequences.

2.0 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate the general subsurface conditions at the project site, to evaluate their engineering properties, and to provide geotechnical recommendations for the foundation design of the proposed project.

The scope of work performed for this investigation included a review of the readily available soils and geologic literature pertaining to the site including available as-built Log of Test Borings (LOTB) for the existing structure (Br. No. 27-0094R), site reconnaissance, obtaining representative soil samples and logging soil materials encountered in exploratory soil borings, laboratory testing of the representative soil samples, performing engineering analyses based on the field and laboratory data, and preparation of this foundation report. The borings for this study were drilled by PARIKH in October/November 2011.

3.0 EXISTING BRIDGE AND PROPOSED CONSTRUCTION

Existing Bridge

Based on the as-built general plan of "North Novato Overhead (Post Mile 22.3)", the existing bridges are 4-span structures, which were originally built in around 1975. The bridge consists of cast-in-place prestressed concrete box girder superstructure. The width of each bridge structure (northbound or southbound) is approximately 54 feet. The length of the bridges is approximately 445 feet. The North Novato Overhead bridges cross over the Sonoma-Marin Area Rail Transit (SMART) Corridor and Rush Landing Road.

Proposed Construction

The California Department of Transportation (Caltrans) in cooperation with Federal Highways Administration (FHWA), the Transportation Authority of Marin (TAM), and Sonoma County Transportation Authority (SCTA) propose to improve State Route (SR) 101 through Marin/Sonoma Narrows (MSN) between SR 37 in the City of Novato to just north of the Corona Road Overcrossing in the City of Petaluma.

The "Marin-Sonoma Narrows (MSN) A3 NB High Occupancy Vehicle (HOV) Lane Widening Project" (hereinafter referred to as "MSN A3 PROJECT") is proposed to widen northbound SR 101 to provide an HOV lane and 10-foot inside shoulder for approximately 2 miles north of the MSN A1 HOV system within the City of Novato in Marin County.

The existing North Novato Overhead Bridge, which is located just north of Atherton Avenue, will be widened by 18 feet 4 inches to accommodate the 10-foot shoulders and the 12-foot HOV Lane. The proposed northbound widening will be on the west side of the existing bridge between the northbound and southbound structure.

This report provides foundation recommendations for the widening of the northbound North Novato Overhead Bridge (Bridge No. 27-00974R).

Our recommendations in this report are based on the above information. Any major deviation should be reported to this office for consideration.

4.0 SITE CONDITIONS

At the project location, existing Rte 101 cuts across the toes of several steep slopes and gently sloping valleys and plains adjacent to Petaluma River marshes to the east. Topography along Rte 101alignment is relatively flat except for the North Novato Overhead section where the elevation of the roadway was raised to a maximum elevation of about 45 feet.

5.0 FIELD EXPLORATION AND LABORATORY TESTING

As-Built LOTB

We refer to the as-built LOTB of "North Novato Overhead" for the subsurface soil conditions at the project site.

Based on the as-built LOTB, Borings B-4, B-5 and B-8 were drilled by Caltrans in the vicinity of northbound North Novato Overhead Bridge in October/November 1968. These soil borings were drilled to the approximate depths between 50 feet and 90 feet and to the bottom elevation between approximately -40.5 feet and -85.5 feet.

Field Exploration in 2011

Based on the preliminary plans, discussions with the designers, and readily available geotechnical data in the area, Borings R-11-NO-001 and R-11-NO-002 were drilled for the proposed widening of the northbound North Novato Overhead Bridge. Boring R-11-NO-001 was drilled on the north side of SMART railroad and east side of the northbound North Novato Overhead Bridge along Rush Landing Road, to the depth of 101.5 feet in November 2011. Boring R-11-NO-002 was drilled on the south side of SMART railroad at the median of south abutment of North Novato Overhead Bridge, to the depth of 96 feet in October 2011.

The approximate locations of the borings are shown on the Site Plan, Plate 2. The details of the field exploration are included in Appendix A. The descriptions of the subsurface soil materials encountered in the soil borings field exploration and relevant boring information are presented in the LOTB in Appendix A of the report.

Both Borings R-11-NO-001 and R-11-NO-02 were advanced with a truck-mounted rotary-wash drilling method. Boring R-11-NO-001 was drilled to the depth of 101 feet with approximately 20 feet of drilling into the Franciscan Complex.

Selected soil samples were obtained from Modified California samplers (2.5 in. I.D.) and Standard Penetration Test samplers (1.375 in. I.D.) at various depths. The MC and SPT samplers were driven under the impact of a 140 lb hammer having a free fall of 30 inches. The blow counts are presented on the LOTB. (When correlating standard penetration data, the blow counts for the Modified California Sampler may be converted to equivalent SPT blow counts by multiplying a conversion factor of 0.65). The samples were sealed and transported to our laboratory for further evaluation and testing. The field investigation was conducted under the supervision of our field engineer who logged the test borings and prepared the samples for subsequent laboratory testing and evaluation.

Laboratory tests were performed on selected soil samples collected during field exploration to evaluate the properties of the subsurface soils. Laboratory tests performed for the study include the following: Laboratory determination of Moisture-Density (California Test Method T-226), Atterberg Limits (California Test Method T-204), Grain Size Distribution Analysis (California Test Method T-202), Unconfined Compression Test (California Test Method T-221) Consolidation Test (ASTM D-2435) and Corrosion Test (California Test Method T643). The laboratory test results are presented on plates in Appendix B.

It should be noted that the descriptions of the soils encountered and relevant boring information presented on the LOTB depict subsurface conditions only at the locations indicated on the plan and on the particular date noted on the boring logs of LOTB (October 2011 and November 2011). Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the boring locations explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental changes.

The locations of Borings R-11-NO-001 and R-11-NO-002 and the as-built borings and CPTs

are shown on Plate 2, "Site Plan".

Copy of the Caltrans "as-built" LOTB (October/November 1968) is included in Appendix A.

6.0 SUBSURFACE SOIL CONDITIONS

Based on the as-built LOTB, the subsurface soils at the project site generally consist of:

- Approximately top 40 feet to 75 feet of interbedded layers of loose to medium dense silty sand and firm to very stiff silt/lean clay.
- Boring B-8 - Pockets/lenses (approximately 3 feet to 7 feet thick) of loose to medium dense sand were encountered at the approximate depths between 10 feet and 20 feet. Five feet of soft silt was encountered at approximate depth of 35 feet.
- Boring B-4 - Pocket/lens (approximately 5 thick) of medium dense sand was encountered at the approximate depth of 15 feet and 20 feet. Occasional pockets/lenses/layers of dense to very dense sand/gravel were encountered at the approximate depths of 25 feet and 40 feet.
- Boring B-5 - twenty feet of soft silt/lean clay were encountered at approximate depth of 45 feet.
- The approximate depth and elevation of the decomposed Graywacke of Franciscan Complex encountered are summarized in the table below:

Boring Number	Approximate Depth (feet)	Approximate Elevation (feet)
B-1	-	-
B-4	75.5	-66.0
B-5	88.0	-83.5
B-8	45.0	-42.5

Groundwater was measured at the approximate depths between 2 feet (approximate Elev. 2.5 feet) and 6 feet (approximate Elev. -1.5 feet) below the ground surface during drilling in Boring B-5, CPTs B-6 and B-7.

Based on the LOTB with Borings R-11-NO-001 and R-11-NO-002, the subsurface soils at the project site generally consist of:

- Boring R-11-NO-001 – approximately top 5 feet of medium dense sand;
  Underlain by approximately 25 feet of very stiff lean clay;
  Underlain by approximately 25 feet of dense to very dense silty/clayey sand;
  Underlain by approximately 20 feet of interbedded layers of stiff lean/fat clay and clayey sand;
  Underlain by very dense silty sand/hard intensely fractured rock to the bottom of boring at the depth of 101 feet.

- Boring R-11-NO-002 – approximately top 5 feet of very stiff lean clay;
  Underlain by approximately 10 feet of dense clayey sand with gravel;
  Underlain by approximately 20 feet of very stiff lean clay;
  Underlain by approximately 35 feet of interbedded layers of very dense sand and hard lean clay;
  Underlain by approximately 10 feet of medium dense sand;
  Underlain by approximately 10 feet of stiff fat clay;
  Underlain by hard lean clay to the bottom of boring at the depth of 96 feet.

Groundwater was encountered at about Elev. +21.5 feet (depth of 17 feet) in Boring R-11-NO-002 and about Elev. +1.0 feet (depth of 11 feet) in Boring R-11-NO-001 during drilling. It is anticipated that groundwater level will vary with the passage of time due to seasonal ground water fluctuations, surface and subsurface flow, ground surface run-off and other factors that were not existent at the time of our investigations.

Based on Caltrans review comment on the Foundation Report (Draft) dated November, 2011, an additional boring is proposed along the bridge widening alignment on Rush Landing Road. Co-ordination is in progress for the field exploration of the additional boring.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the subsurface soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope. Such variations, when encountered, generally require additional engineering services to attain properly constructed project. We, therefore, recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during construction.

7.0 GEOLOGY

General geologic features pertaining to the site were evaluated by reference to the "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California, by Brabb, E.E., Graymer, R.W., and Jones, D.L., 2000". Based on the publication, the project site is underlain by artificial fill over marine and marsh deposits (Bay Mud) (Quaternary) (Qmf), Alluvium (Quaternary) (Qal) that were deposited upon the previously eroded surface of Franciscan bedrock and Metagraywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex. A geologic map of the general project area is shown on Plate 3. The general constituents and the engineering characteristics of each geologic unit are described below.

Artificial fill over marine and marsh deposits (Quaternary) (Qmf) – Mud, including much organic material, silty mud, silt, and sand; very soft to soft if wet, similar to unit Qm overlain by artificial fill, the limits of which are not mapped.

Alluvium (Quaternary) (Qal) – Variably sized gravel overlain by unconsolidated sand, silt and clay comprises the unit. Alluvium (Quaternary) is mapped in small valleys where separate fan, basin, and terrace units could not be delineated at the scale of general geologic mapping, and where deposits might be of either latest Pleistocene or Holocene age. This unit occurs in the floodplains of streams and rivers. The sediments form a rich loam and are excellent for agriculture.

The older Quaternary deposits are those mapped units that were deposited in the Quaternary, but are no longer actively being deposited. They have been deposited within the Pleistocene Epoch between 10,000 to 1.8 million years ago. These older units may also have an increased susceptibility to seismic shaking, liquefaction, differential settlement and landslide because they have generally not been buried deep or long enough to become well compacted and indurated. However, in general they are less susceptible to geologic hazards than the younger surficial deposits.

The **Metagraywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex** was formed in a subduction zone where sea floor (basalt) was forced downward

into the upper mantle beneath the North American Continent; carrying with it various sediments (sand, silt, and clay) eroded from the continent or precipitated by organisms. Increased pressure and heat, combined with the tectonic displacement and shear forces, resulted in a chaotic mixing of the various materials with various strengths. The Franciscan Complex forms a diverse assemblage of rock types called mélanges (French: *mélange* or "mixture"), chaotic mixtures of hard blocks of various rock types surrounded by weaker matrix of sheared to pulverized rock. The Franciscan mélange is predominantly weathered and fractured sandstone and shale, with lesser amounts of chert.

To focus on the common fundamental engineering problems related to the characterization of complex geological mixtures, Medley (1994) coined the geologically neutral word "bimrocks" from Raymond's (1984) "block-in-matrix rocks". Medley's definition of a bimrocks is: *"a mixture of rocks composed of geotechnically significant blocks within a bonded matrix of finer texture*". The expression "geotechnically significant blocks" means that there is mechanical contrast between blocks and matrix, and the volume and size of the blocks influence the rock mass properties at the scales of engineering interest. Consequently, bimrocks may have considerable spatial, lithological, and mechanical variability. The weakest elements in bimrocks are the contacts between blocks and matrix. In mélanges, matrix shears generally pass around blocks with intense shearing adjacent to the larger blocks. The overall strength of a bimrocks is independent of the strength of the individual blocks and depends more on the strength of the matrix between the blocks. Subsurface exploration may not reveal the size and distribution of strong blocks and the extent of weaker matrix in mélange. Consequently, the overall strength of Franciscan bedrock buried beneath the project site may not be fully characterized by even a significant number of borings. Interpolation between even closely spaced borings can lead to an overly simplistic representation of the rock mass strength.

Franciscan Complex bedrock is exposed in the hills surrounding the project site and is buried beneath approximately 60 feet to 80 feet of younger alluvium and Bay Mud at the site. The bedrock consists of greywacke sandstone that was metamorphosed during subduction. Franciscan greywacke is a variety of sandstone generally characterized by its significant hardness, dark color, and poorly sorted angular grains of quartz, feldspar, and small rock

fragments or lithic fragments set in a compact, clay-fine matrix. The cementing material between the grains may be siliceous or argillaceous and is sometimes calcareous. Component particles are usually not very rounded or polished, and the rocks are often considerably indurate by re-crystallization. When subjected to increasing metamorphism, greywacke frequently passes into mica-schist, chloritic schist and sedimentary gneisses. Veins of white quartz are commonly found in greywacke Franciscan Complex.

Rock core samples encountered at a depth of 70 feet below the ground surface in Boring R-11-NO-001, consist of very hard, medium to dark gray colored greywacke sandstone that is fine-grained and well-cemented. The upper few feet of the rock is stained light orange-brown from iron oxide, indicating that it was previously exposed to near surface oxidation, prior to being buried by Bay Mud and alluvium. The presence of planar fractures in the in-place rock is evidenced by the fact that the cores broke into ¼ to ½ inch fragments that were subsequently rounded by the rotating drill bit. A few pieces of intact core that were not rounded by the drill bit exhibit very sharp edges. Pieces of white quartz appear to be remnants of ¼ inch-thick quartz veins. At a depth of 89 feet, a several inch thick zone of pulverized rock appears to be sheared matrix situated between two large blocks of greywacke sandstone above and below it.

8.0 EARTHQUAKE CONSIDERATIONS

8.1 Seismic Sources

The project is located in a seismically active part of northern California. Many faults exist in the regional area. These faults are capable of producing earthquakes and may cause strong ground shaking at the site. Faults in the vicinity of the site with a moderate to high potential for surface rupture include the Rogers Creek Fault Zone and San Andreas Fault Zone/North Coast Section. The attached Fault Map (Plate 4) presents the locations of the fault systems relative to the project site.

Maximum moment magnitudes (M_{max}) of some of the major faults in the area are determined by the Caltrans' recently developed online ARS tool (2007 Caltrans Deterministic PGA Map and ARS Online Report). These maximum credible

earthquake magnitudes represent the largest earthquake a fault is capable of generating and is related to the seismic moment. The earthquake data of the active faults in the project vicinity are summarized in the table below.

TABLE 1: EARTHQUAKE DATA

Fault (Fault ID)	Maximum Moment Magnitude of Fault, M_{Max}	Fault Type	Site-to-Fault Distance
Rodgers Creek Fault (157)	7.1	Right Lateral Strike Slip	7 mi.
San Andreas Fault Zone (North Coast section) (308)	7.9	Right Lateral Strike Slip	13 mi.

8.2 Seismic Design Criteria

The recommended response spectrum was determined based on the new 2007 Caltrans Deterministic PGA Map and the Caltrans ARS Online (Ver. 1.0.4) for the development of response spectra for design. The development of the design ARS curve is based on several input parameters, including site location (longitude/latitude), average shear wave velocity for the top 30m/100 feet (Vs_{30m}), and other site parameters, such as fault characteristics, site-to-fault distances.

Based on the 2007 Caltrans Deterministic PGA Map and ARS Online tool, the Rogers Creek Fault (Mmax = 7.1, RLSS, at 7 miles) and the San Andreas Fault Zone (North Coast Section) (Mmax = 7.9, RLSS, at 13 miles) are considered for design.

The new design methods incorporate both the deterministic and the probabilistic seismic hazards to produce the Design Response Spectrum. According to the design manual, we have also reviewed and compared the probabilistic response spectrum from 2008 USGS Deaggregation Hazard (beta) website for the 5% in 50 years probability of exceedance (or 975 year return period).

Average shear wave velocity for the top 30m (100 feet) at the site was estimated by using established correlations and the procedure provided in the Design Manual (Ver. 1.0, August 2009). Based on the subsurface soil data, it is our opinion that the subsurface soil can be categorized as Soil Type D per NEHRP criteria. The site location and the relevant parameters are summarized as follows, and the

recommended design curve is presented on Plates 5A and 5B.

- Site Location: 38.1220°N/122.5658°W
- Estimated V_{S30m} = 230 m/s
- The recommended ARS curve is governed by the USGS 2008 Deaggregation (Beta) method.
- Anticipated Peak Ground Acceleration (PGA): 0.60 g
- No adjustments were made for basin effect or near fault effect.

Calculation for the V_{S30m} is included in Appendix C.

8.3 Seismic Hazards/Liquefaction Potential

Potential seismic hazards may arise from three sources: surface fault rupture, ground shaking and liquefaction. Since no active faults pass through the site, the potential for fault rupture is relatively low. As shown on the Fault Map, Plate No. 4, the closest active fault is Rodgers Creek fault is located approximately 7 miles northeast from the project site. Based on available geological and seismic data, the possibility of the site to experience strong ground shaking may be considered high.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

Based on the field logs and available data, the subsurface soil encountered in the as-built borings (Boring B-4, B-5 and B-8) consists of interbedded layers of loose to medium dense silty sand and firm to very stiff silt/lean clay, underlain by dense to very dense sand/gravel, underlain by decomposed Graywacke Franciscan Complex. Occasional pockets/lenses of medium dense silty/clayey sand were encountered at approximate depths of 20 feet in Borings R-11-NO-002 and 60 feet in Borings

R-11-NO-001 and R-11-NO-002. Groundwater was encountered at shallow depths during the field exploration in November 1968 and at approximate depths between 11 feet (Elev. +1.0 feet) in Boring R-11-NO-001 and 17 feet (Elev. +21.5 feet) in Boring R-11-NO-002 during the field exploration in 2011.

The liquefaction potential was evaluated in accordance with the methods proposed by Youd, et al. (2001). The evaluation was primarily using the boring data of borings which encountered loose to medium dense sand, on the nearby San Andreas Fault (North Coast Section) with a Magnitude 7.9 earthquake and a peak ground acceleration of about 0.63 g (from the USGS 2008 Deaggregation (Beta) method). This method compares the estimates of the earthquake-induced shear stress to the susceptibility of soil liquefaction. As indicated by recent advances in soil liquefaction engineering (Bray, 2006), for soils with sufficient fines content so as to separate the coarser particles and control behavior, liquefaction appears to occur in soils where these fines are ether non-plastic or are low plasticity silts and/or silty clays (PI<12%, and LL<37%), and with high water content relative to their liquid limit (w>0.85 LL).

The boring number, location, approximate thickness, and approximate top and bottom elevation of the sand pockets/lenses/layers and estimated post-liquefaction settlement are summarized in the Table 2 below.

TABLE 2: SUMMMARY OF POST-LIQUEFACTION SETTLEMENT

Boring No.	For Foundation Design of	Approx. Soil Thickness) (ft)	Estimated Soil Top Elev.(ft)	Estimated Soil Bottom Elev.(ft)	Estimated Post-liquefaction Settlement (inches)	Residual Undrained Strength (psf)
B-4	Bents 3 & 4 and Abutment 5	4.5	-7.0	-11.5	0.5	1,300
B-8	Abutment 1 & Bent 2	2.5	-6.0	-8.5	0.4	640
		6.5	-16.5	-23.0	1.2	430
R-11-NO-001	-	5.5	-45.0	-50.5	0.7	540
R-11-NO-002	Abutment 1	5.0	20.5	15.5	-	2,300
		6.0	-28.0	-34.0	0.2	1,520

A residual undrained strength of approximately 2,300 pound per square foot [$(N_1)_{60}$,

$_{CS} \approx 28$] was estimated for the medium dense sand between Elev. +20.5 feet and Elev. +15.5 feet in Boring R-11-NO-002 under seismic condition. It is our opinion that the pocket/lens of medium dense sand between Elev. 20.5 feet and 15.5 feet in Boring R-11-NO-002 is unlikely to liquefy due to the relatively high residual undrained strength.

Based on the results of the evaluation of liquefaction potential for the above soil borings, the estimated post-liquefaction settlements may be on the order of 0.2 inches to 1.6 inches.

The estimated top and bottom elevations of the potential liquefiable soils vary significantly as shown in the above table. Based on this data it appears that the liquefiable soil exist in the form of isolated pocket and lens. The liquefaction potential at the project site is anticipated to be moderate to high for the isolated pocket/lens of loose to medium dense sand. Lateral spreading is not anticipated since the continuous liquefiable soil layer was not recorded based on the available boring information.

The post-liquefaction settlement might cause downdrag and reduce the load carrying capacity of the piles. These loads have been considered in the calculations of the vertical pile capacities.

Lateral Spreading

Liquefaction-induced spreading has been defined as the *"lateral displacement of large surficial blocks of soil as a result of liquefaction in a subsurface layer"*. Lateral spreading refers to the more moderate movements of gently sloping ground due to soil liquefaction. As described by Bartlett and Youd (1992a; 1992b), liquefaction-induced lateral spreading occurs on mild slopes of 0.3 to 5% underlain by loose sand and shallow water table. The geologic conditions conducive to lateral spreading (gentle surface slope, shallow water table, and liquefiable cohesionless soils) are frequently found along streams and other waterfronts in recent alluvial or deltaic deposits, as well as in loosely-packed, saturated, sandy fills

In our opinion, lateral spreading is unlikely to occur at the project site because:

- The loose to medium dense sand occurs in the form of isolated pockets/lenses at various depths, not in the form of continuous soil layer.
- Majority of the potentially liquefiable soil pockets/lenses are at greater depth, not at the shallow depth.
- None of the potentially liquefiable soil pockets/lenses appear to daylight in the free surface.

9.0 FINDINGS AND RECOMMENDATIONS

9.1 General

This report was prepared specifically for the proposed project according to the plans provided to us. Normal construction procedures were assumed throughout our analysis and represent one of the bases of recommendations presented herein. Our design criteria have been based upon the materials and subsurface soil conditions encountered in the soil borings at the project site. Therefore, we should be notified in the event that these conditions are changed, so as to modify or amend our recommendations.

9.2 Earthwork and Grading

The project requires engineered fill behind the abutments. Areas to receive engineered fill should be excavated to remove any loose/soft soil materials. The resulting surface upon which fill is to be placed should be observed by the Geotechnical Engineer. Areas receiving fill should be scarified, moisture conditioned and compacted in accordance with Caltrans standard specifications.

In general, engineered fill imported to the site should be relatively non-expansive granular material having a Plasticity Index (P.I.) less than 15, a minimum Sand Equivalent of 10, and should be reviewed by the engineer. Engineered fill should have a minimum 90-percent relative compaction per Caltrans standard except that

95-percent compaction is recommended for the upper 6-inch of subgrade. The on-site materials exposed after the excavation may be used for engineered fill provided that they meet the above criteria (P.I. and Sand Equivalent) and are not contaminated.

9.3 Bridge Foundations

Based on the available boring information, the subsurface soils consist of very stiff lean clay/medium dense to dense sand, underlain by stiff lean clay, underlain by hard intensely fractured metamorphic rock.

For the proposed bridge structure widening, different foundation systems have been evaluated with respect to their design capacity and construction considerations. Based on the available boring information and considering the drivability of the pile through the dense to very dense sand/gravel layers and decomposed Graywacke Franciscan Complex at the project site, Cast-In-Situ-Steel Shell (CISS) Concrete piles are recommended to be the foundation system for the abutments and Caltrans Standard Class 200 Alternate "W" piles are recommended to be the foundation system for the bents of the proposed structure widening.

9.3.1 Pile Design

The piles are subject to compression and lateral loads at the abutments and compression, tension and lateral loads at the bents. According to the Biggs Cardosa Associates (Structural Designer), the planned pile cap/bottom of footing elevations are Elev. +33.64 feet and Elev. +32.14 feet at the abutments and between Elev. -3.86 feet and Elev. +1.14 feet at the bents. Pertinent foundation design information provided by the structural designer, including Foundation Design Data and Foundation Loads, are presented in the following tables.

TABLE 3: FOUNDATION DESIGN DATA

Support No	Design Method	Pile Type	Finish Grade Elev. (ft)	Pile Cut-off Elev. (ft)	Pile Cap Size(ft)		Permissible Settlement (in)	No. of Piles per Support
					B	L		
Abut 1	WSD	72" Dia. CISS	41.14	33.31	N/A	N/A	1	2
Bent 2 Column Footing	LRFD	Class 200 Alt "W"	7.64±	-2.44	12	27	1	19
Bent 2 Grade Beam	LRFD	Class 200 Alt "W"	7.64±	0.06	4.00	42.33	1	3
Bent 3 Column Footing	LRFD	Class 200 Alt "W"	7.64±	-3.44	12	27	1	19
Bent 3 Grade Beam	LRFD	Class 200 Alt "W"	7.64±	-0.94	4.00	40	1	3
Bent 4 Column Footing	LRFD	Class 200 Alt "W"	10.64±	1.56	12	27	1	19
Bent 4 Grade Beam	LRFD	Class 200 Alt "W"	10.64±	4.06	4.00	40	1	3
Abut 5	WSD	72" Dia. CISS	42.14	31.81	N/A	N/A	1	2

TABLE 4: FOUNDATION DESIGN LOADS

Support No.	**Service-I Limit State (kips)**			**Strength Limit State (Controlling Group, kips)**				**Extreme Limit State (Controlling Group, kips)**			
	Total Load		**Permanent Loads**	**Compression**		**Tension**		**Compression**		**Tension**	
	Per Support	**Per Pile**	**Per Support**	**Per Support**	**Max. Per Pile.**	**Per Support**	**Max. Per Pile.**	**Per Support**	**Max. Per Pile.**	**Per Support**	**Max. Per Pile.**
Abut 1	1025	520	755	N/A	NA	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2 Column Footing	1660	N/A	1535	2375 (II)	210 (II)	No Tens.	-	-	390	-	240
Bent 2 Grade Beam	412	N/A	412	515 (I)	172 (I)	No Tens.	-	-	138	-	No Tens.
Bent 3 Column Footing	1720	N/A	1520	2335 (II)	200 (II)	No Tens.	-	-	390	-	240
Bent 3 Grade Beam	408	N/A	408	509 (I)	170 (I)	No Tens.	-	-	136	-	No Tens.
Bent 4 Column Footing	1560	N/A	1460	2110 (II)	200 (II)	No Tens.	-	-	400	-	250
Bent 4 Grade Beam	202	N/A	202	252 (I)	84 (I)	No Tens.	-	-	68	-	No Tens.
Abut 5	1120	570	875	N/A	NA	N/A	N/A	N/A	N/A	N/A	N/A

Consistent with Caltrans requirements, Working Stress Design (WSD) is used for the abutment foundations. The abutment foundations are evaluated for the foundation

design data and loading condition using Caltrans November 2003 Bridge Design Specifications for foundations, using Working Stress Design (WSD) methods with "LRFD Service-I Loads", based upon WSD is presented in Table 4 above.

The evaluation of Load Demands on the piles, based upon WSD and LRFD is presented in Table 3 above. The estimated specified tip elevations for the anticipated design loading of the piles are shown in Tables 5A and 5B below. The pile cut-off elevations are shown in Table 3.

TABLE 5A: FOUNDATION RECOMMENDATIONS FOR ABUTMENTS

Location	Pile Type	Cut-off Elevation (ft)	LRFD Service-I Limit State Total Load (kips) per Support		LRFD Service-I Limit State Total Load (kips) per Pile (Compression)	Nominal Resistance (kips)	Design Tip Elev. (ft)	Specified Tip Elev. (ft)
			Total	Permanent				
Abut 1	72" Dia. CISS Pile	33.64	1025	755	520	1040	-51.61 (a), -46.36 (b)	-51.61
Abut 5	72" Dia. CISS Pile	32.14	1120	875	570	1140	-38.11 (a), -52.86 (b)	-52.86

Notes: (i) Design tip elevations are controlled by (a) Compression, (b) Lateral Load, respectively.

TABLE 5B: FOUNDATION RECOMMENDATION FOR BENTS

Location	Pile Type	Cut-off Elev. (ft)	Service-I Limit State Load (kips) per Support	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elev.[1] (ft)	Specified Tip Elev. (ft)[i]	Nominal Driving Resistance Required (kips)[ii]
					Strength Limit		Extreme Event				
					Comp. (φ=0.7)	Tension (φ=0.7)	Comp. (φ=1.0)	Tension (φ=1.0)			
Bent 2 Column Footing	Class 200 Alt "W"	-2.61	1660	1	210	No. Tens.	390	240	-69.36 (a), -83.86 (c), -69.36 (d), -37.86 (e)	-83.86	520
Bent 2 Grade Beam	Class 200 Alt "W"	-0.11	412	1	172	No. Tens.	138	No. Tens.	-72.36 (a), -49.36 (c), -35.36 (e)	-72.36	410
Bent 3 Column Footing	Class 200 Alt "W"	-3.61	1720	1	200	No. Tens.	390	240	-58.86 (a), -67.36 (c), -58.86 (d), -38.86 (e)	-67.36	450
Bent 3 Grade Beam	Class 200 Alt "W"	-1.11	408	1	170	No. Tens.	136	No. Tens.	-51.86 (a), -33.86 (c), -36.36 (e)	-51.86	310
Bent 4 Column Footing	Class 200 Alt "W"	1.39	1560	1	200	No. Tens.	400	250	-51.86 (a), -66.86 (c), -65.86 (d), -33.86 (e)	-66.86	480
Bent 4 Grade Beam	Class 200 Alt "W"	3.89	202	1	84	No. Tens.	68	No. Tens.	-24.86 (a), -33.86 (c), -31.36 (e)	-33.86	240

Notes

(i) Design tip elevations are controlled by (a) Compression (Strength Limit), (b) Tension (Strength Limit), (c) Compression (Extreme Event), (d) Tension (Extreme Event), (e) Lateral Load, (f) Settlement respectively.

(ii) The nominal driving resistance required is equal to the nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the design resistance.

TABLE 6: PILE DATA TABLE

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elev.[(i)] (ft)	Specified Tip Elevation[(ii)] (ft)	Nominal Driving Resistance Required (kips)
		Compression	Tension			
Abutment 1	72" Dia. CISS Pile	1040	0	-51.61 (a), -46.36 (b)	-51.61	2190
Bent 2 Column Footing	Class 200 Alt "W"	390	240	-83.86 (a), -69.36 (b), -37.86 (c)	-83.86	520
Bent 2 Grade Beam	Class 200 Alt "W"	250	0	-72.36 (a), -35.36 (c)	-72.36	410
Bent 3 Column Footing	Class 200 Alt "W"	390	240	-67.36 (a), -58.86 (b), -38.86 (c)	-67.36	450
Bent 3 Grade Beam	Class 200 Alt "W"	245	0	-51.86 (a), -36.36 (c)	-51.86	310
Bent 4 Column Footing	Class 200 Alt "W"	400	250	-66.86 (a), -65.86 (b), -33.86 (c)	-66.86	480
Bent 4 Grade Beam	Class 200 Alt "W"	120	0	-33.86 (a), -31.36 (c)	-33.86	240
Abutment 5	72" Dia. CISS Pile	1140	0	-38.11 (a), -52.86 (b)	-52.86	2220

Notes

(i) Design tip elevations for the ***Abutments*** are controlled by (a) Compression (b) Lateral Load. Design tip elevations for the ***Bents*** are controlled by (a) Compression, (b) Tension, (c) Lateral Load.

(ii) The specified tip elevation shall not be raised above the design tip elevations for tension and lateral load.

(iii) Unsuitable soil layer (liquefiable) that does not contribute to the design nominal resistance exist between Elev. -6.0' and -8.5' and between Elev. -16.5' and -23.0' at Abutment 1 (72 "Dia. CISS Pile) and Bent 2 (Class 200 Alt "W" pile), between Elev. -7.0' and -11.5' at Bent 3 (Class 200 Alt "W" pile) and Bent 4 (Class 200 Alt "W" pile) and at Abutment 5 (72 "Dia. CISS Pile). The estimated driving resistance from the unsuitable penetrated soil is approximately 12 kips for the upper zone and 44 kips for the lower zone at Abutment 1 (72 "Dia. CISS Pile) and Bent 2 (Class 200 Alt "W" pile), is approximately 19 kips at Bent 3 and Bent 4 (Class 200 Alt "W" pile) and at Abutment 5 (72 "Dia. CISS Pile).

The estimation of the driven pile capacity of the Alt "W" pile at the bents is based on the U.S. Army Corps Method by which the skin friction of piles in sand increases linearly to an assumed critical depth and then remains constant below the depth. The estimation of the driven pile capacity of the CISS concrete pile at the abutments is based on the American Petroleum Institute Method. The pile capacity will be derived from both frictional resistance along the pile shafts and end bearing at the bents and only frictional resistance along the pile shafts at the abutments. A factor of safety of 2 was used to estimate the allowable pile capacity at the abutments. Based on the Pile Data Table 5, the pile tip elevation is controlled by the demand in compression on the pile, except at Abutment 5 which is controlled by the demand in the lateral load on the pile.

The design tip elevations and specified tip elevations are based on the "pile cut-off" elevation provided by the structural designer. In the event that the "pile cut-off" elevations are changed, the design pile tip elevations may have to be revised accordingly.

The piles should not be spaced closer than 3 times the pile diameter measured center-to-center. For piles spaced at center-to-center distance greater than or equal to 3 times the pile diameter, there is no group effect for pile vertical capacity. A "P-Y" Curve Modification Factor" of 0.6 should be adopted in the lateral pile capacity analyses for pile spacing of 3 times the pile diameter.

Available boring information indicates that dense to very dense sands are likely to be encountered at depth during pile driving. Relatively hard driving conditions may be anticipated during installation of the piles. We recommended that driving shoes be used for the pile driving at the bents. We recommend that the piles be driven to the specified elevations.

Vibratory hammer may be used to install no more than first 20 feet of steel shells for the CISS concrete piles if found necessary.

It is anticipated that the pile capacity at the bents will develop after driving as a result of soil "freeze" and dissipation of excess pore water pressures. The final pile capacity at the bents can be verified and the gain of pile capacity after initial driving may be evaluated based on "re-driving" after 24-hour (min.) set up. Caltrans Standard Specifications (Section 49-1.08) may be used as the pile driving acceptance criteria for the Caltrans Standard Class 200 Alternate "W" piles. In the event that unanticipated pile driving conditions are encountered, Driving Analyzer (PDA) may be used, as an option, to evaluate the pile capacity of the driven piles when unanticipated conditions arise. Typical applications of the PDA include capacity evaluation (for both during driving and re-driving) and integrity testing for piles that have experienced hard driving. The geotechnical engineer should be consulted for any unanticipated pile driving conditions.

Groundwater was encountered between Elev. -1.5 feet in Boring B-5 and Elev. +21.5 feet in Boring R-11-NO-002 at the time of drilling. Groundwater level could vary, and groundwater conditions should be assumed during construction.

9.4 Lateral Design for Piles

Under seismic loading conditions, lateral pile capacity analyses will be performed for the foundation piles at the abutments and bents using the LPILE program by the structural designer. A "p-y Curve Modification Factor" of 0.6 should be adopted in the lateral pile analysis for pile spacing of 3 times the pile diameter. A "p-y Curve Modification Factor" of 0.1 should be applied to the potentially liquefiable layers.

The recommended geotechnical parameters for L-PILE analyses are summarized in the following tables. Undrained residual strength has been recommended for the potentially liquefiable soils based on the standard blow count $(N_1)_{60, CS}$.

"Passive Resistance Mobilization against Pile Caps", Plate 6, is included in this report.

Abutment 1 – Boring R-11-NO-002 (ground elevation ≈ +38.5 feet)/As-built Boring B-8 (ground elevation ≈ +2.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 3.5	Clay (very stiff)	ϕ = 0°; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.067
3.5 to 14	Sand (dense)	ϕ = 37°; c= 0 psf	Sand	225	-	0.067
14 to 17(1)	Clay (very stiff)	ϕ = 0°; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.067
17 to 18	Clay (very stiff)	ϕ = 0°; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
18 to 23	Sand (medium dense)	ϕ = 34°; c= 0 psf	Sand	60	-	0.036
23 to 32	Clay (very stiff)	ϕ = 0°; c=2250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
32 to 36	Sand (dense)	ϕ = 40°; c= 0 psf	Sand	125	-	0.036
37 to 38.5	Clay (hard)	ϕ = 0°; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036
36(3) to 42	Clay	ϕ = 0°; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.067
42 to 44.5	Clay	ϕ = 0°; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
44.5 to 47	Sand (loose)(2)	ϕ = 0°; c= 640 psf(4)	Liquefiable Sand	-	0.05	0.036
47 to 55	Clay (stiff)	ϕ = 0°; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
55 to 61.5	Sand (loose)(2)	ϕ = 0°; c= 430 psf(4)	Liquefiable Sand	-	0.05	0.036
61.5 to 65	Clay (very stiff)	ϕ = 0°; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
65 to 70.5	Clay (stiff)	ϕ = 0°; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
70.5 to 75.5	Clay (soft)	ϕ = 0°; c=625 psf	Soft Clay	-	0.01	0.036
75.5 to 81	Sand (dense)	ϕ = 38°; c= 0 psf	Sand	125	-	0.036
81 to 88.5	Clay (hard)	ϕ = 0°; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +2.64 feet of Boring B-8.
(4) Residual undrained strength.

Bents 2 - As-built Boring B-8 (ground elevation ≈ +2.64 feet) and As-built Boring B-5

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 6[1]	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.067
6 to 8.5	Clay	$\phi = 0°$; c=1000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
8.5 to 11	Sand (loose)[2]	$\phi = 0°$; c= 640 psf[4]	Liquefiable Sand	-	0.05	0.036
11 to 19	Clay (stiff)	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
19 to 25.5	Sand (loose)[2]	$\phi = 0°$; c= 430 psf[4]	Liquefiable Sand	-	0.05	0.036
25.5 to 29	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
29 to 34.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
34.5 to 39.5	Clay (soft)	$\phi = 0°$; c=625 psf	Soft Clay	-	0.01	0.036
39.5 to 45	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
45 to 52	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036
52[3] to 63.5	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
63.5 to 75	Clay (stiff)	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.036
75 to 86	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
86 to 92	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +49.36 feet of Boring B-5.
(4) Residual undrained strength.

Bents 3 and 4 - As-built Boring B-4 (ground elevation ≈ +9.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
Abutment Fill	Clay	$\phi = 0°$; c=1500 psf	Stiff Clay w/o Free Water	-	0.007	0.067
0 to 6[(1)]	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.067
6 to 7.5	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
7.5 to 12	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
12 to 16.5	Clay (stiff)	$\phi = 0°$; c=1750 psf	Stiff Clay w/o Free Water	-	0.007	0.036
16.5 to 21	Sand (loose)[(2)]	$\phi = 0°$; c= 1300 psf[(3)]	Liquefiable Sand	-	0.05	0.036
21 to 25	Clay (very stiff)	$\phi = 0°$; c=2000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
25 to 29	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
29 to 34.5	Clay (very stiff)	$\phi = 0°$; c=2750 psf	Stiff Clay w/o Free Water	-	0.005	0.036
34.5 to 40	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
40 to 43.5	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
43.5 to 49	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
49 to 55.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
55.5 to 61.5	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
61.5 to 75.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
75.5 to 78.5	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Residual undrained strength.

Abutment 5 – Boring R-11-NO-002 (ground elevation ≈ +38.5 feet)/As-built Boring B-4 (ground elevation ≈ +9.64 feet)

Approx. Depth. (ft.)	Soil Type	Strength Parameters	L-Pile Soil Type	Soil Modulus Parameter k (pci)	Soil Strain Parameter ε_{50}	Effective Unit Weight γ' (pci)
0 to 3.5	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.067
3.5 to 14	Sand (dense)	$\phi = 37°$; c= 0 psf	Sand	225	-	0.067
14 to 17(1)	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.067
17 to 18	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
18 to 23	Sand (medium dense)	$\phi = 34°$; c= 0 psf	Sand	60	-	0.036
23 to 29	Clay (very stiff)	$\phi = 0°$; c=2250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
29 (3) to 35	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
35 to 36.5	Clay (soft)	$\phi = 0°$; c=750 psf	Soft Clay	-	0.01	0.036
36.5 to 41	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
41 to 45.5	Clay (stiff)	$\phi = 0°$; c=1750 psf	Stiff Clay w/o Free Water	-	0.007	0.036
45.5 to 50	Sand (loose)(2)	$\phi = 0°$; c= 1300 psf(4)	Liquefiable Sand	-	0.05	0.036
50 to 54	Clay (very stiff)	$\phi = 0°$; c=2000 psf	Stiff Clay w/o Free Water	-	0.007	0.036
54 to 58	Sand (dense)	$\phi = 38°$; c= 0 psf	Sand	125	-	0.036
58 to 63.5	Clay (very stiff)	$\phi = 0°$; c=2750 psf	Stiff Clay w/o Free Water	-	0.005	0.036
63.5 to 69	Clay (very stiff)	$\phi = 0°$; c=3250 psf	Stiff Clay w/o Free Water	-	0.005	0.036
69 to 72.5	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
72.5 to 78	Sand (dense)	$\phi = 40°$; c= 0 psf	Sand	125	-	0.036
78 to 84.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
84.5 to 90.5	Clay (very stiff)	$\phi = 0°$; c=2500 psf	Stiff Clay w/o Free Water	-	0.005	0.036
90.5 to 104.5	Clay (stiff)	$\phi = 0°$; c=1250 psf	Stiff Clay w/o Free Water	-	0.007	0.036
104.5 to 107.5	Clay (hard)	$\phi = 0°$; c=4000 psf	Stiff Clay w/o Free Water	-	0.005	0.036

(1) Assumed groundwater depth.
(2) Potentially liquefiable layer. The recommended parameters have been corrected for residual undrained strength with blow count correction. A P-Y factor of 0.1 was applied to the potentially liquefiable layers.
(3) Continuous from ≈Elev. +9.64 feet of Boring B-4.
(4) Residual undrained strength.

9.5 Lateral Earth Pressures and Friction Coefficient

Abutment walls and wing walls should be designed to resist the following Applied Lateral Earth Pressures (Equivalent Fluid Pressures-EFP) and live load. These values assume no hydrostatic pore pressure buildup behind the wall and are based on well-drained backfill behind the walls supported in native soil.

(a) Active Condition — Recommended active pressure is 36 pcf EFP for the engineered fill.

(b) At-Rest Condition — Recommended at-rest pressure is 55 pcf EFP for the engineered fill.

(c) Passive Resistance — Recommended passive pressure is 350 EFP with a maximum value of 3500 psf.

5.0 ksf (ultimate) for seismic design of the abutment wall (5.5 feet or greater); for activated height less than 5.5 feet, modify proportionally i.e. 5.0x (H/5.5) ksf per Caltrans SDC v.1.6. A minimum lateral wall movement of 2% of wall height to mobilize the full ultimate passive resistance is required.

(d) A coefficient of friction of 0.3 may be used to estimate the frictional resistance along the bottom of the footing. Only dead loads should be used to estimate the frictional resistance at the bottom of footings.

(e) Sliding resistance should be calculated using not more than 50% of the available passive lateral earth pressure in determining the factor of safety against sliding.

(f) The effect of any surcharge (dead or live load) should be added to the preceding lateral earth pressures. Use equivalent earth pressure of not less than 2 feet of uniform soil weight at 125 pcf if the traffic (HS20 loading) is within a horizontal distance of one half of the wall height.

Cantilever walls, which are free to rotate by at least 0.005 radian, may be assumed flexible and designed for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition. The effect

of any surcharge (dead, live, or traffic load) should be added to the preceding lateral earth pressures. A coefficient of 0.4 and 0.5 may be used to determine the additional lateral earth pressures resulting from the surcharge for cantilever walls and rigid walls, respectively.

The above values assume no hydrostatic pore pressure build up behind the wall and are based on well-drained backfill behind the walls. A minimum 1-foot thick compact clay cover or concrete cap should be placed over the well-drained material. If hydrostatic pressures are allowed to build up behind the walls, additional lateral loads should be considered in the design.

9.6 Embankment Settlement & Waiting Period

Based on our understanding, minimum excavation and backfill with engineered fill will be required for the foundation construction. No embankment fill will be required. The subsurface soil conditions at the project consist of mainly stiff to very stiff lean clay and medium dense to dense sand/gravel. No soft clay/silt was retrieved from the borings that have been drilled. It appears that the majority of the consolidation settlement of the soft clay/silt shown in the as-built borings might have already competed. It is our opinion that settlement should not be a geotechnical concern and waiting period is not required for this project.

9.7 Embankment Stability

There is no new embankment proposed for this project. Embankment stability should not be a geotechnical concern.

9.8 Corrosion

Chemical tests were performed on soil samples from R-11-NO-001, R-11-NO-002 and additional roadway borings (A-11-101 and A-11-103) to evaluate the corrosion potential of the subsoil. The test results are as follows:

TABLE 7: SUMMARY OF CORROSION TEST RESULTS

Boring No.	Station & Offset	Depth (ft)	Min. Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
R-11-NO-001	"J1R" 402+50, 85 feet Right	15.0	510	8.11	40.4	149.4
R-11-NO-002	"J1R" 396+50, 0 feet Right	15.0	1,210	7.71	44.6	200.1
A-11-101	"J1R" 394+00 (median)	0-5	2,680	7.13	33.2	28.9
A-11-103	"J1R" 412+00 (median)	0-5	940	7.72	475.4	72.1

According to Caltrans Corrosion Guidelines, September 2003 (Version 1.0), Caltrans considers a site to be corrosive to foundation element if one of the following conditions exists for the representative soil samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm,
- Sulfate concentration is greater than or equal to 2000 ppm,
- pH is 5.5 or less.

Based on the corrosion test results, the native subsurface soils in the borings as shown in Table 7 are considered non-corrosive per Caltrans corrosion design guidelines. Standard Type II modified or Type I-P (MS) modified cement may be used for the concrete substructure. The minimum cement factor and cover thickness should be per Section 5.12 of California Amendments to AASHTO LRFD Bridge Design Specifications – Fourth Edition (December 2008).

As discussed in Section 6.0 "Subsurface Soil Conditions", an additional boring is proposed on Rushing Landing Road. Additional corrosion tests will be arranged to investigate the corrosion status at the project site.

10.0 PLAN REVIEW

This report is prepared for the proposed "North Novato Overhead Widen (Bridge No. 27-0094R)". We recommend that final foundation plans for the proposed project to be reviewed by PARIKH prior to construction so that the intent of our recommendations is included in the project plans and specifications and to further see that no misunderstandings or

misinterpretations have occurred. However, design-build elements should be reviewed only from overall compliance standpoint.

11.0 CONSTRUCTION OBSERVATION

To a degree, the performance of any structure is dependent upon construction procedures and quality control measures. Hence, geotechnical observation and testing of grading operations, foundation excavations, and observation of pile installations should be carried out by the Geotechnical Engineer. If the subsurface conditions different from those forming the basis of our recommendations are encountered, this office should be informed in order to assess the need for design changes. Therefore, the recommendations presented in this report are contingent upon good quality control and these geotechnical observations during construction.

12.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our site reconnaissance and the assumption that the subsurface conditions do not deviate from observed conditions. All work done is in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater or air, below or around this site. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require that additional expenditures be made during construction to attain a properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed project as described earlier, to assist the engineer in the design of this project. In the event any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our conclusions and recommendations shall not be considered valid unless the changes or variations are reviewed and our recommendations modified or approved by us in writing.

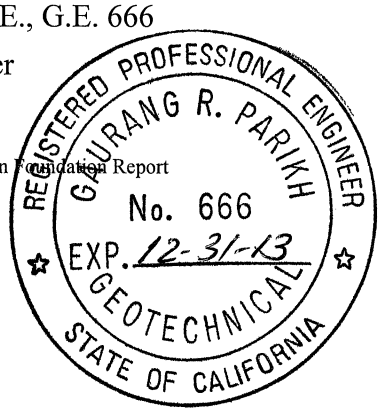
This report is issued with the understanding that it is the designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the project and that necessary steps are also taken to see that the recommendations are carried out in the field.

The findings in this report are valid as of the present date. However, changes in the subsurface conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

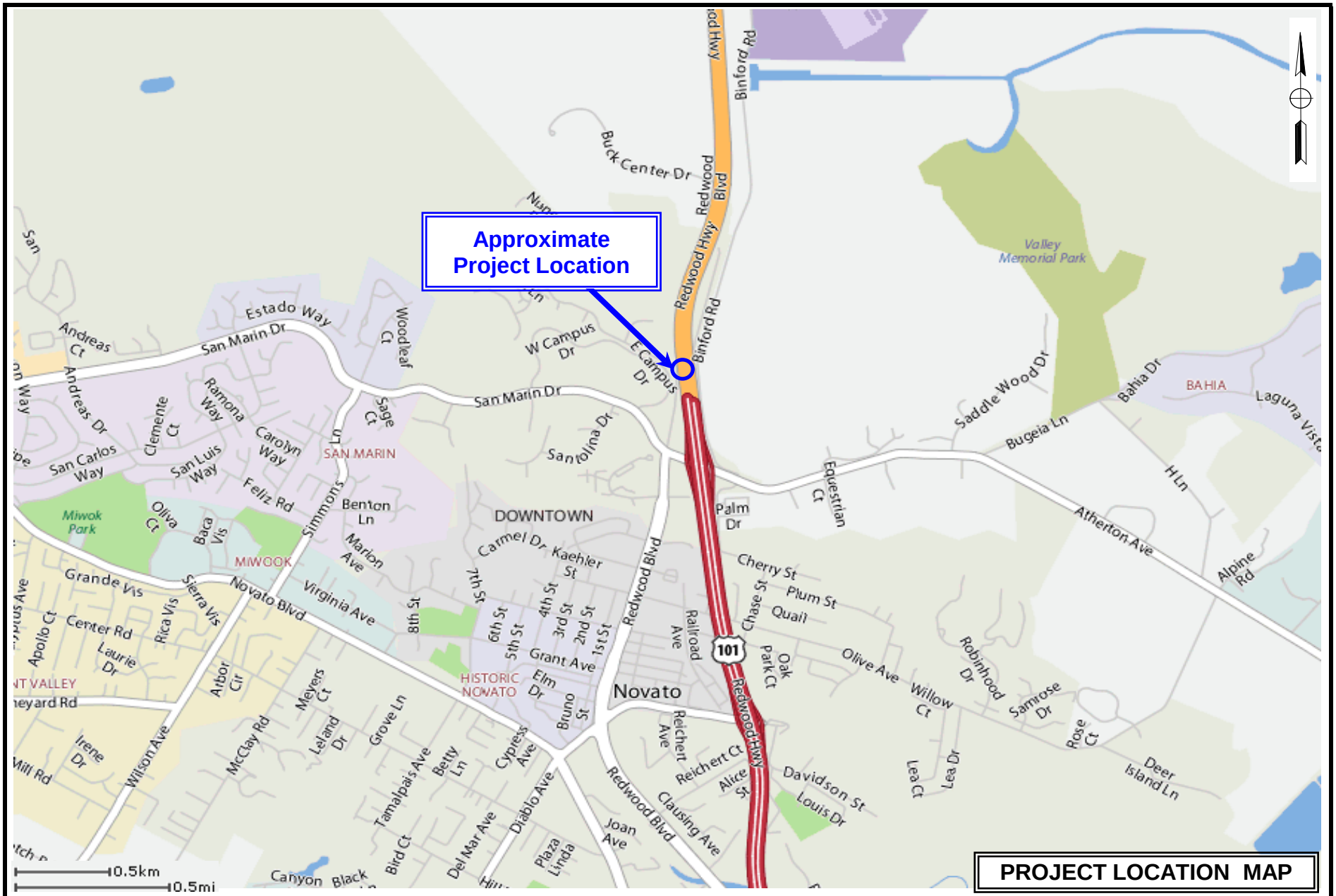
Respectfully submitted,
PARIKH CONSULTANTS, INC.

Alston Lam, P.E., G.E. 2605
Project Engineer

Gary Parikh, P.E., G.E. 666
Project Manager



S:\Ongoing Projects\Alston Lam\2011-145-MSN A3\Bridge Foundation\North Novato Overhead Widen Foundation Report

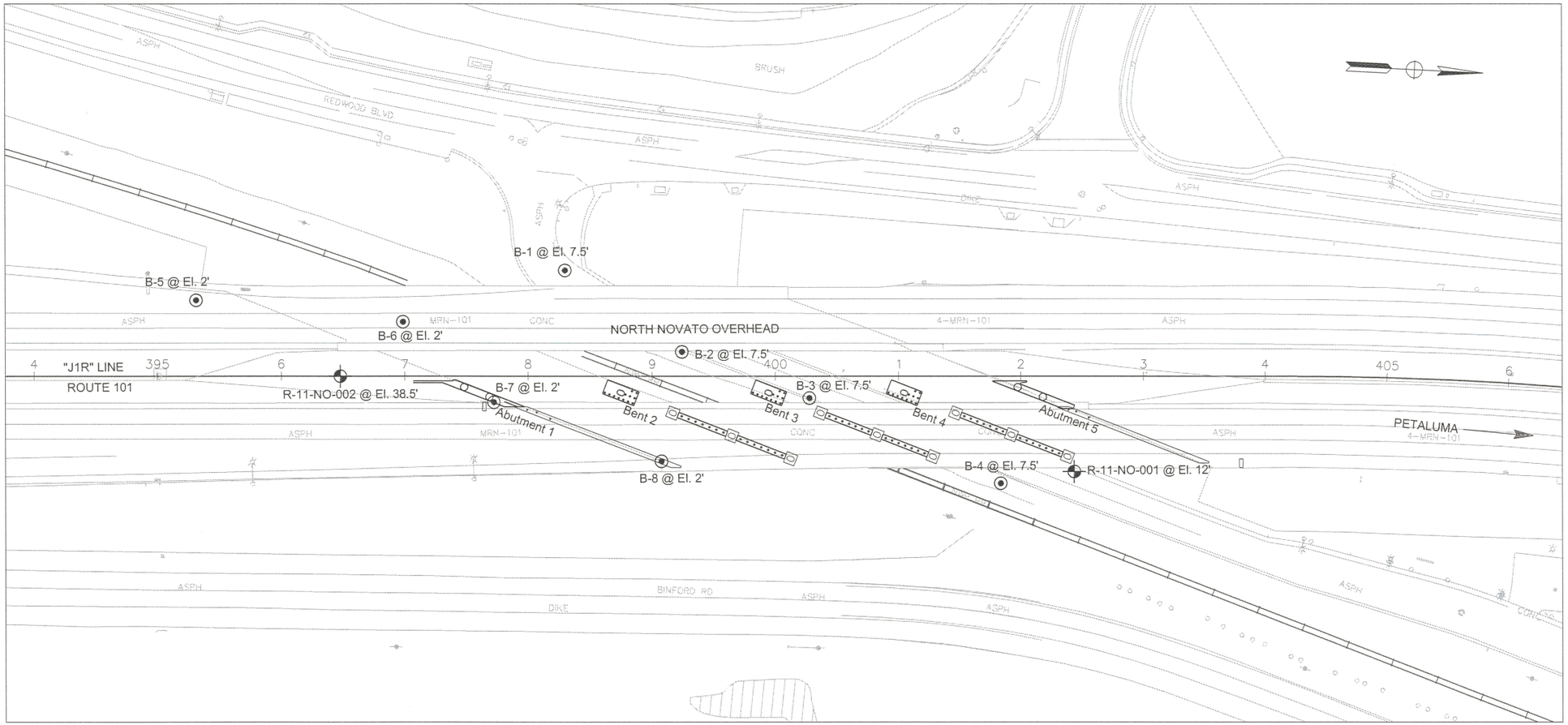


PROJECT LOCATION MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG	PLATE NO.: 1



SITE PLAN

LEGEND

- Borings drilled by Parikh Consultants Inc. in October & November, 2011.
- Borings drilled by Caltrans in October & November, 1968.

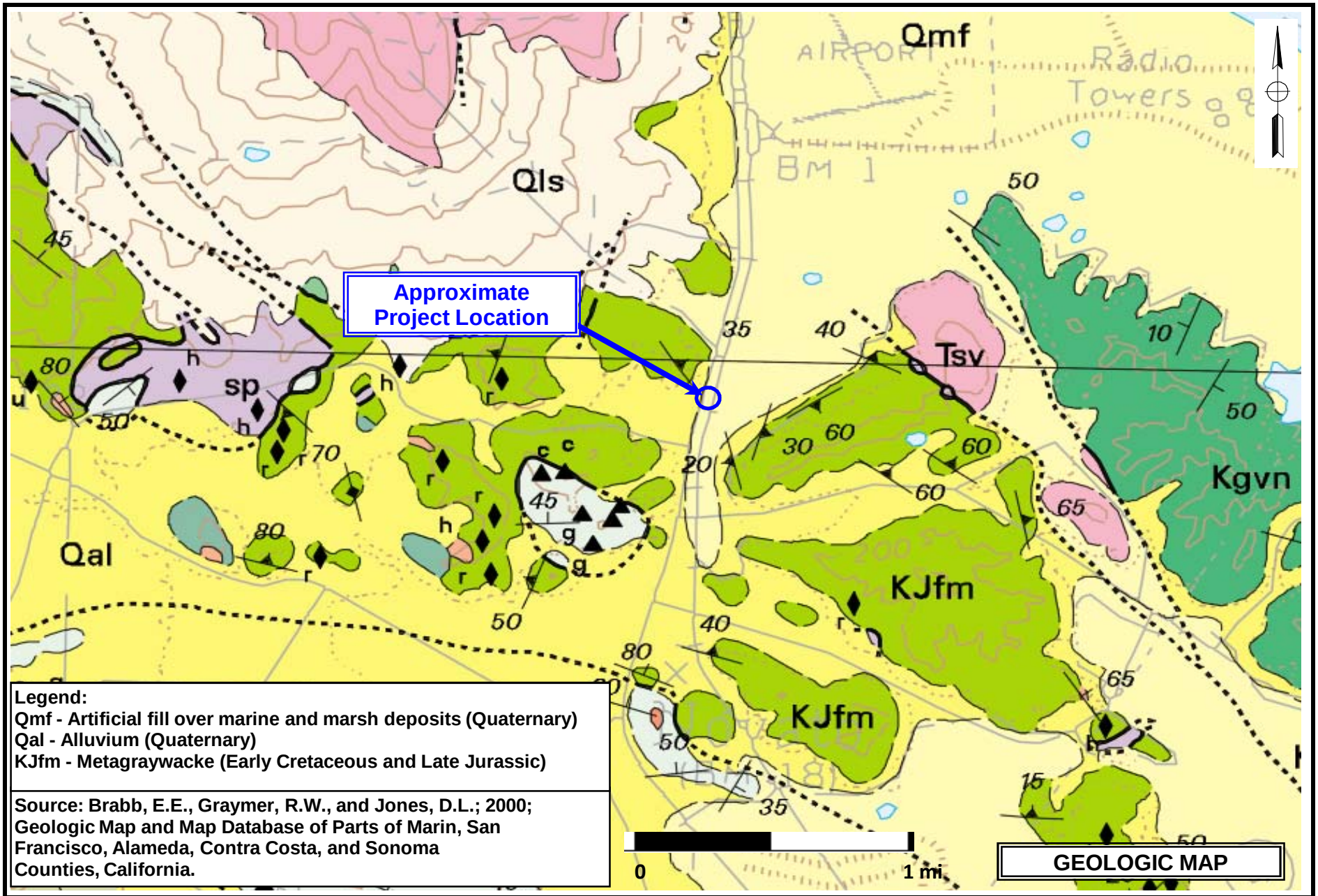
SCALE 1 inch = 100 feet

Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT- NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

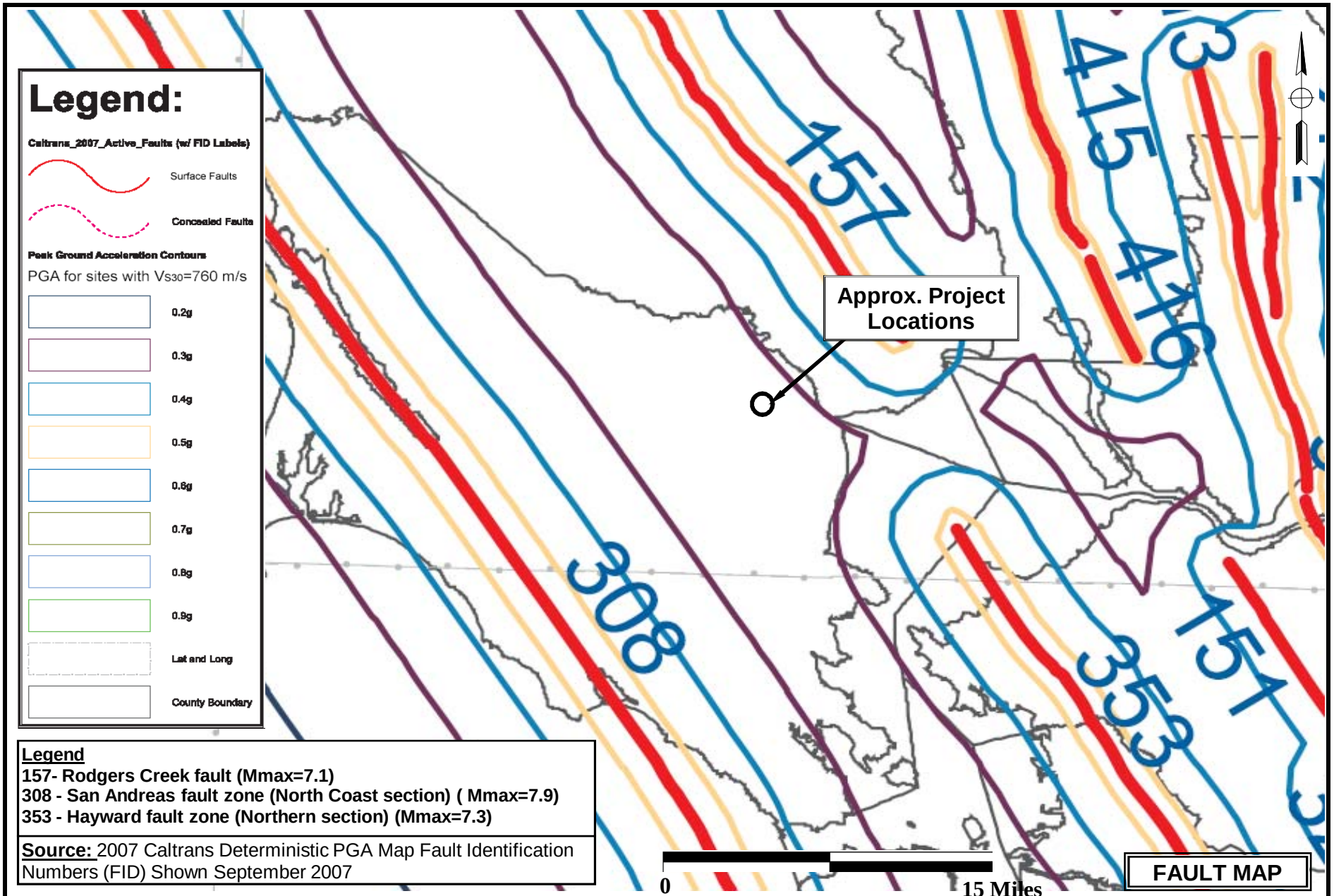
JOB NO.:2011-145-BRG | PLATE NO: 2



PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG	PLATE NO.: 3



Legend
157- Rodgers Creek fault (Mmax=7.1)
308 - San Andreas fault zone (North Coast section) (Mmax=7.9)
353 - Hayward fault zone (Northern section) (Mmax=7.3)

Source: 2007 Caltrans Deterministic PGA Map Fault Identification Numbers (FID) Shown September 2007

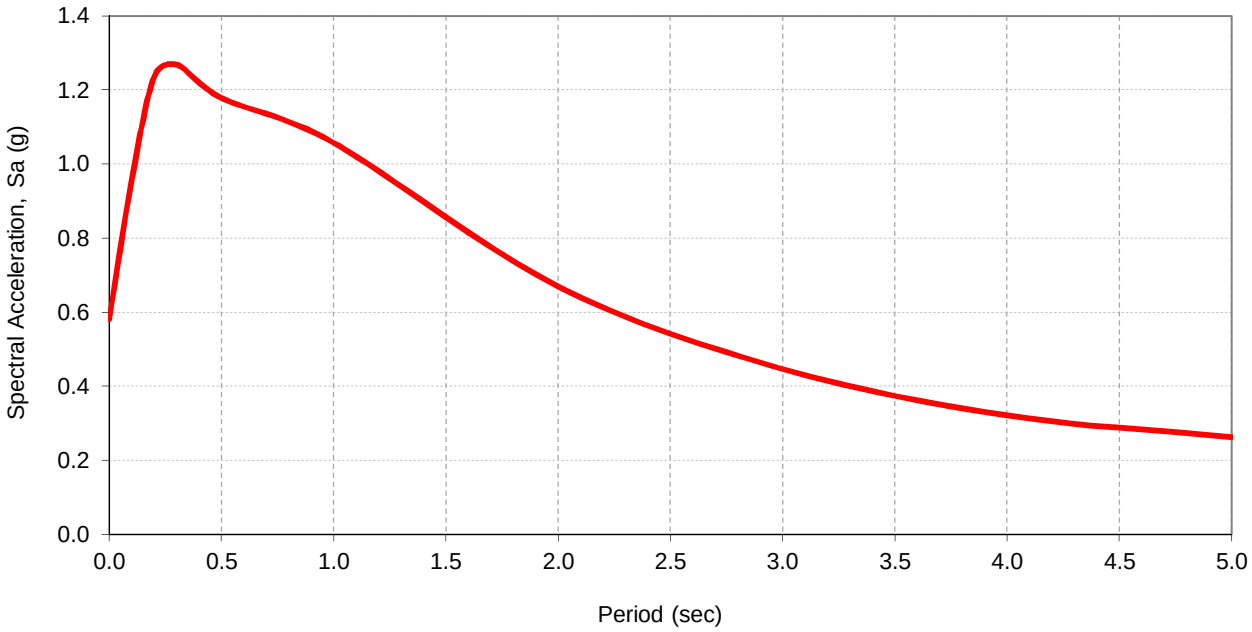
FAULT MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG | **PLATE NO.: 4**

RECOMMENDED ACCELERATION RESPONSE SPECTRUM



Site Information

Latitude:	38.1220
Longitude	-122.5658
V_{S30} (m/s) =	230
$Z_{1.0}$ (m) =	N/A
$Z_{2.5}$ (km) =	N/A
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1

Governing Curve:

USGS Deaggregation 2008 (beta)

Recommended Response Spectrum

Period (sec)	USGS Deagg. Spectral Acceleration (g)	Adjusted for Near Fault Effect	Adjusted For Basin Effect	Final Adjusted Spectral Acceleration (g)
0.0	0.5816	1.000	1.000	0.582
0.1	0.9563	1.000	1.000	0.956
0.2	1.236	1.000	1.000	1.236
0.3	1.2684	1.000	1.000	1.268
0.5	1.1783	1.000	1.000	1.178
1.0	0.8809	1.200	1.000	1.057
2.0	0.5579	1.200	1.000	0.669
3.0	0.3722	1.200	1.000	0.447
4.0	0.2677	1.200	1.000	0.321
5.0	0.2184	1.200	1.000	0.262

Source:

1. Caltrans ARS Online tool (V.1.0.4, http://dap3.dot.ca.gov/shake_stable/)
2. USGS Deaggregation 2008 beta (http://eqint.cr.usgs.gov/deaggint/2008/index.php)
3. Caltrans Geotechnical Services Design Manual (Version 1.0)

Note:

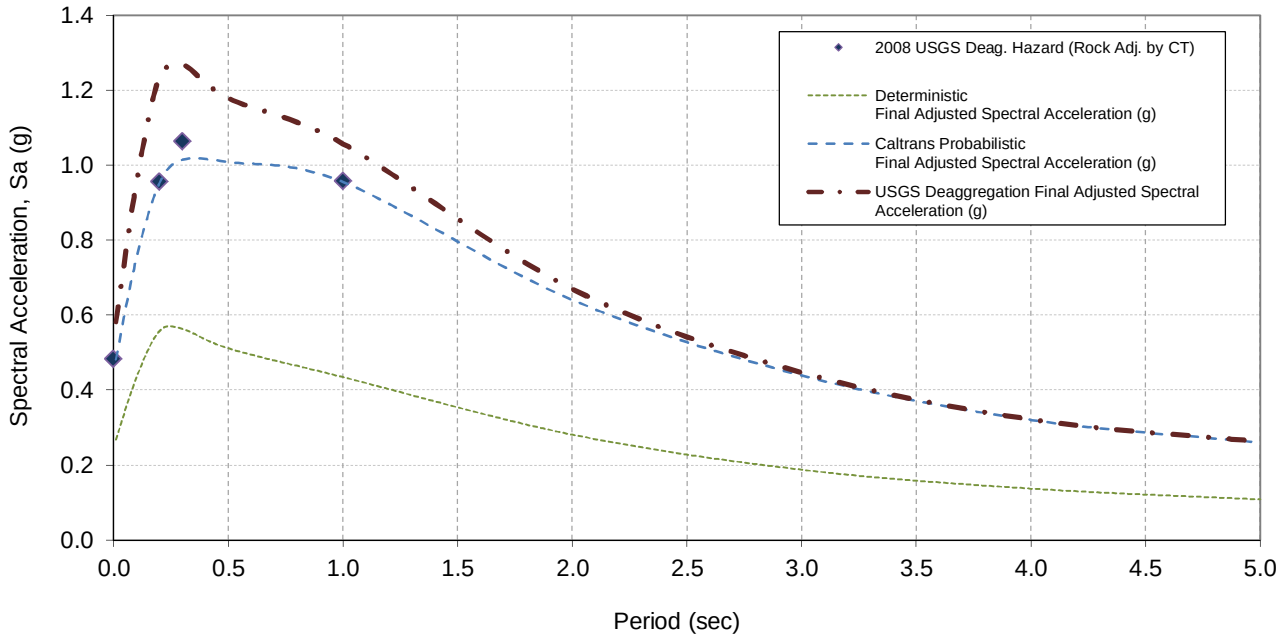
Refer to "ARS Spreadsheet" (attached) for development of the recommended ARS curve.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
MATERIALS TESTING

MSN A3 - NB HOV WIDENING PROJECT -
NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

Project No.: 2011-145-BRG | **Plate No.: 5A**

ACCELERATION RESPONSE SPECTRUM COMPARISONS



Site Information

Latitude:	38.1220
Longitude	-122.5658
V_{S30} (m/s) =	230
$Z_{1.0}$ (m) =	N/A
$Z_{2.5}$ (km) =	N/A
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1

Period (sec)	Deterministic Final Adjusted Spectral Acceleration (g)	Caltrans Probabilistic Final Adjusted Spectral Acceleration (g)	USGS Deaggregation Final Adjusted Spectral Acceleration (g)
0.0	0.268	0.482	0.582
0.1	0.435	0.754	0.956
0.2	0.557	0.952	1.236
0.3	0.563	1.014	1.268
0.5	0.511	1.008	1.178
1.0	0.434	0.955	1.057
2.0	0.281	0.640	0.669
3.0	0.187	0.439	0.447
4.0	0.137	0.320	0.321
5.0	0.108	0.260	0.262

Source:

1. Caltrans ARS Online tool (V.1.0.4, http://dap3.dot.ca.gov/shake_stable/)
2. USGS Deaggregation 2008 beta (http://eqint.cr.usgs.gov/deaggint/2008/index.php)
3. Caltrans Geotechnical Services Design Manual (Version 1.0)

Note:

Refer to "ARS Spreadsheet" (attached) for development of the recommended ARS curve.

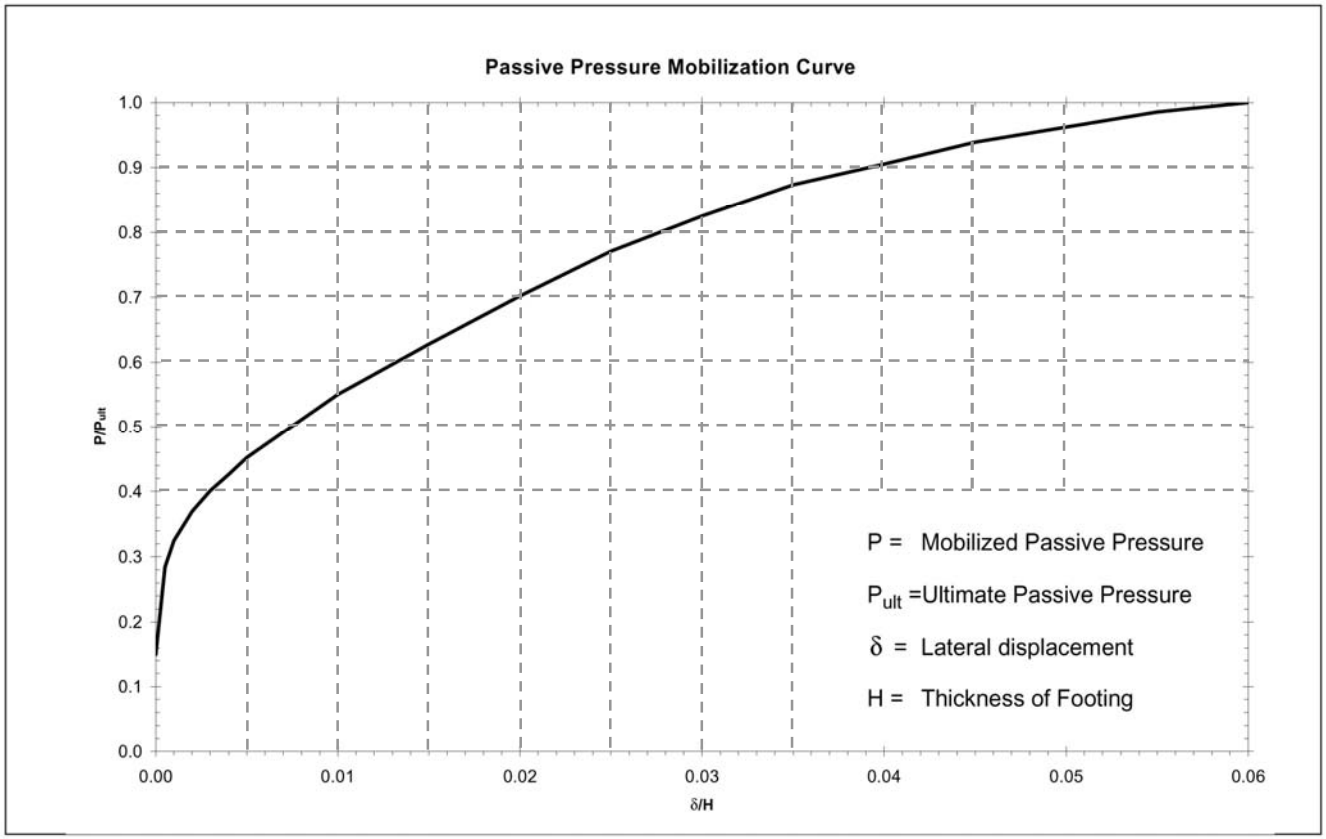


Figure 4-6 Passive Pressure Mobilization Curve

Reference: Chapter 4, Foundation and Geologic Site Hazards, FEMA 356, November 2000

For North Novato OH (Widen), the recommened passive resistance against the vertical sic
of the pile caps is 3.5 ksf. This is a uniformly distributed resistance for seismic & ultimate conditio

PASSIVE PRESSURE MOBILIZATION AGAINST PILE CAPS

PARIKH
Practicing in the Geosciences

NORTH NOVATO OVERHEAD WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-BRG | **Plate No.: 6**

APPENDIX A

APPENDIX A

FIELD EXPLORATION

All the test borings were drilled with a truck-mounted drill rig using 4-inch diameter rotary-wash drilling method. The soil samples were obtained from the borings during drilling at various depths by driving a 2.5 inches Inside Diameter (I. D.) Modified California Sampler or a 1.375 inches I.D. Standard Penetration Sampler (ASTM Test Method No. 1586). The sampler was driven into the subsurface soils under the impact of a 140 pounds hammer having a free fall of 30 inches. The blow counts required to drive the sampler for the last 12 inches are presented on the Logs of Test Borings, Appendix A. (When correlating standard penetration data in similar soils, the blow counts for the Modified California sampler can be taken as roughly twice that for the Standard Penetration Test sampler in similar soils.). Pocket penetration tests were also performed on clay samples to evaluate their consistency. Upon completion of drilling, the boreholes were backfilled with cement grout.

The borings were drilled under the technical supervision of our engineers, who classified and continuously logged the soils encountered during drilling and supervised the collection of soil samples at various depths for visual examination and laboratory testing. The soil samples were visually classified in the field according to the Unified Soil Classification System and then transported to our laboratory for further evaluation and testing.

The descriptions of the soils encountered and relevant boring information are presented on the Log of Test Borings attached in Appendix A. The laboratory test methods and results are presented in Appendix B. The logs presented in Appendix A were prepared from the field logs which were edited after visual re-examination of the soil samples in the laboratory and results of classification tests on selected soil samples as indicated on the logs.

The descriptions and related information presented on these logs of test borings depict subsurface conditions only at the locations indicated on the plan and on the particular date noted on the logs. Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the locations explored. The abrupt stratum changes shown on the logs may be gradational and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental changes.

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

GEOTECHNICAL PROFESSIONAL — 4-16-12 DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

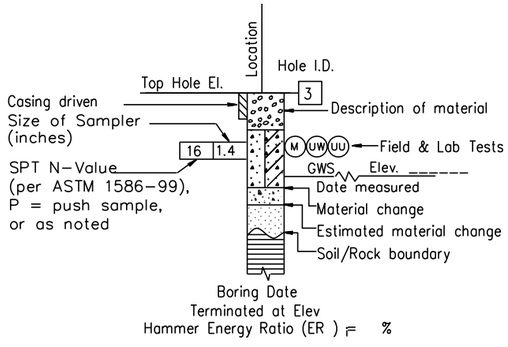
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring (hollow or solid stem bucket)
Size	R RW RC P	Rotary drilled boring (conventional) Rotary drilled with self-casing wire-line Rotary core with continuously-sampled, self-casing wire-line Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
	D	Dynamic Cone Penetration Boring
	CPT	Cone Penetration Test (ASTM D 5778)
	O	Other (note on LOTB)

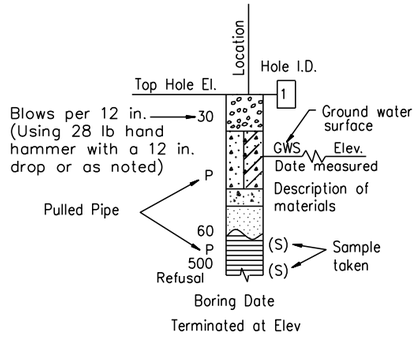
Note: Size in inches.

CONSISTENCY OF COHESIVE SOILS

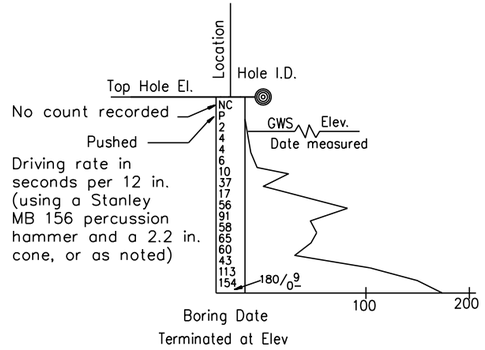
Description	Shear Strength (tsf)	Pocket Penetrometer Measurement, PP, (tsf)	Torvane Measurement, TV, (tsf)	Vane Shear Measurement, VS, (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 – 0.25	0.25 – 0.5	0.12 – 0.25	0.12 – 0.25
Medium Stiff	0.25 – 0.5	0.5 – 1	0.25 – 0.5	0.25 – 0.5
Stiff	0.5 – 1	1 – 2	0.5 – 1	0.5 – 1
Very Stiff	1 – 2	2 – 4	1 – 2	1 – 2
Hard	Greater than 2	Greater than 4	Greater than 2	Greater than 2



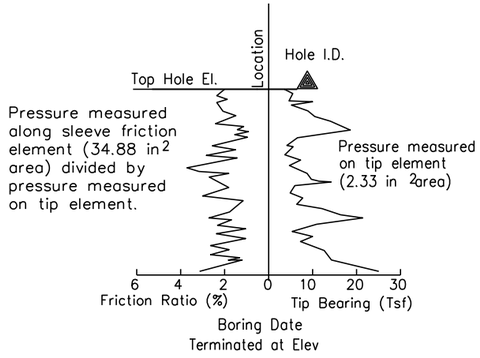
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) BORING

DESIGN OVERSIGHT	DRAWN BY	E. ORTAKCI/A. JACKSON	L.S. BHANGOO	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ALSTON LAM	BRIDGE NO. 27-0094R	NORTH NOVATO OVERHEAD (WIDEN)
SIGN OFF DATE	CHECKED BY	A. LAM	FIELD INVESTIGATION BY: DATE: OCTOBER & NOVEMBER, 2011		PROJECT ENGINEER	POST MILES R22.3	LOG OF TEST BORINGS 1 of 5

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET 27 | OF 31

CONTRACT NO.: 04-2640L1 PROJECT ID:

FILE => $REQUEST

Apr 16, 2012 - 1:52pm S:\ACAD\2011-145.00PW\LOTBs\Structures\LOTB.dwg Ajackson

TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL		
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content–% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (UC) Unconfined Compression–Soil (ASTM D 2166) Unconfined Compression–Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

GEOTECHNICAL PROFESSIONAL — 4-16-12 DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 in.)
Very Loose	0 – 5
Loose	5 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	Greater than 50

MOISTURE

Description	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5% – 10%
Little	15% – 25%
Some	30% – 45%
Mostly	50% – 100%

PARTICLE SIZE

Description		Size (in.)
Boulder		Greater than 12
Cobble		3 – 12
Gravel	Coarse	3/4 – 3
	Fine	1/5 – 3/4
Sand	Coarse	1/16 – 1/5
	Medium	1/64 – 1/16
	Fine	1/300 – 1/64
Silt and Clay		Less than 1/300

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY: E. ORTAKCI/A. JACKSON

CHECKED BY: A. LAM

L.S. BHANGOO
FIELD INVESTIGATION BY:

DATE: OCTOBER & NOVEMBER, 2011

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

ALSTON LAM
PROJECT ENGINEER

BRIDGE NO. 27-0094R

POST MILES R22.3

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS 2 of 5

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES

SHEET 28 OF 31

FILE => $REQUEST

CONTRACT NO.: 04-2640L1 PROJECT ID:

Ajackson Apr. 16, 2012 - 1:53pm S:\ACAD\2011-145.GDR\LOTBs\Structures\LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

GEOTECHNICAL PROFESSIONAL — 4-16-12 DATE

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

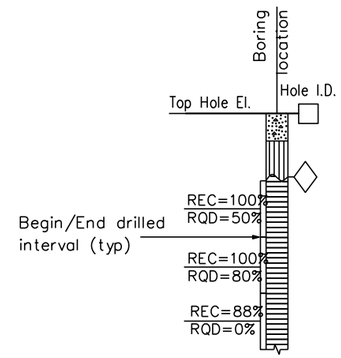
TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131

PERCENT CORE RECOVERY (REC) + ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100\%$$



RQD* Indicates soundness criteria not met.

BEDDING SPACING

Description	Thickness / Spacing
Massive	Greater than 10 ft
Very Thickly Bedded	3 ft – 10 ft
Thickly Bedded	1 ft – 3 ft
Moderately Bedded	4 in. – 1 ft
Thinly Bedded	1 in. – 4 in.
Very Thinly Bedded	1/4 in. – 1 in.
Laminated	Less than 1/4 in.

LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

ROCK HARDNESS

Description	Criteria
Extremely Hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very Hard	Cannot be scratched with a pocketknife or sharp pick. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with a pocketknife or sharp pick with difficulty (heavy pressure). Breaks with heavy hammer blows.
Moderately Hard	Can be scratched with pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately Soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily by a pocketknife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Can be readily indented, grooved or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures.
Very Slightly Fractured	Core lengths greater than 3 ft.
Slightly Fractured	Core lengths mostly from 1 to 3 ft.
Moderately Fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely Fractured	Core lengths mostly from 1 to 4 in.
Very Intensely Fractured	Mostly chips and fragments.

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic Features					General Characteristics
	Chemical Weathering–Discoloration and/or Oxidation		Mechanical Weathering–Grain Boundary Conditions (Disaggregation) Primarily for Granitics and Some Coarse–Grained Sediments	Texture and Leaching		
	Body of Rock	Fracture Surfaces		Texture	Leaching	
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change	No leaching	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved	Minor leaching of some soluble minerals.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe–Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe–Mg minerals are altered to clay to some extent; or chemical alteration produces in–situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe–Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated).	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

DESIGN OVERSIGHT — SIGN OFF DATE

DRAWN BY: E. ORTAKCI/A. JACKSON
CHECKED BY: A. LAM

L.S. BHANGOO
FIELD INVESTIGATION BY:
DATE: OCTOBER & NOVEMBER, 2011

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

ALSTON LAM
PROJECT ENGINEER

BRIDGE NO. 27-0094R
POST MILES R22.3

NORTH NOVATO OVERHEAD (WIDEN)
LOG OF TEST BORINGS 3 of 5

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET 29 | OF 31

CONTRACT NO.: 04-2640L1 PROJECT ID:

FILE => $REQUEST

Apr 16, 2012 - 1:53pm S:\ACAD\2011-145.GDR\LOTBs\Structures\LOTB.dwg
Ajackson
TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

GEOTECHNICAL PROFESSIONAL — 4-16-12 DATE

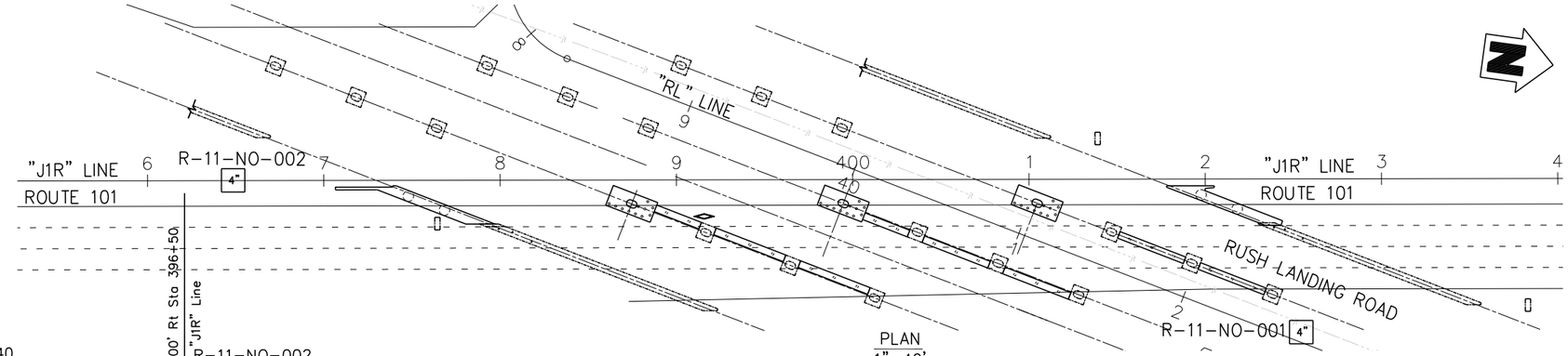
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

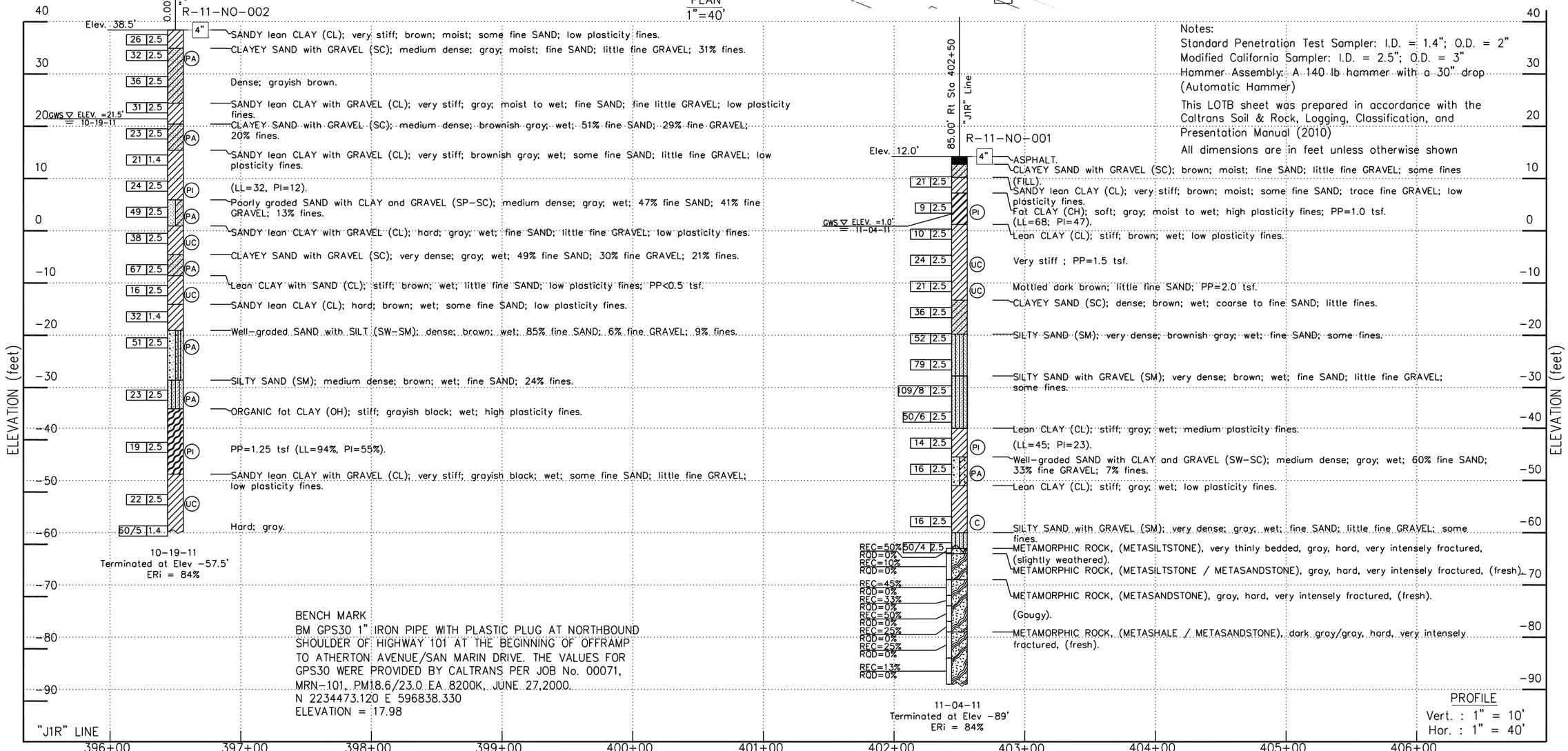
REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131



PLAN
1"=40'



Notes:
Standard Penetration Test Sampler: I.D. = 1.4"; O.D. = 2"
Modified California Sampler: I.D. = 2.5"; O.D. = 3"
Hammer Assembly: A 140 lb hammer with a 30" drop (Automatic Hammer)
This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock, Logging, Classification, and Presentation Manual (2010)
All dimensions are in feet unless otherwise shown

BENCH MARK
BM GPS30 1" IRON PIPE WITH PLASTIC PLUG AT NORTHBOUND SHOULDER OF HIGHWAY 101 AT THE BEGINNING OF OFFRAMP TO ATHERTON AVENUE/SAN MARIN DRIVE. THE VALUES FOR GPS30 WERE PROVIDED BY CALTRANS PER JOB No. 00071, MRN-101, PM18.6/23.0 EA 8200K, JUNE 27,2000.
N 2234473.120 E 596838.330
ELEVATION = 17.98

PROFILE
Vert. : 1" = 10'
Hor. : 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	E. ORTAKCI/A. JACKSON	L.S. BHANGOO	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ALSTON LAM	BRIDGE NO. 27-0094R	NORTH NOVATO OVERHEAD (WIDEN)
SIGN OFF DATE	CHECKED BY	A. LAM	FIELD INVESTIGATION BY: DATE: OCTOBER & NOVEMBER, 2011		PROJECT ENGINEER	POST MILES R22.3	LOG OF TEST BORINGS 4 of 5

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET 30 | OF 31

FILE => $REQUEST

CONTRACT NO.: 04-2640L1 PROJECT ID:

Apr. 16, 2012 - 1:54pm S:\ACAD\2011-145.GPR\LOTBs\Structures\LOTB.dwg
Ajackson
USERNAME => $USER
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	Mrn	101	18.2 / 23.3	3/2	3/2

R E Hannaman
DESIGN COORDINATION SUPERVISOR — REGISTERED CIVIL ENGINEER NO. 21196
DATE APPROVED: November 8, 1971

DIVISION OF ENGINEERING SERVICES – GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is consicered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	Sheet No.	Total Sheets
04	Mrn	101	R22/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT: 0716
PROJECT NUMBER & PHASE: 04120C03371

BRIDGE No.	Sheet	of
27-0094R	31	31

AS BUILT NONE 4/5/74
CORRECTIONS BY C.S. Foster
CONTRACT NO. 04-120373
DATE - 10-27-75

LEGEND OF BORING OPERATIONS

PENETRATION BORING
ROTARY BORING
1" SOIL TUBE

Penetrometer — 2½" Cone Penetrometer
SPT — Standard Penetration Boring (SPT)
RB — Rotary Boring (RB)
AB — Auger Boring (AB)
JB — Jet Boring
CB — Core Boring
TP — Test Pit

LEGEND OF EARTH MATERIALS

Gravel; Sand; Silt; Clay; Silty Clay or Clayey Silt; Peat and/or Organic Matter; Fill Material; Sandy Clay or Clayey Sand or Silty Sand; Igneous Rock; Sedimentary Rock; Metamorphic Rock

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

Diagram showing the size limits of boulder, cobble, gravel, sand, silt and clay, and the terms "coarse", "medium" and "fine" used to describe sand, gravel and boulder sizes to standard grade size limits.

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

FIELD STUDY — W. R. Williams 11-68
DRAWN — M. Hennessy 12-22-68
CHECKED — M. Hennessy 1-30-69
Appval Recommended by: [illegible] Engineering Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

3/2

PLAN
1"=50'

"J" Line
"J" 404+13.50± B.C.
Pacific R.R.
B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8
Approx. O.G. Along "J" Line

PROFILE
Horiz. 1"=20'
Vert. 1"=10'

B-5: Gray CLAYEY SILT; Tan CLAY; Compact brown SILTY fine to coarse SAND with scattered GRAVEL; Stiff brown CLAYEY SILT; Stiff gray rust stained CLAY; Slightly compact brown SAND & GRAVEL; Loose gray rust stained SILT & fine SANDY SILT; Slightly compact brown CLAYEY SILT with ORGANIC debris; Hard blue rust stained SILTY CLAY; Slightly compact gray rust stained CLAYEY SILT; Very stiff blue fine SANDY CLAY with occasional thin GRAVEL layers; Stiff blue CLAY; Soft blue gray CLAY with ORGANIC debris; Stiff dark gray fine to coarse SANDY CLAY with ORGANIC debris; Very stiff gray CLAY; Very dense blue CLAYEY fine to coarse SAND & GRAVEL; Decomposed GRAYWACKE of Franciscan Formation. — 11-7-68

B-6: G.W.S. El. -1' 11-7-68; Very loose buff & red brown SILT w/occasional SILT concretions & GRAVEL - FILL; Loose blue gray SILT w/ Fine to med. SAND & ORGANIC matl.; loose to slightly compact dark brown & black mottled SANDY SILT; Dense to compact dark brown SILTY SANDY fine GRAVEL; Very stiff blue gray & brown mottled SILTY CLAY with some fine SAND; St.f light grey SILTY CLAY with very coarse SAND; Very dense light brown cemented SILTY coarse SAND; Very dense dark brown very coarse SAND — 11-6-68

B-7: G.W.S. El. -3' 11-7-68 — 11-7-68

B-8: Dark gray CLAYEY SILT; Loose brown & gray mottled CLAYEY SILT; Compact brown SILTY fine to coarse SAND & GRAVEL; Slightly compact brownish gray rust stained fine SANDY CLAYEY SILT; Loose brown SILTY SAND & GRAVEL; Compact brown SILT with occasional GRAVEL; Slightly compact brown SILT with occasional GRAVEL; Very loose brown rust stained CLAYEY SILT; Dense brown SILTY fine to coarse SAND & GRAVEL; Decomposed GRAYWACKE of Franciscan Formation — 10-23-68

B-2: Very soft buff SILTY CLAY with some SAND & GRAVEL - FILL; Soft dark brown CLAYEY SILT w/ some SAND & occasional PEBBLES grading to stiff brown SILTY CLAY; Slightly compact brown SILTY SANDY fine GRAVEL; Slightly compact gray & brown mottled SILT w/med. SAND & some ORGANIC material; Dense dark brown SILTY SANDY fine GRAVEL; Very stiff dark brown SILTY CLAY; Compact gray & brown mottled SANDY SILT w/some CLAY; Dense dark brown to brown SILTY SANDY very fine to medium GRAVEL; Stiff & very stiff dark blue gray CLAY with ORGANIC material & occasional GRAVELLY SAND layers; Decomposed GRAYWACKE of Franciscan Formation. — 10-24-68

B-3: 10-23-68

B-4: 10-24-68

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NORTH NOVATO OVERHEAD

LOG OF TEST BORINGS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
27-94 R/L	22.3		15	15

WO 120371 PR-2794-2
CU 0212

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

AS BUILT PLANS
Contract No. 04-120374
Date Completed —
Document No. [illegible] SIGNED

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 6/28/76 — SIGNATURE [illegible] — TITLE Materials Engineer

ClibPDF - www.fastio.com

APPENDIX B

APPENDIX B

LABORATORY TESTS

Classification Tests

The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System. The results are presented in "Log of Test Borings", Appendix A.

Moisture-Density

The natural moisture contents and dry unit weights were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-98. This information was used to classify and correlate the soils. The results are presented on Plate B-2, Appendix B.

Atterberg Limits

The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-00. The results of these tests are presented on" Plasticity Chart", Plate B-3, Appendix B.

Grain Size Classification

Grain size classification tests (ASTM Test Method D 420) were performed on selected samples of granular soil to aid in the classification. The results are presented on "Grain Size Distribution Curves", Plate B-4A and Plate B-4B, Appendix B.

Unconfined Compression Tests

Strength tests were performed on selected undisturbed samples using unconfined compression machine. Unconfined compression tests were performed in general accordance with ASTM Test Method D 2166-00. The results are presented on Plate B-5A through Plate B-5E, Appendix B.

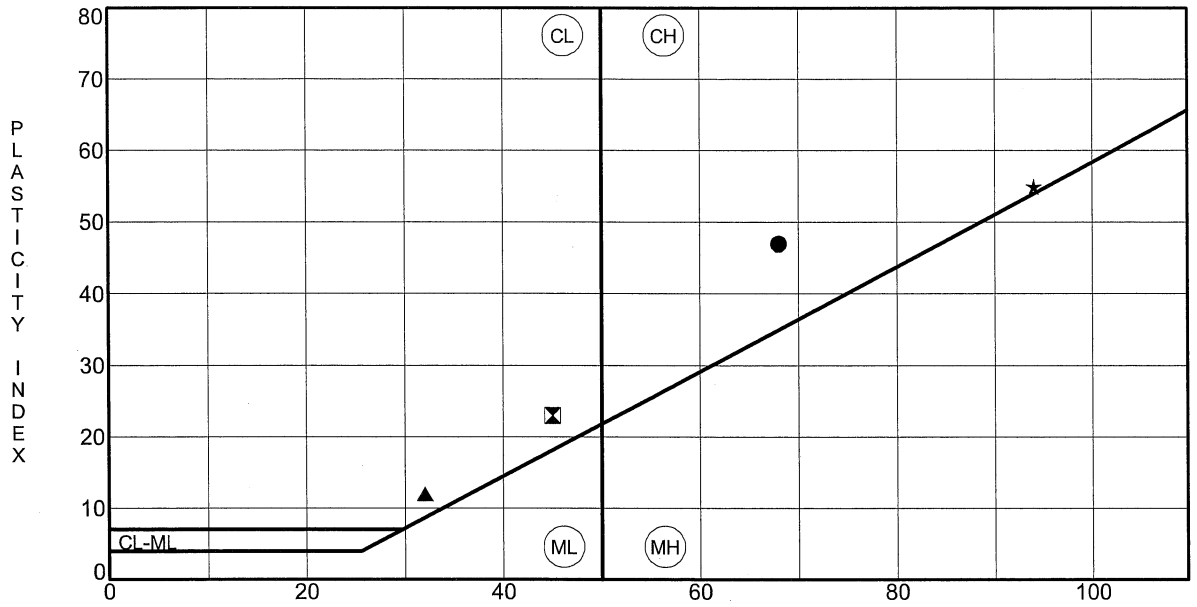
Corrosion Tests

Corrosion tests were performed on selected samples to determine the corrosion potential of the soils. The pH and minimum resistively tests were performed according to California Test Method T643. The tests were performed by Sunland Analytical. The test results are presented on Plate B-6A and Plate B-6B, Appendix B.

Consolidation Test

Consolidation tests (ASTM Test Method D 2435) were performed on selected relatively undisturbed sample. The test results are presented on Plate B-7, Appendix B.

Borehole	Sample Number	Depth	Classi-fication	Water Content	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	% > Sieve 4	% < Sieve 200	Unconfined Compressive Strength (tsf)
R-11-NO-001	1	2.5	SC	6.3	-						
R-11-NO-001	2	5.0	CL	9.9	-						
R-11-NO-001	3	10.0	CH	32.0	91.8	68	21	47			
R-11-NO-001	4	15.0	CL	26.9	98.2						
R-11-NO-001	5	20.0	CL	28.4	89.4						1.6
R-11-NO-001	6	25.0	CL	21.8	106.6						2.4
R-11-NO-001	7	30.0	SC	-	-						
R-11-NO-001	8	35.0	SM	11.5	-						
R-11-NO-001	9	40.0	SM	14.4	152.5						
R-11-NO-001	10	45.0	SM	9.6	-						
R-11-NO-001	11	50.0	SM	12.4	-						
R-11-NO-001	12	55.0	CL	28.6	-	45	22	23			
R-11-NO-001	13	60.0	SW-SC	29.6	95.7				33.4	7.0	
R-11-NO-001	14	70.0	CL	-	-						
R-11-NO-001	15	74.5	SM	7.8	-						
R-11-NO-002	1	2.0	CL	9.4	120.2						
R-11-NO-002	2	4.5	SC	9.2	-					31.0	
R-11-NO-002	3	10.0	SC	8.1	-						
R-11-NO-002	4	15.0	CL	9.8	130.0						
R-11-NO-002	5	20.0	SC	8.3	-				28.6	20.4	
R-11-NO-002	6	25.0	CL	14.5	-						
R-11-NO-002	7	30.0	CL	11.6	-	32	20	12			
R-11-NO-002	8	35.0	SP-SC	11.5	-				41.4	11.8	
R-11-NO-002	9	40.0	CL	17.2	118.8						0.27
R-11-NO-002	10	45.0	SC	10.8	-				30.1	21.2	
R-11-NO-002	11	50.0	CL	24.6	99.9						0.68
R-11-NO-002	12	55.0	CL	17.8	-						
R-11-NO-002	13	60.0	SW-SM	19.1	110.4				5.6	9.1	
R-11-NO-002	14	70.0	SM	25.2	100.6					23.9	
R-11-NO-002	15	80.0	OH	56.5	65.6	94	39	55			
R-11-NO-002	16	90.0	CL	18.6	114.8						1
R-11-NO-002	17	95.5	CL	10.9	-						



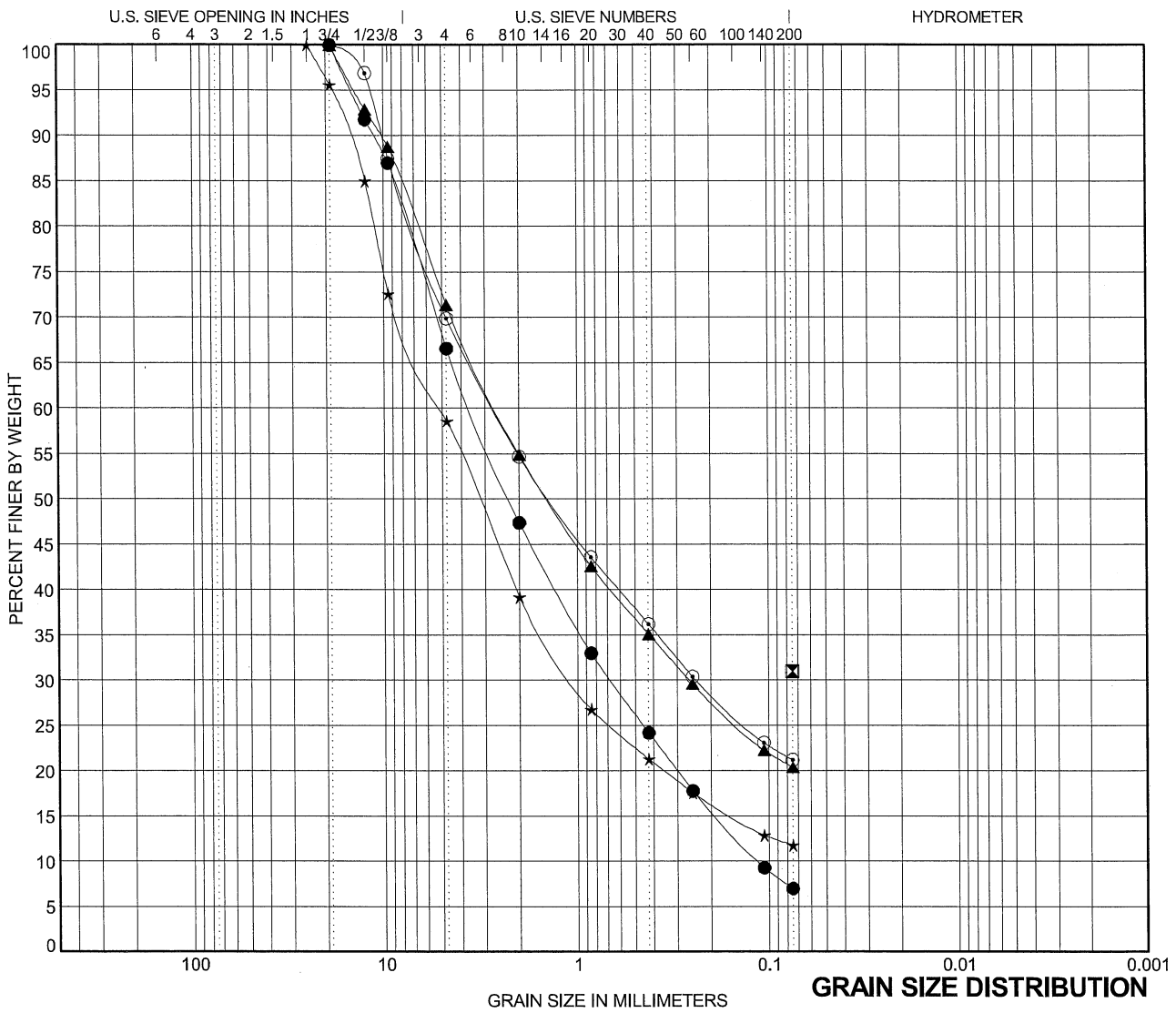
PLASTICITY

	BOREHOLE	SAMPLE #	DEPTH (ft)	LL	PL	PI	Fines	USCS Classification
●	**R-11-NO-001**	**3**	**10.0**	**68**	**21**	**47**		**Fat CLAY**
⧓	**R-11-NO-001**	**12**	**55.0**	**45**	**22**	**23**		**Lean CLAY**
▲	**R-11-NO-002**	**7**	**30.0**	**32**	**20**	**12**		**SANDY lean CLAY with GRAVEL**
★	**R-11-NO-002**	**15**	**80.0**	**94**	**39**	**55**		**ORGANIC fat CLAY**

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 - NB HOV WIDENING PROJECT - N NOVATO OH WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG | **PLATE NO: B-3**



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING SAMPLE #	DEPTH (ft)	Classification	LL	PL	PI	Cc	Cu
●	R-11-NO-001	13 60.0	Well-graded SAND with CLAY and GRAVEL				1.12	31.01
⧓	R-11-NO-002	2 4.5	CLAYEY SAND with GRAVEL					
▲	R-11-NO-002	5 20.0	CLAYEY SAND with GRAVEL					
★	R-11-NO-002	8 35.0	Poorly graded SAND with CLAY and GRAVEL				5.18	119.56
⊙	R-11-NO-002	10 45.0	CLAYEY SAND with GRAVEL					

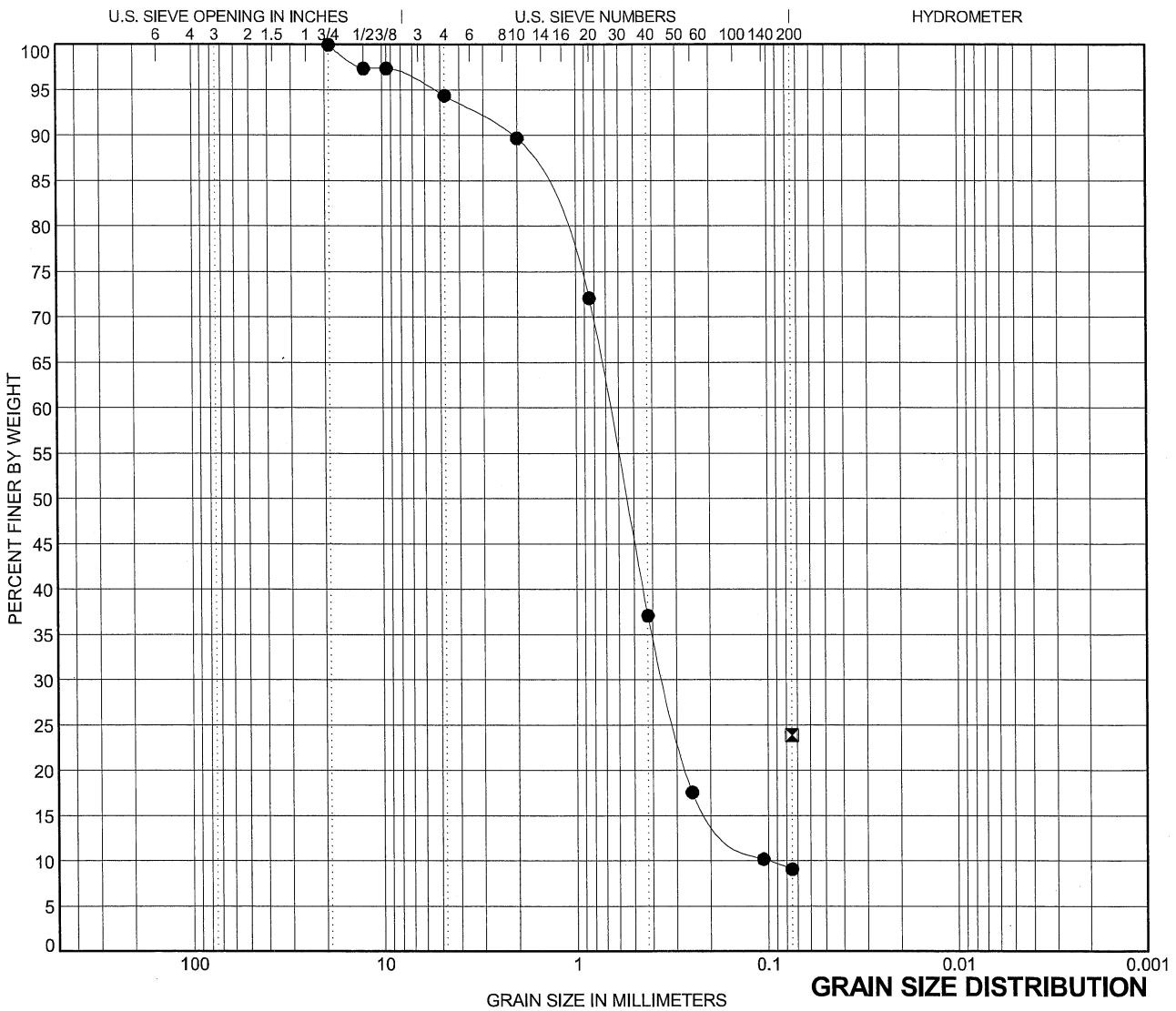
	BORING SAMPLE #	DEPTH (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-11-NO-001	13 60.0	19	3.528	0.671	0.114	33.4	59.6	7.0	
⧓	R-11-NO-002	2 4.5	0.075						31.0	
▲	R-11-NO-002	5 20.0	19	2.613	0.26		28.6	51.0	20.4	
★	R-11-NO-002	8 35.0	25	5.091	1.06		41.4	46.8	11.8	
⊙	R-11-NO-002	10 45.0	19	2.704	0.239		30.1	48.7	21.2	

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 - NB HOV WIDENING PROJECT - N NOVATO OH WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG

PLATE NO: B-4A



GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING SAMPLE #	DEPTH (ft)	Classification	LL	PL	PI	Cc	Cu
●	R-11-NO-002 13	60.0	Well-graded SAND with SILT				1.84	6.72
⧓	R-11-NO-002 14	70.0	SILTY SAND					

	BORING SAMPLE #	DEPTH (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	R-11-NO-002 13	60.0	19	0.669	0.35	0.1	5.6	85.3	9.1	
⧓	R-11-NO-002 14	70.0	0.075						23.9	

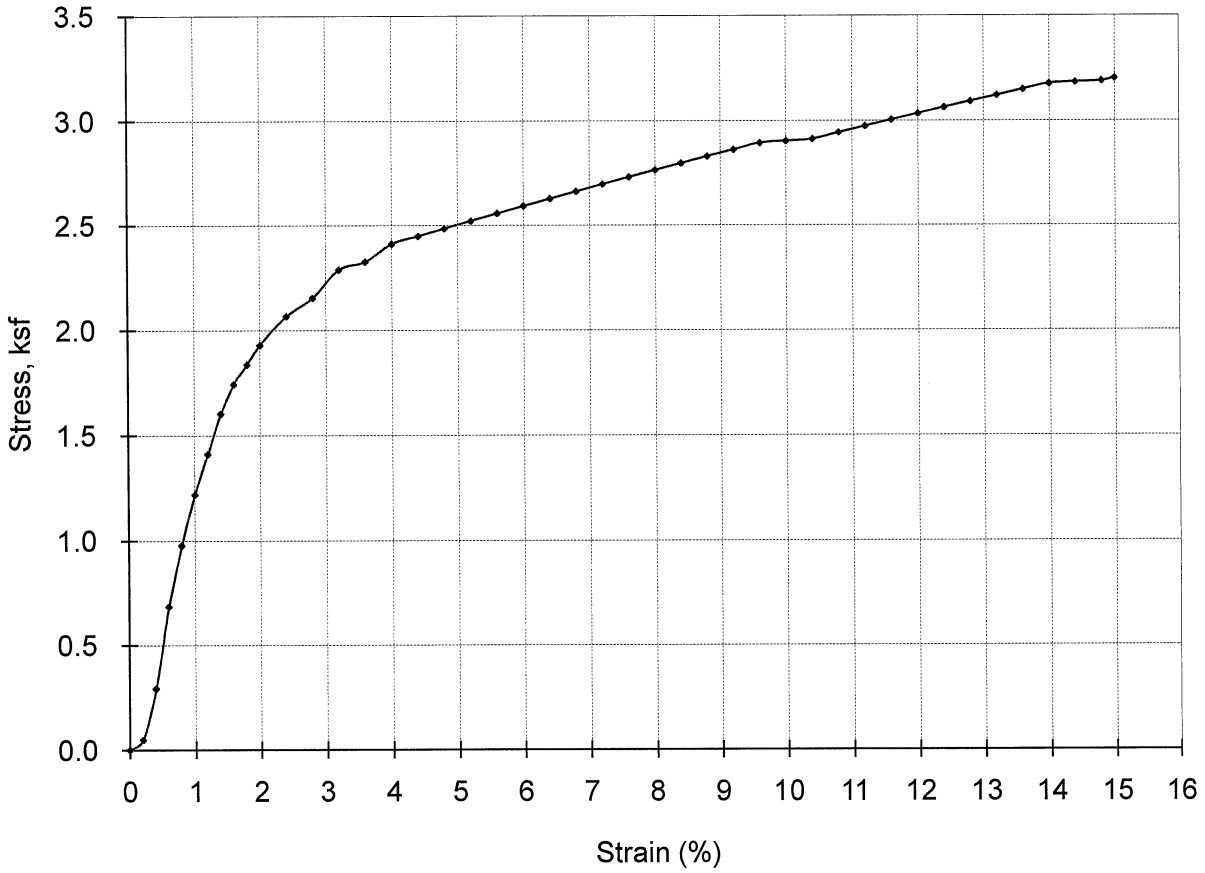
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 - NB HOV WIDENING PROJECT - N NOVATO OH WIDEN, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-BRG

PLATE NO: B-4B

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-001

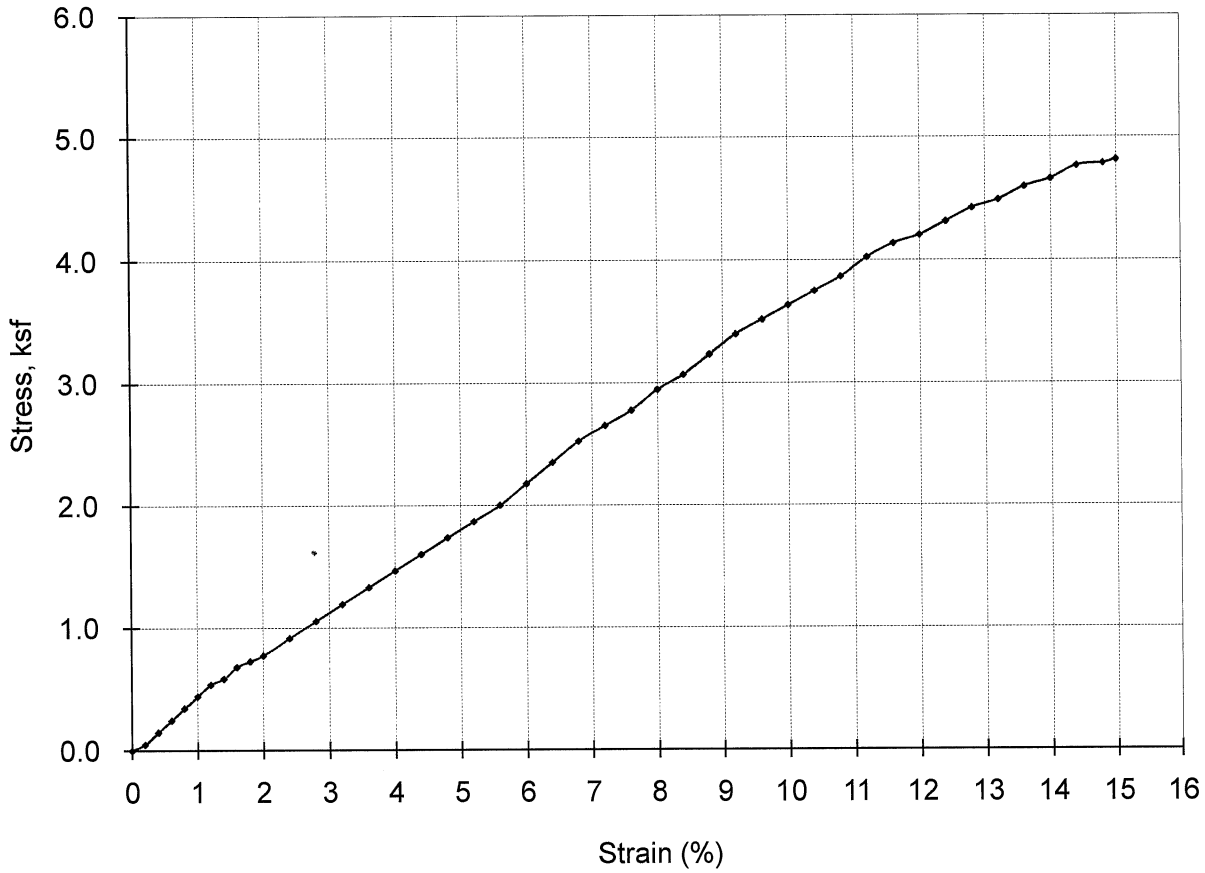
Sample No. : 5 **Strength (ksf):** 3.20

Depth (feet): 20 **Strain (%):** 15.00

Material Description:
Very Stiff, Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN** **NOVOTO, MARIN COUNTY, CALIFORNIA**	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5A

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-001

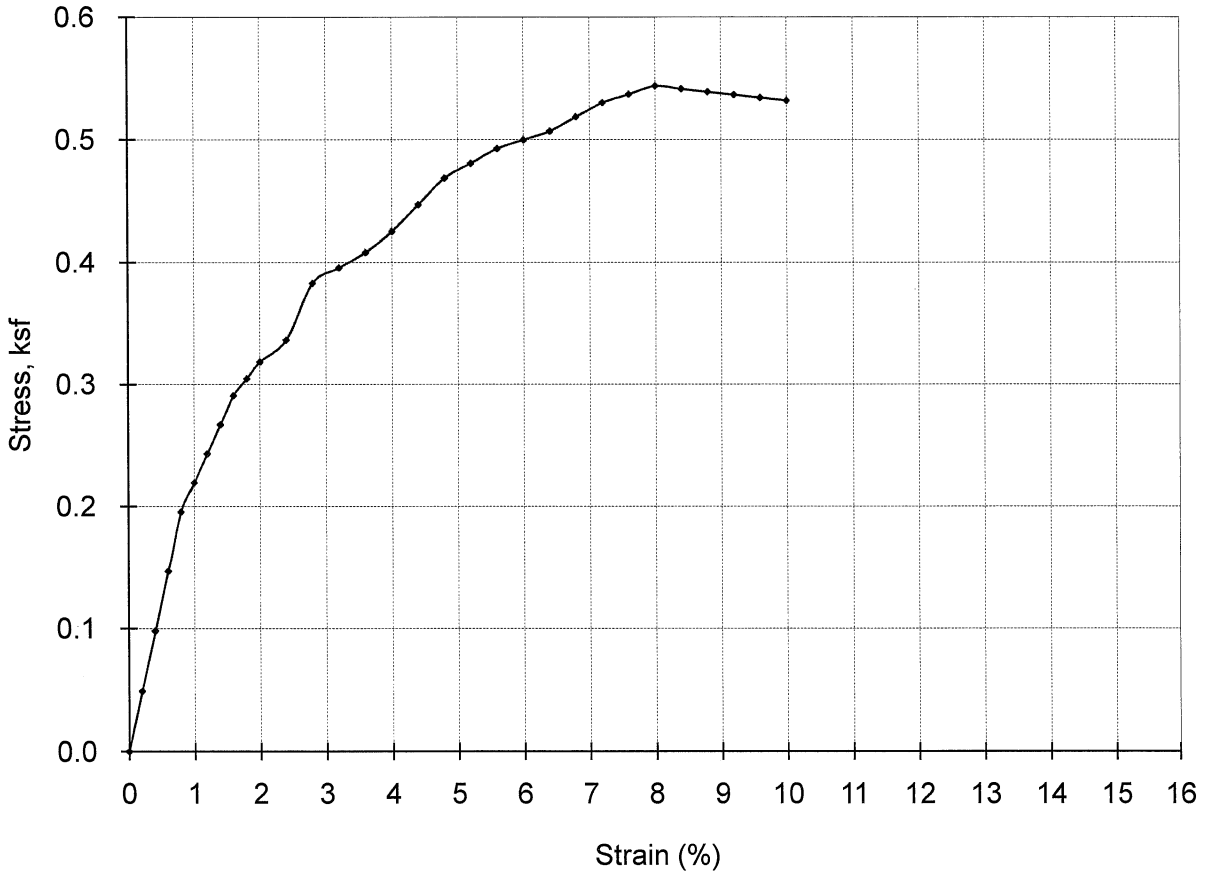
Sample No. : 6 **Strength (ksf):** 4.81

Depth (feet): 25 **Strain (%):** 15.00

Material Description:
Hard, Sandy Lean Clay

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5B

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

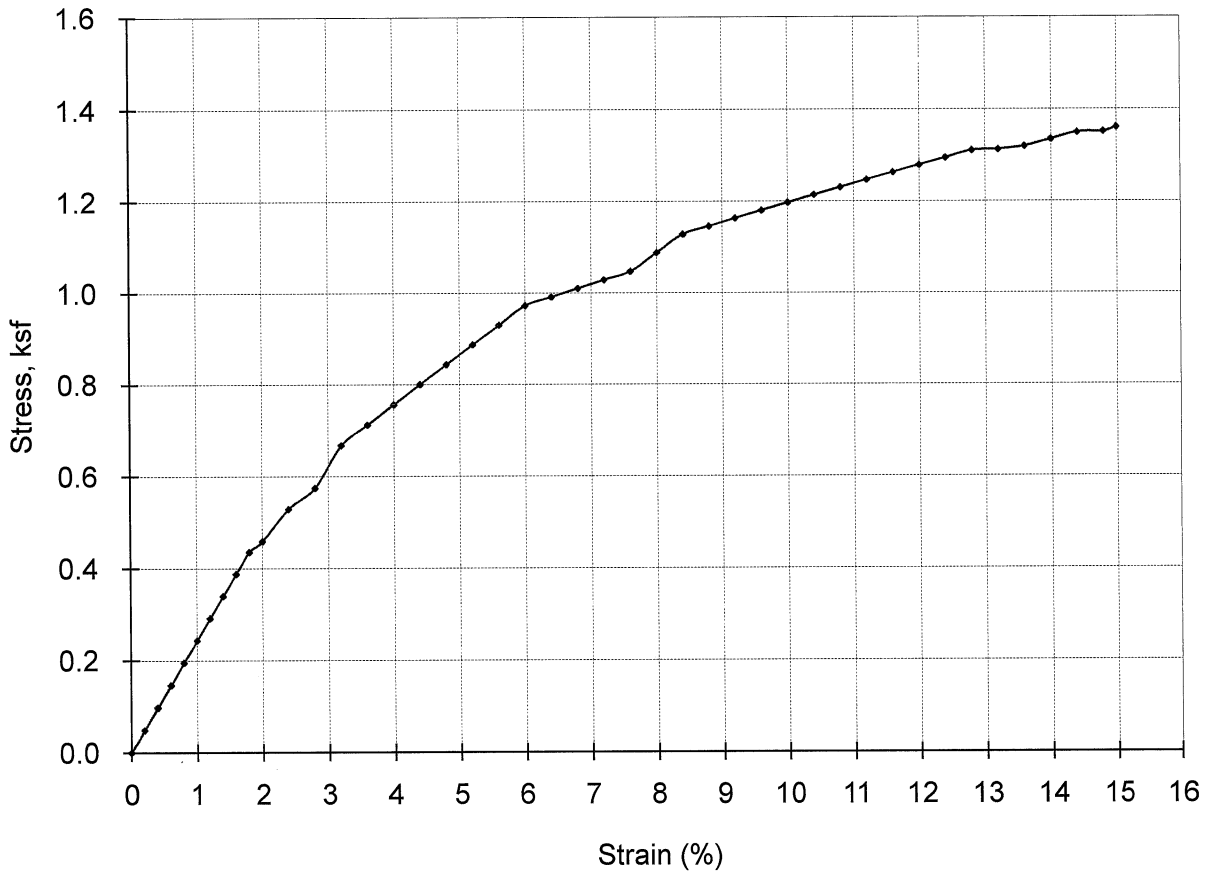
Sample No. : 9 **Maximum Strength (ksf):** 0.54

Depth (feet): 40 **Strain @ Failure (%):** 7.60

Material Description:
Solf, Lean Clay with Gravel

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN** **NOVOTO, MARIN COUNTY, CALIFORNIA**	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5C

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

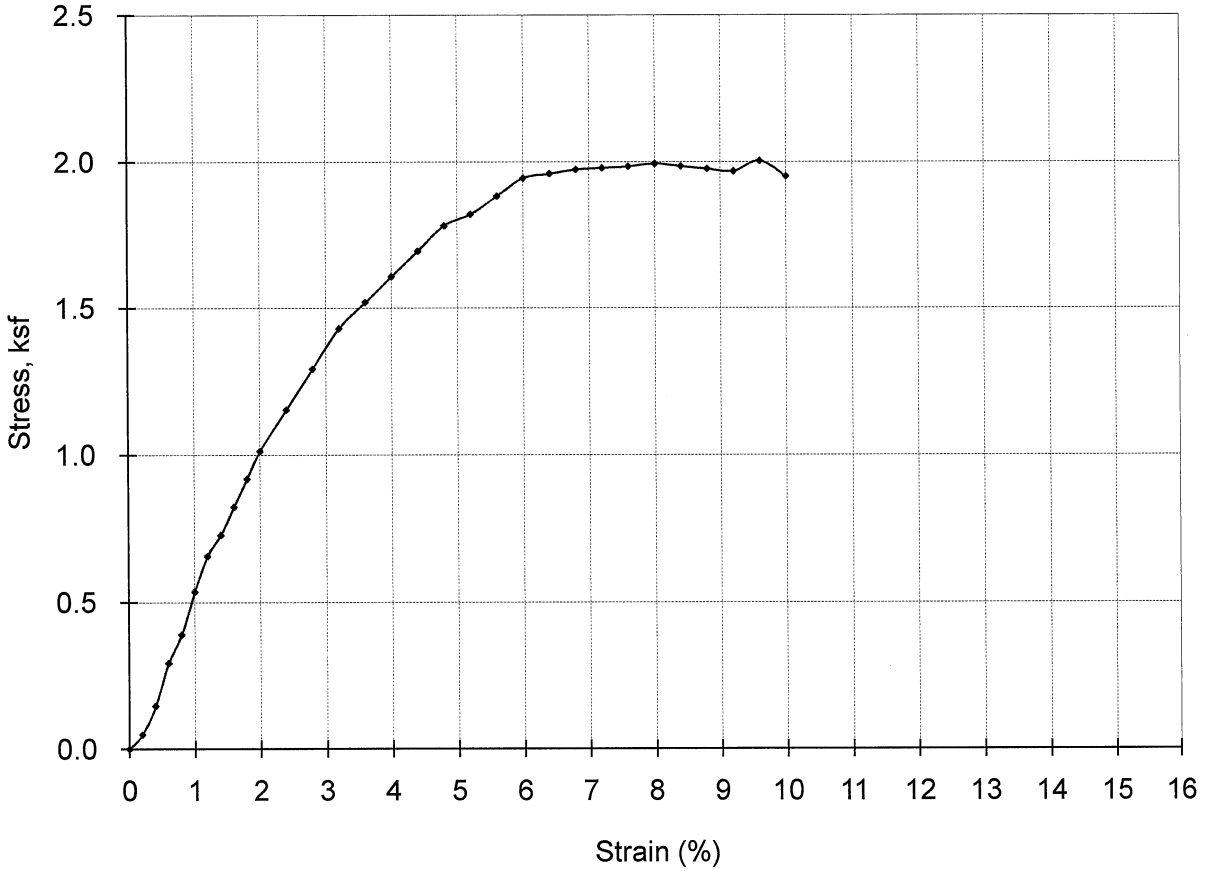
Sample No. : 11 **Strength (ksf):** 1.36

Depth (feet): 50 **Strain (%):** 15.00

Material Description:
Firm, Lean Clay with Sand

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5D

UNCONFINED COMPRESSION TEST



Boring No.: R-11-N0-002

Sample No. : 16 **Maximum Strength (ksf):** 2.00

Depth (feet): 90' **Strain @ Failure (%):** 9.60

Material Description:
Firm, Lean Clay with Gravel

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	MSN A3 - NB HOV WIDENING PROJECT - NORTH NOVATO OVERHEAD WIDEN NOVOTO, MARIN COUNTY, CALIFORNIA	
	JOB NO.: 2011-145-BRG	PLATE NO.: B-5E

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 12/16/2011
Date Submitted 12/13/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-BRG Site ID : R-11NO-001#4@15.
Thank you for your business.

* For future reference to this analysis please use SUN # 61493-126386.

EVALUATION FOR SOIL CORROSION

Soil pH	8.11		
Minimum Resistivity	0.51 ohm-cm (x1000)		
Chloride	149.4 ppm	00.01494	%
Sulfate	40.4 ppm	00.00404	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

PLATE NO. B-6A

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/04/2011
Date Submitted 11/01/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-BRG/MSN A3 Site ID : R-11NO002#4@15'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61292-125955.

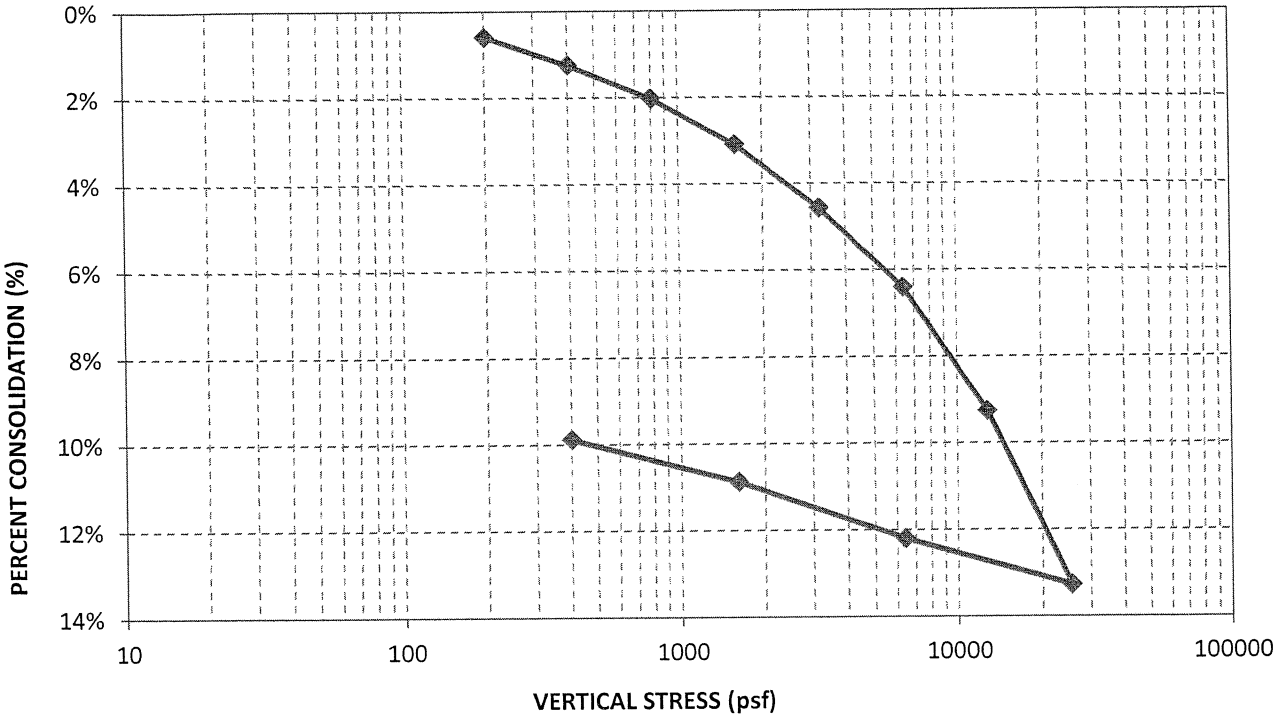
EVALUATION FOR SOIL CORROSION

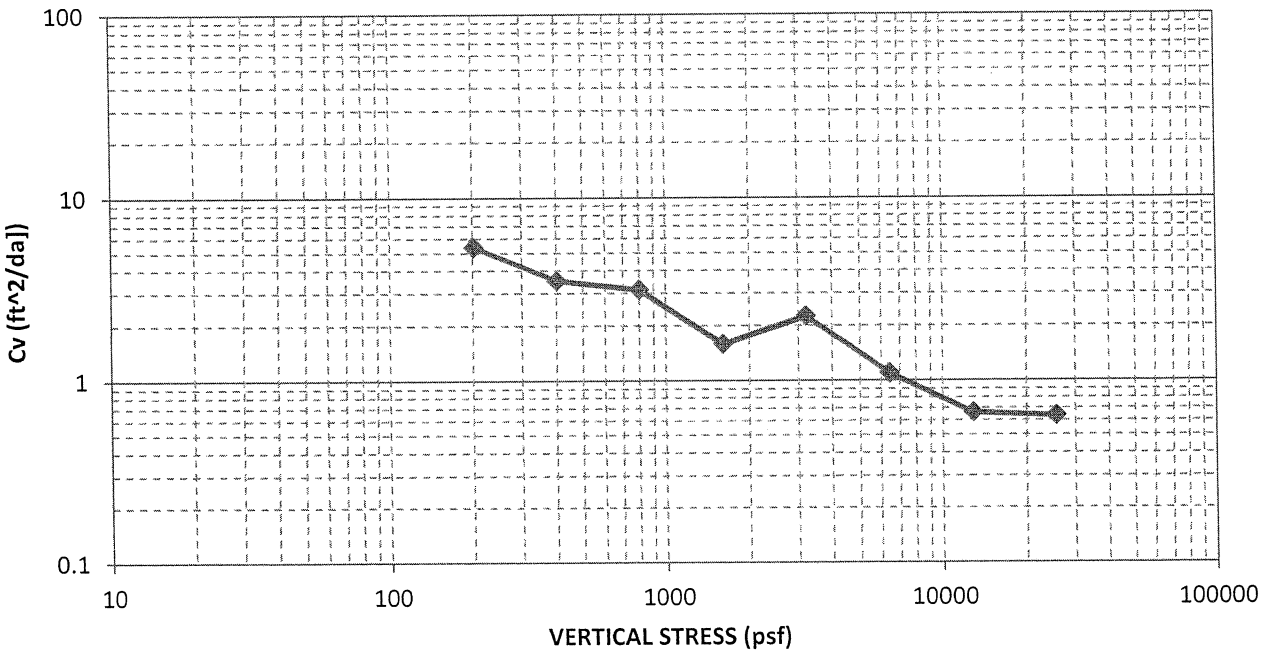
Soil pH	7.71	
Minimum Resistivity	1.21 ohm-cm (x1000)	
Chloride	44.6 ppm	00.00446 %
Sulfate	200.1 ppm	00.02001 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

PLATE NO. B-6B

CONSOLIDATION TEST RESULT





	Moisture Content (%)	Bulk Density (psf)	Dry Density (psf)
Initial	27.0	129.36	101.85
Final	21.8	137.64	113.01

Boring No.	R-11-N0-001
Sample No.	14
Depth (ft)	70.0'
Soil Description:	LEAN CLAY (CL), dark gray

PARIKH

Practicing in the Geosciences

MNS A3 WIDENING PROJECT - NORTH NOVATO OVERHEAD, NOVATO, CA.

JOB NO.: 2011-145-BRG | PLATE NO.: B-7

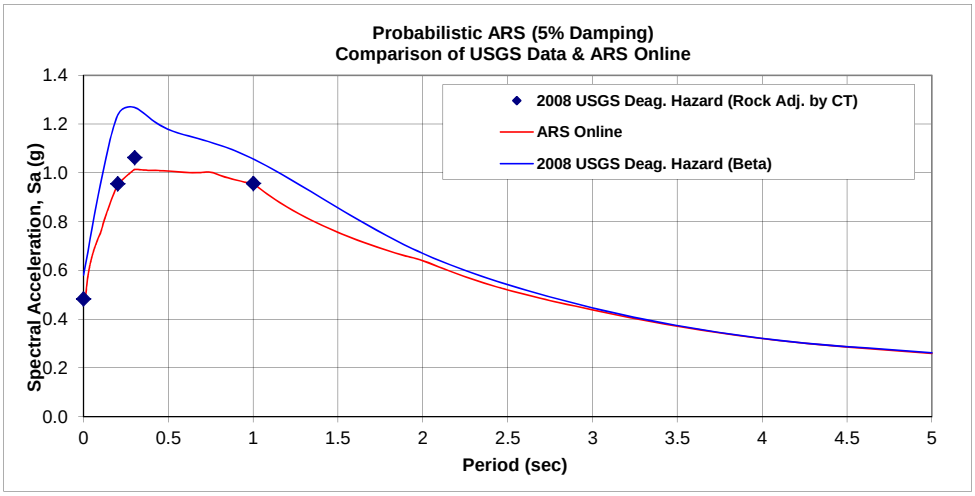
APPENDIX C

ARS Calculated Spectra Deterministic and Probabilistic Input Data

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data (unlock spreadsheet "shmi")
Spectral Accelerations Points from USGS Website at http://earthquake.usgs.gov/research/hazmaps/products_data/2008/data/

*** Note: This spreadsheet uses the given latitude and longitude data provided by the user to estimate spectral acceleration values with a probability of exceedence 5% in 50 yrs (or 975 yr return period). The four spectral acceleration data points plotted on the graph are from the USGS website and are based on a 0.05 degree grid. Basic interpolation is used to estimate intermediate values inside each grid. Raw Data points are provided in the tabs of this spreadsheet. Corner grid spectral acceleration data are shown in the "calculation" tab.**

Input Site Information	
Latitude	Longitude
38.1220	-122.5658
V_{S30} (m/s) =	230
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1
$Z_{1.0}$ (m) =	335
$Z_{2.5}$ (km) =	2.00



Place ARS Online Probabilistic Data Here "Paste"

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.482	1	1	0.482
0.02	0.551	1	1	0.551
0.022	0.561	1	1	0.561
0.025	0.576	1	1	0.576
0.029	0.593	1	1	0.593
0.03	0.596	1	1	0.596
0.032	0.604	1	1	0.604
0.035	0.615	1	1	0.615
0.036	0.618	1	1	0.618
0.04	0.631	1	1	0.631
0.042	0.637	1	1	0.637
0.044	0.643	1	1	0.643
0.045	0.645	1	1	0.645
0.046	0.648	1	1	0.648
0.048	0.654	1	1	0.654
0.05	0.659	1	1	0.659
0.055	0.671	1	1	0.671
0.06	0.683	1	1	0.683
0.065	0.693	1	1	0.693
0.067	0.697	1	1	0.697
0.07	0.703	1	1	0.703
0.075	0.713	1	1	0.713
0.08	0.722	1	1	0.722
0.085	0.731	1	1	0.731
0.09	0.739	1	1	0.739
0.095	0.746	1	1	0.746
0.1	0.754	1	1	0.754
0.11	0.779	1	1	0.779
0.12	0.802	1	1	0.802
0.13	0.823	1	1	0.823
0.133	0.83	1	1	0.83
0.14	0.844	1	1	0.844
0.15	0.864	1	1	0.864
0.16	0.883	1	1	0.883
0.17	0.901	1	1	0.901
0.18	0.919	1	1	0.919
0.19	0.935	1	1	0.935
0.2	0.952	1	1	0.952
0.22	0.966	1	1	0.966
0.24	0.979	1	1	0.979
0.25	0.986	1	1	0.986
0.26	0.992	1	1	0.992
0.28	1.003	1	1	1.003
0.29	1.009	1	1	1.009

Analysis of ARS Online Results vs USGS Deaggregation Hazard (Adj. By CT)

Period (sec)	USGS Interpolated Spectral Accel.	Adj. for Near Fault Effect	Adj. for Soil Amplification	Adj. For Basin Effect	Final Adj. USGS Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.590	1.000	0.818	1.000	0.483	0.482	0.2%
0.2	1.476	1.000	0.648	1.000	0.956	0.952	0.4%
0.3	1.232	1.000	0.863	1.000	1.063	1.014	4.6%
1	0.484	1.200	1.649	1.000	0.957	0.955	0.2%

Max % Difference = **4.6%**

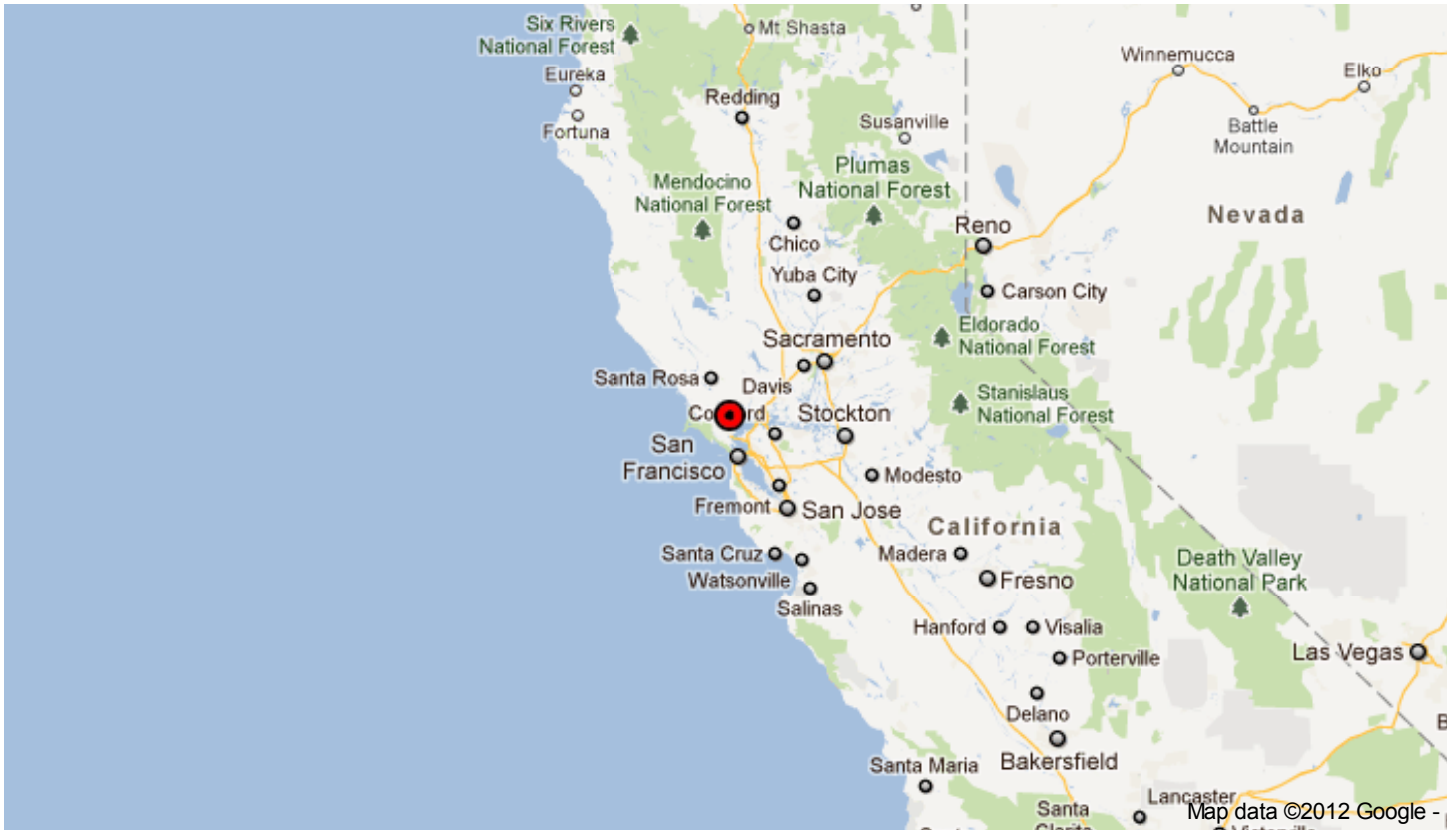
USGS Deaggregation Hazard (Beta) with Near Field and Basin Factors

Period (sec)	INPUT USGS Deagg. Spec Accel	Adj. for Near Fault Effect	Adj. For Basin Effect	Final Adj. USGS Deagg Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.5816	1.000	1.000	0.582	0.482	*17.1%*
0.1	0.9563	1.000	1.000	0.956	0.754	*21.2%*
0.2	1.236	1.000	1.000	1.236	0.952	*23.0%*
0.3	1.2684	1.000	1.000	1.268	1.014	*20.1%*
0.5	1.1783	1.000	1.000	1.178	1.008	14.5%
1	0.8809	1.200	1.000	1.057	0.955	9.7%
2	0.5579	1.200	1.000	0.669	0.64	4.4%
3	0.3722	1.200	1.000	0.447	0.439	1.7%
4	0.2677	1.200	1.000	0.321	0.32	0.4%
5	0.2184	1.200	1.000	0.262	0.26	0.8%

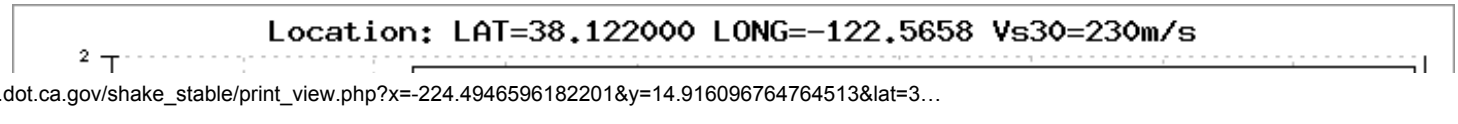
Max % Difference = **14.5%**

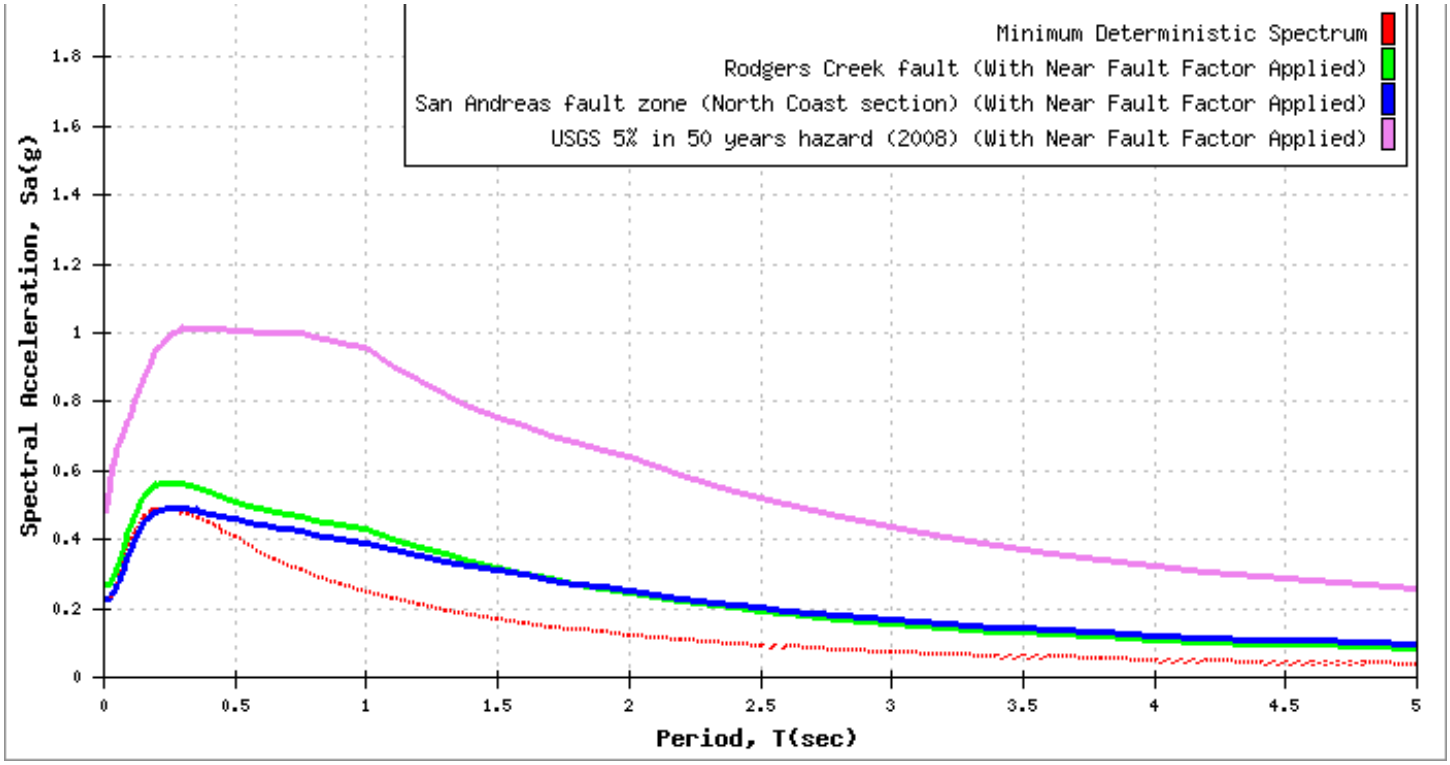
0.3	1.014	1	1	1.014
0.32	1.014	1	1	1.014
0.34	1.013	1	1	1.013
0.35	1.012	1	1	1.012
0.36	1.012	1	1	1.012
0.38	1.011	1	1	1.011
0.4	1.011	1	1	1.011
0.42	1.01	1	1	1.01
0.44	1.01	1	1	1.01
0.45	1.009	1	1	1.009
0.46	1.009	1	1	1.009
0.48	1.009	1	1	1.009
0.5	1.008	1	1	1.008
0.55	0.985	1	1.02	1.004
0.6	0.964	1	1.04	1.002
0.65	0.945	1	1.06	1.001
0.667	0.939	1	1.067	1.001
0.7	0.927	1	1.08	1.002
0.75	0.912	1	1.1	1.003
0.8	0.884	1	1.12	0.991
0.85	0.86	1	1.14	0.98
0.9	0.837	1	1.16	0.971
0.95	0.816	1	1.18	0.962
1	0.796	1	1.2	0.955
1.1	0.754	1	1.2	0.904
1.2	0.717	1	1.2	0.86
1.3	0.684	1	1.2	0.821
1.4	0.656	1	1.2	0.787
1.5	0.63	1	1.2	0.756
1.6	0.607	1	1.2	0.728
1.7	0.586	1	1.2	0.703
1.8	0.567	1	1.2	0.68
1.9	0.55	1	1.2	0.659
2	0.534	1	1.2	0.64
2.2	0.488	1	1.2	0.586
2.4	0.45	1	1.2	0.54
2.5	0.434	1	1.2	0.52
2.6	0.418	1	1.2	0.502
2.8	0.39	1	1.2	0.468
3	0.366	1	1.2	0.439
3.2	0.341	1	1.2	0.409
3.4	0.319	1	1.2	0.383
3.5	0.309	1	1.2	0.371
3.6	0.3	1	1.2	0.36
3.8	0.282	1	1.2	0.339
4	0.267	1	1.2	0.32
4.2	0.255	1	1.2	0.306
4.4	0.244	1	1.2	0.293
4.6	0.234	1	1.2	0.281
4.8	0.225	1	1.2	0.27
5	0.217	1	1.2	0.26

SELECT SITE LOCATION



CALCULATED SPECTRA





SITE DATA

Shear Wave Velocity, Vs_{30}:	230 m/s
Latitude:	38.122000
Longitude:	-122.565800
Depth to Vs = 1.0 km/s:	335 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Rodgers Creek fault

Fault ID:	157
Maximum Magnitude (MMax):	7.1
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	12.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	11.23 km
Rjb:	11.23 km
Rx:	11.23 km
Fnorm:	0

Frev: 0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.268	1.000	1.000	0.268
0.02	0.271	1.000	1.000	0.271
0.022	0.273	1.000	1.000	0.273
0.025	0.276	1.000	1.000	0.276
0.029	0.280	1.000	1.000	0.280
0.03	0.281	1.000	1.000	0.281
0.032	0.284	1.000	1.000	0.284
0.035	0.289	1.000	1.000	0.289
0.036	0.291	1.000	1.000	0.291
0.04	0.297	1.000	1.000	0.297
0.042	0.300	1.000	1.000	0.300
0.044	0.304	1.000	1.000	0.304
0.045	0.305	1.000	1.000	0.305
0.046	0.307	1.000	1.000	0.307
0.048	0.311	1.000	1.000	0.311
0.05	0.314	1.000	1.000	0.314
0.055	0.326	1.000	1.000	0.326
0.06	0.337	1.000	1.000	0.337
0.065	0.349	1.000	1.000	0.349
0.067	0.354	1.000	1.000	0.354
0.07	0.361	1.000	1.000	0.361
0.075	0.373	1.000	1.000	0.373
0.08	0.386	1.000	1.000	0.386
0.085	0.398	1.000	1.000	0.398
0.09	0.411	1.000	1.000	0.411
0.095	0.423	1.000	1.000	0.423
0.1	0.435	1.000	1.000	0.435
0.11	0.455	1.000	1.000	0.455
0.12	0.474	1.000	1.000	0.474
0.13	0.491	1.000	1.000	0.491
0.133	0.496	1.000	1.000	0.496
0.14	0.506	1.000	1.000	0.506
0.15	0.520	1.000	1.000	0.520
0.16	0.530	1.000	1.000	0.530
0.17	0.538	1.000	1.000	0.538
0.18	0.545	1.000	1.000	0.545
0.19	0.551	1.000	1.000	0.551
0.2	0.557	1.000	1.000	0.557
0.22	0.561	1.000	1.000	0.561
0.24	0.564	1.000	1.000	0.564

0.25	0.564	1.000	1.000	0.564
0.26	0.564	1.000	1.000	0.564
0.28	0.564	1.000	1.000	0.564
0.29	0.563	1.000	1.000	0.563
0.3	0.563	1.000	1.000	0.563
0.32	0.559	1.000	1.000	0.559
0.34	0.554	1.000	1.000	0.554
0.35	0.551	1.000	1.000	0.551
0.36	0.549	1.000	1.000	0.549
0.38	0.543	1.000	1.000	0.543
0.4	0.538	1.000	1.000	0.538
0.42	0.532	1.000	1.000	0.532
0.44	0.527	1.000	1.000	0.527
0.45	0.524	1.000	1.000	0.524
0.46	0.521	1.000	1.000	0.521
0.48	0.516	1.000	1.000	0.516
0.5	0.511	1.000	1.000	0.511
0.55	0.490	1.000	1.020	0.499
0.6	0.471	1.000	1.040	0.489
0.65	0.453	1.000	1.060	0.480
0.667	0.448	1.000	1.067	0.478
0.7	0.438	1.000	1.080	0.473
0.75	0.423	1.000	1.100	0.465
0.8	0.408	1.000	1.120	0.457
0.85	0.394	1.000	1.140	0.449
0.9	0.381	1.000	1.160	0.442
0.95	0.369	1.000	1.180	0.436
1	0.358	1.000	1.200	0.429
1.1	0.335	1.000	1.200	0.402
1.2	0.315	1.000	1.200	0.379
1.3	0.298	1.000	1.200	0.357
1.4	0.282	1.000	1.200	0.338
1.5	0.267	1.000	1.200	0.320
1.6	0.252	1.000	1.200	0.302
1.7	0.238	1.000	1.200	0.286
1.8	0.226	1.000	1.200	0.271
1.9	0.215	1.000	1.200	0.258
2	0.205	1.000	1.200	0.246
2.2	0.185	1.000	1.200	0.222
2.4	0.168	1.000	1.200	0.202
2.5	0.160	1.000	1.200	0.193
2.6	0.153	1.000	1.200	0.184

2.8	0.141	1.000	1.200	0.169
3	0.130	1.000	1.200	0.156
3.2	0.120	1.000	1.200	0.144
3.4	0.112	1.000	1.200	0.134
3.5	0.108	1.000	1.200	0.130
3.6	0.104	1.000	1.200	0.125
3.8	0.098	1.000	1.200	0.117
4	0.092	1.000	1.200	0.110
4.2	0.087	1.000	1.200	0.104
4.4	0.082	1.000	1.200	0.098
4.6	0.077	1.000	1.200	0.093
4.8	0.073	1.000	1.200	0.088
5	0.070	1.000	1.200	0.084

San Andreas fault zone (North Coast section)

Fault ID:	308
Maximum Magnitude (MMax):	7.9
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	11.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	21.44 km
Rjb:	21.44 km
Rx:	21.44 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.227	1.000	1.000	0.227
0.02	0.229	1.000	1.000	0.229
0.022	0.231	1.000	1.000	0.231
0.025	0.234	1.000	1.000	0.234
0.029	0.237	1.000	1.000	0.237
0.03	0.238	1.000	1.000	0.238
0.032	0.240	1.000	1.000	0.240
0.035	0.244	1.000	1.000	0.244
0.036	0.245	1.000	1.000	0.245
0.04	0.250	1.000	1.000	0.250
0.042	0.253	1.000	1.000	0.253
0.044	0.256	1.000	1.000	0.256
0.045	0.258	1.000	1.000	0.258

0.046	0.259	1.000	1.000	0.259
0.048	0.262	1.000	1.000	0.262
0.05	0.265	1.000	1.000	0.265
0.055	0.274	1.000	1.000	0.274
0.06	0.284	1.000	1.000	0.284
0.065	0.293	1.000	1.000	0.293
0.067	0.297	1.000	1.000	0.297
0.07	0.303	1.000	1.000	0.303
0.075	0.313	1.000	1.000	0.313
0.08	0.324	1.000	1.000	0.324
0.085	0.334	1.000	1.000	0.334
0.09	0.345	1.000	1.000	0.345
0.095	0.356	1.000	1.000	0.356
0.1	0.366	1.000	1.000	0.366
0.11	0.384	1.000	1.000	0.384
0.12	0.401	1.000	1.000	0.401
0.13	0.417	1.000	1.000	0.417
0.133	0.421	1.000	1.000	0.421
0.14	0.431	1.000	1.000	0.431
0.15	0.443	1.000	1.000	0.443
0.16	0.452	1.000	1.000	0.452
0.17	0.460	1.000	1.000	0.460
0.18	0.468	1.000	1.000	0.468
0.19	0.474	1.000	1.000	0.474
0.2	0.480	1.000	1.000	0.480
0.22	0.485	1.000	1.000	0.485
0.24	0.490	1.000	1.000	0.490
0.25	0.491	1.000	1.000	0.491
0.26	0.492	1.000	1.000	0.492
0.28	0.493	1.000	1.000	0.493
0.29	0.493	1.000	1.000	0.493
0.3	0.493	1.000	1.000	0.493
0.32	0.490	1.000	1.000	0.490
0.34	0.486	1.000	1.000	0.486
0.35	0.484	1.000	1.000	0.484
0.36	0.482	1.000	1.000	0.482
0.38	0.477	1.000	1.000	0.477
0.4	0.472	1.000	1.000	0.472
0.42	0.470	1.000	1.000	0.470
0.44	0.468	1.000	1.000	0.468
0.45	0.467	1.000	1.000	0.467
0.46	0.466	1.000	1.000	0.466
0.48	0.464	1.000	1.000	0.464

0.5	0.461	1.000	1.000	0.461
0.55	0.449	1.000	1.007	0.452
0.6	0.437	1.000	1.014	0.443
0.65	0.427	1.000	1.021	0.436
0.667	0.423	1.000	1.024	0.433
0.7	0.417	1.000	1.028	0.429
0.75	0.408	1.000	1.036	0.422
0.8	0.397	1.000	1.043	0.414
0.85	0.388	1.000	1.050	0.407
0.9	0.378	1.000	1.057	0.400
0.95	0.370	1.000	1.064	0.394
1	0.362	1.000	1.071	0.387
1.1	0.345	1.000	1.071	0.369
1.2	0.329	1.000	1.071	0.353
1.3	0.315	1.000	1.071	0.338
1.4	0.303	1.000	1.071	0.324
1.5	0.291	1.000	1.071	0.311
1.6	0.277	1.000	1.071	0.297
1.7	0.265	1.000	1.071	0.284
1.8	0.254	1.000	1.071	0.272
1.9	0.243	1.000	1.071	0.261
2	0.234	1.000	1.071	0.251
2.2	0.214	1.000	1.071	0.229
2.4	0.196	1.000	1.071	0.210
2.5	0.188	1.000	1.071	0.202
2.6	0.181	1.000	1.071	0.194
2.8	0.168	1.000	1.071	0.180
3	0.156	1.000	1.071	0.167
3.2	0.146	1.000	1.071	0.156
3.4	0.136	1.000	1.071	0.146
3.5	0.132	1.000	1.071	0.142
3.6	0.128	1.000	1.071	0.137
3.8	0.121	1.000	1.071	0.129
4	0.114	1.000	1.071	0.122
4.2	0.108	1.000	1.071	0.116
4.4	0.103	1.000	1.071	0.111
4.6	0.098	1.000	1.071	0.105
4.8	0.094	1.000	1.071	0.101
5	0.090	1.000	1.071	0.096

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.482	1.000	1.000	0.482
0.02	0.551	1.000	1.000	0.551
0.022	0.561	1.000	1.000	0.561
0.025	0.576	1.000	1.000	0.576
0.029	0.593	1.000	1.000	0.593
0.03	0.596	1.000	1.000	0.596
0.032	0.604	1.000	1.000	0.604
0.035	0.615	1.000	1.000	0.615
0.036	0.618	1.000	1.000	0.618
0.04	0.631	1.000	1.000	0.631
0.042	0.637	1.000	1.000	0.637
0.044	0.643	1.000	1.000	0.643
0.045	0.645	1.000	1.000	0.645
0.046	0.648	1.000	1.000	0.648
0.048	0.654	1.000	1.000	0.654
0.05	0.659	1.000	1.000	0.659
0.055	0.671	1.000	1.000	0.671
0.06	0.683	1.000	1.000	0.683
0.065	0.693	1.000	1.000	0.693
0.067	0.697	1.000	1.000	0.697
0.07	0.703	1.000	1.000	0.703
0.075	0.713	1.000	1.000	0.713
0.08	0.722	1.000	1.000	0.722
0.085	0.731	1.000	1.000	0.731
0.09	0.739	1.000	1.000	0.739
0.095	0.746	1.000	1.000	0.746
0.1	0.754	1.000	1.000	0.754
0.11	0.779	1.000	1.000	0.779
0.12	0.802	1.000	1.000	0.802
0.13	0.823	1.000	1.000	0.823
0.133	0.830	1.000	1.000	0.830
0.14	0.844	1.000	1.000	0.844
0.15	0.864	1.000	1.000	0.864
0.16	0.883	1.000	1.000	0.883
0.17	0.901	1.000	1.000	0.901
0.18	0.919	1.000	1.000	0.919
0.19	0.935	1.000	1.000	0.935
0.2	0.952	1.000	1.000	0.952
0.22	0.966	1.000	1.000	0.966

0.24	0.979	1.000	1.000	0.979
0.25	0.986	1.000	1.000	0.986
0.26	0.992	1.000	1.000	0.992
0.28	1.003	1.000	1.000	1.003
0.29	1.009	1.000	1.000	1.009
0.3	1.014	1.000	1.000	1.014
0.32	1.014	1.000	1.000	1.014
0.34	1.013	1.000	1.000	1.013
0.35	1.012	1.000	1.000	1.012
0.36	1.012	1.000	1.000	1.012
0.38	1.011	1.000	1.000	1.011
0.4	1.011	1.000	1.000	1.011
0.42	1.010	1.000	1.000	1.010
0.44	1.010	1.000	1.000	1.010
0.45	1.009	1.000	1.000	1.009
0.46	1.009	1.000	1.000	1.009
0.48	1.009	1.000	1.000	1.009
0.5	1.008	1.000	1.000	1.008
0.55	0.985	1.000	1.020	1.004
0.6	0.964	1.000	1.040	1.002
0.65	0.945	1.000	1.060	1.001
0.667	0.939	1.000	1.067	1.001
0.7	0.927	1.000	1.080	1.002
0.75	0.912	1.000	1.100	1.003
0.8	0.884	1.000	1.120	0.991
0.85	0.860	1.000	1.140	0.980
0.9	0.837	1.000	1.160	0.971
0.95	0.816	1.000	1.180	0.962
1	0.796	1.000	1.200	0.955
1.1	0.754	1.000	1.200	0.904
1.2	0.717	1.000	1.200	0.860
1.3	0.684	1.000	1.200	0.821
1.4	0.656	1.000	1.200	0.787
1.5	0.630	1.000	1.200	0.756
1.6	0.607	1.000	1.200	0.728
1.7	0.586	1.000	1.200	0.703
1.8	0.567	1.000	1.200	0.680
1.9	0.550	1.000	1.200	0.659
2	0.534	1.000	1.200	0.640
2.2	0.488	1.000	1.200	0.586
2.4	0.450	1.000	1.200	0.540
2.5	0.434	1.000	1.200	0.520
2.6	0.418	1.000	1.200	0.502

2.8	0.390	1.000	1.200	0.468
3	0.366	1.000	1.200	0.439
3.2	0.341	1.000	1.200	0.409
3.4	0.319	1.000	1.200	0.383
3.5	0.309	1.000	1.200	0.371
3.6	0.300	1.000	1.200	0.360
3.8	0.282	1.000	1.200	0.339
4	0.267	1.000	1.200	0.320
4.2	0.255	1.000	1.200	0.306
4.4	0.244	1.000	1.200	0.293
4.6	0.234	1.000	1.200	0.281
4.8	0.225	1.000	1.200	0.270
5	0.217	1.000	1.200	0.260

MINIMUM DETERMINISTIC SPECTRUM

Period	SA
0.01	0.224
0.02	0.226
0.022	0.228
0.025	0.231
0.029	0.234
0.03	0.235
0.032	0.239
0.035	0.243
0.036	0.245
0.04	0.250
0.042	0.253
0.044	0.257
0.045	0.258
0.046	0.260
0.048	0.263
0.05	0.266
0.055	0.278
0.06	0.289
0.065	0.300
0.067	0.305
0.07	0.312
0.075	0.323
0.08	0.335
0.085	0.347

0.09	0.359
0.095	0.371
0.1	0.382
0.11	0.401
0.12	0.418
0.13	0.434
0.133	0.438
0.14	0.448
0.15	0.460
0.16	0.467
0.17	0.473
0.18	0.479
0.19	0.483
0.2	0.487
0.22	0.488
0.24	0.487
0.25	0.486
0.26	0.485
0.28	0.482
0.29	0.481
0.3	0.479
0.32	0.473
0.34	0.466
0.35	0.463
0.36	0.460
0.38	0.453
0.4	0.446
0.42	0.438
0.44	0.430
0.45	0.426
0.46	0.422
0.48	0.414
0.5	0.407
0.55	0.382
0.6	0.361
0.65	0.342
0.667	0.336
0.7	0.325
0.75	0.310
0.8	0.295
0.85	0.281
0.9	0.268
0.95	0.257

0.95	0.254
1	0.246
1.1	0.226
1.2	0.209
1.3	0.194
1.4	0.180
1.5	0.168
1.6	0.157
1.7	0.147
1.8	0.137
1.9	0.129
2	0.122
2.2	0.108
2.4	0.097
2.5	0.092
2.6	0.088
2.8	0.080
3	0.073
3.2	0.067
3.4	0.062
3.5	0.060
3.6	0.057
3.8	0.053
4	0.050
4.2	0.047
4.4	0.044
4.6	0.041
4.8	0.039
5	0.037

Envelope Data

Period	SA
0.01	0.482
0.02	0.551
0.022	0.561
0.025	0.576
0.029	0.593
0.03	0.596
0.032	0.604
0.035	0.615
0.036	0.618
0.04	0.631
0.042	0.637
0.044	0.643

0.044	0.643
0.045	0.645
0.046	0.648
0.048	0.654
0.05	0.659
0.055	0.671
0.06	0.683
0.065	0.693
0.067	0.697
0.07	0.703
0.075	0.713
0.08	0.722
0.085	0.731
0.09	0.739
0.095	0.746
0.1	0.754
0.11	0.779
0.12	0.802
0.13	0.823
0.133	0.830
0.14	0.844
0.15	0.864
0.16	0.883
0.17	0.901
0.18	0.919
0.19	0.935
0.2	0.952
0.22	0.966
0.24	0.979
0.25	0.986
0.26	0.992
0.28	1.003
0.29	1.009
0.3	1.014
0.32	1.014
0.34	1.013
0.35	1.012
0.36	1.012
0.38	1.011
0.4	1.011
0.42	1.010
0.44	1.010
0.45	1.009
0.46	1.009

0.46	1.009
0.48	1.009
0.5	1.008
0.55	1.004
0.6	1.002
0.65	1.001
0.667	1.001
0.7	1.002
0.75	1.003
0.8	0.991
0.85	0.980
0.9	0.971
0.95	0.962
1	0.955
1.1	0.904
1.2	0.860
1.3	0.821
1.4	0.787
1.5	0.756
1.6	0.728
1.7	0.703
1.8	0.680
1.9	0.659
2	0.640
2.2	0.586
2.4	0.540
2.5	0.520
2.6	0.502
2.8	0.468
3	0.439
3.2	0.409
3.4	0.383
3.5	0.371
3.6	0.360
3.8	0.339
4	0.320
4.2	0.306
4.4	0.293
4.6	0.281
4.8	0.270
5	0.260

Calculation of Shear Wave Velocity

PROJECT NAME **MSN**
PROJECT NO. **2011-145-MSN**
BORING NO. **As-built Boring B-5**

SOIL GROUPS

1. GRAVELS, SANDS AND NONPLASTIC SILTS $Vs=100.5(N_{60})^{0.29}$
2. CLAYS AND PLASTIC SILTS $Vs=86.9(N_{60})^{0.333}$
3. ROCK $Vs=109(N_{60})^{0.319}$

HAMMER ENERGY 0.6

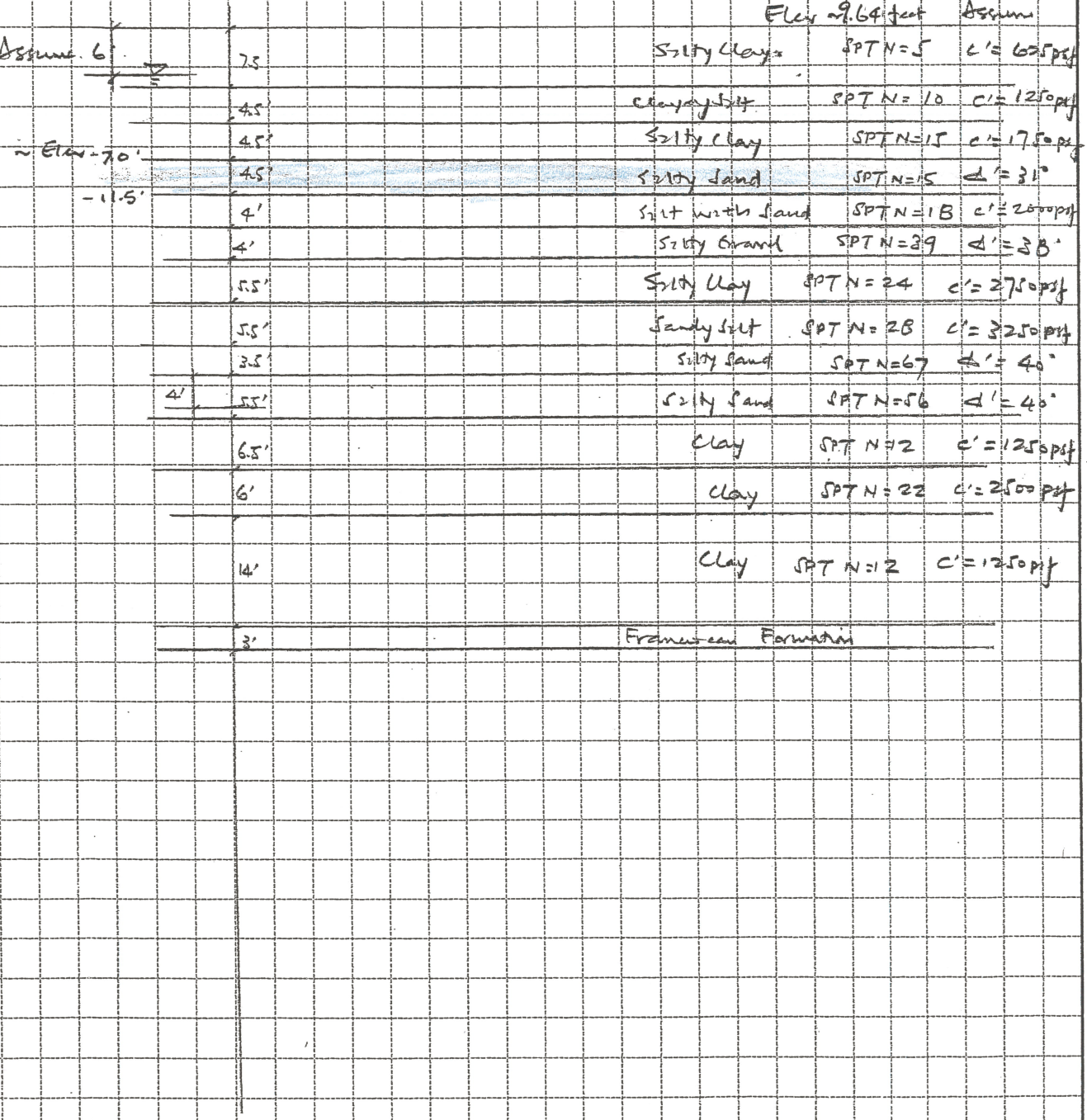
Depth (ft)		Thickness, D (ft)	Soil Type	Sample Type	N	N_{60}	Vs (m/s)	Vs (ft/s)	D/V	Vs30 (m/s)
0	8	8	1	SPT	24	24.0	252.6	828.5	0.010	229.5
8	17	9	2	SPT	12	12.0	198.8	652.0	0.014	
17	20	3	1	SPT	16	16.0	224.6	736.6	0.004	
20	29	9	2	SPT	36	36.0	286.6	940.0	0.010	
29	34	5	2	SPT	13	13.0	204.2	669.6	0.007	
34	39	5	2	SPT	25	25.0	253.8	832.5	0.006	
39	45	6	2	SPT	15	15.0	214.1	702.3	0.009	
45	50	5	2	SPT	9	9.0	180.6	592.5	0.008	
50	55	5	2	SPT	6	6.0	157.8	517.6	0.010	
55	60	5	2	SPT	5	5.0	148.5	487.1	0.010	
60	65	5	2	SPT	5	5.0	148.5	487.1	0.010	
65	77	12	2	SPT	14	14.0	209.3	686.4	0.017	
77	90	13	1	SPT	77	77.0	354.2	1161.8	0.011	
90	100	10	3	SPT	100	100.0	473.6	1553.5	0.006	

Evaluation of Liquefaction Potential

PARIKH
Practicing in the Geosciences

JOB MSN A3 Project
SHEET NO 2 OF 3
CALCULATED BY DATE 10/2021
CHECKED BY DATE
SCALE

Evaluation of Liquefaction Potential - About 5 Generalized Soil Profile (Boring B-4)



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***As-built Boring B-4***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 6

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *60%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

*F.S.=(CRR 7.5/CSR)*MSF*K σ*K α*

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*													
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	6	2	5	SPT	750	750	0.99		5.0	1.0	0.75	1.2	1.00	4.5	1.40	6.3				1.00	1	
2	7.5	2	5	SPT	937.5	850	0.98		5.0	1.0	0.75	1.2	1.15	5.2	1.35	7.0				1.00	1	
3	12	2	10	SPT	1500	1131	0.97		10.0	1.0	0.80	1.2	1.00	9.6	1.25	12.0				1.00	1	
4	16.5	2	15	SPT	2062.5	1413	0.97		15.0	1.0	0.85	1.2	1.00	15.3	1.15	17.7				1.00	1	
5	21	1	15	SPT	2625	1694	0.95	0.61	15.0	1.0	0.95	1.2	1.15	19.7	1.07	21.1	15%	24.7	0.29	1.00	1	0.44
6	25	2	18	SPT	3125	1944	0.94		18.0	1.0	0.95	1.2	1.15	23.6	1.01	23.9				1.00	1	
7	29	1	39	SPT	3625	2194	0.93	0.63	39.0	1.0	0.95	1.2	1.00	44.5	0.96	42.6	15%	47.1		0.96	1	
8	34.5	2	24	SPT	4312.5	2538	0.89		24.0	1.0	1.00	1.2	1.00	28.8	0.89	25.7				0.91	1	
9	40	2	28	SPT	5000	2881	0.85		28.0	1.0	1.00	1.2	1.00	33.6	0.83	28.0				0.86	1	
10	43.5	1	67	SPT	5437.5	3100	0.82	0.59	67.0	1.0	1.00	1.2	1.15	92.5	0.80	74.0	15%	80.0		0.84	1	
11	49	1	56	SPT	6125	3444	0.76	0.56	56.0	1.0	1.00	1.2	1.15	77.3	0.75	58.2	15%	63.5		0.80	1	
12	55.5	2	12	SPT	6937.5	3850	0.70		12.0	1.0	1.00	1.2	1.15	16.6	0.70	11.7				0.77	1	
13	61.5	2	22	SPT	7687.5	4225	0.65		22.0	1.0	1.00	1.2	1.15	30.4	0.66	20.2				0.74	1	
14	75.5	2	12	SPT	9437.5	5100	0.57		12.0	1.0	1.00	1.2	1.15	16.6	0.59	9.7				0.69	1	
15	78.5	2	50	SPT	9812.5	5288	0.55		50.0	1.0	1.00	1.2	1.15	69.0	0.57	39.5				0.68	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$

   where α and β = coefficients determined from the following relationships

   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$

   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$

   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB MSN NB Hovland Widening AS Project
SHEET NO ____ OF ____
CALCULATED BY A Lam DATE 4/2012
CHECKED BY ____ DATE ____
SCALE ____

Evaluation of Post-Liquefaction Settlement

As-built Boring B-4

Based on the result of the liquefaction potential analyses

Sample No. 5 $(N_1)_{60\text{-}cs} = 24.7$ CSR = 0.29

Volumetric strain = 1%

Post-liquefaction settlement = 4.5 x 12 x 0.01

= 0.54 inches. Say 0.5 inches

PARIKH
Practicing in the Geosciences

JOB MSN A3 Projects
SHEET NO 2 OF 4
CALCULATED BY A Lam DATE
CHECKED BY DATE
SCALE

Evaluation of Liquefaction Potential/Abut 1/Generalized Soil Profile (Boring B-8)

Depth ≈ 31.0 Elev. ~2.6 feet

	3'	Clayey Silt	SPT N=9	Assume c'=1000 psf
~Elev -6.0'	5.5'			
-8.5'	2.5'	Silty Sand	SPT N=14	φ'=31°
		Clayey Silt	SPT N=13	
-16.5	8'			c'=1500 psf
-23.0'	6.5	Silty Sand	SPT N=8	φ'=30°
	3.5'	Silt	SPT N=22	c'=2500 psf
	5.5'	Silt	SPT N=12	c'=1250 psf
	5'	Silt	SPT N=5	c'=625 psf
	5.5'	Sand	SPT N>50	φ'=38°
Elev -52.0'	7' (5')	Franciscan Formation		

LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***As-built Boring B-8***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 6

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *60%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} *(g)=* 0.63
FAULT M_w = 7.9
MSF = 0.94

*F.S.=(CRR 7.5/CSR)*MSF*Kσ*Kα*

					CYCLIC STRESS RATIO (CSR)				*LIQUEFACTION RESISTANCE ($CRR_{7.5}$)*												
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60,\ CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	6	2	9	SPT	750	750	0.99		9.0	1.0	0.75	1.2	1.00	8.1	1.40	11.3				1.00	1	
2	8.5	2	9	SPT	1062.5	913	0.98		9.0	1.0	0.75	1.2	1.15	9.3	1.33	12.4				1.00	1	
3	11	1	14	SPT	1375	1069	0.98	0.51	14.0	1.0	0.80	1.2	1.00	13.4	1.27	17.0	15%	20.4	0.22	1.00	1	0.40
4	19	2	13	SPT	2375	1569	0.96		13.0	1.0	0.85	1.2	1.00	13.3	1.11	14.7				1.00	1	
5	25.5	1	8	SPT	3187.5	1975	0.94	0.62	8.0	1.0	0.95	1.2	1.15	10.5	1.01	10.5	15%	13.6	0.15	1.00	1	0.22
6	29	2	22	SPT	3625	2194	0.93		22.0	1.0	0.95	1.2	1.15	28.8	0.96	27.6				0.96	1	
7	34.5	2	12	SPT	4312.5	2538	0.89		12.0	1.0	1.00	1.2	1.00	14.4	0.89	12.8				0.91	1	
8	39.5	2	5	SPT	4937.5	2850	0.86		5.0	1.0	1.00	1.2	1.15	6.9	0.84	5.8				0.87	1	
9	45	1	50	SPT	5625	3194	0.80	0.58	50.0	1.0	1.00	1.2	1.15	69.0	0.79	54.3		54.3		0.83	1	
10	52	2	50	SPT	6500	3631	0.73		50.0	1.0	1.00	1.2	1.15	69.0	0.73	50.3				0.79	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$

   where α and β = coefficients determined from the following relationships

   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$

   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$

   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB MSN NB HOV Lane Widening A3 Project
SHEET NO ____ OF ____
CALCULATED BY A Lam DATE 4/2012
CHECKED BY ____ DATE ____
SCALE ____

Evaluation of Post-Liquefaction Settlement

As-built Boring B-B

Based on the result of the liquefaction potential analyses.

Sample No 3 $(N_1)_{60,CS} = 26.4$ CSR = 0.27

Volumetric strain = 1.8%

Sample No 5 $(N_1)_{60,CS} = 13.6$ CSR = 0.15

Volumetric strain = 1.5%

Post-liquefaction settlement = $2.5 \times 12 \times 0.013 + 6.5 \times 12 \times 0.015$

$= 0.39 + 1.17$

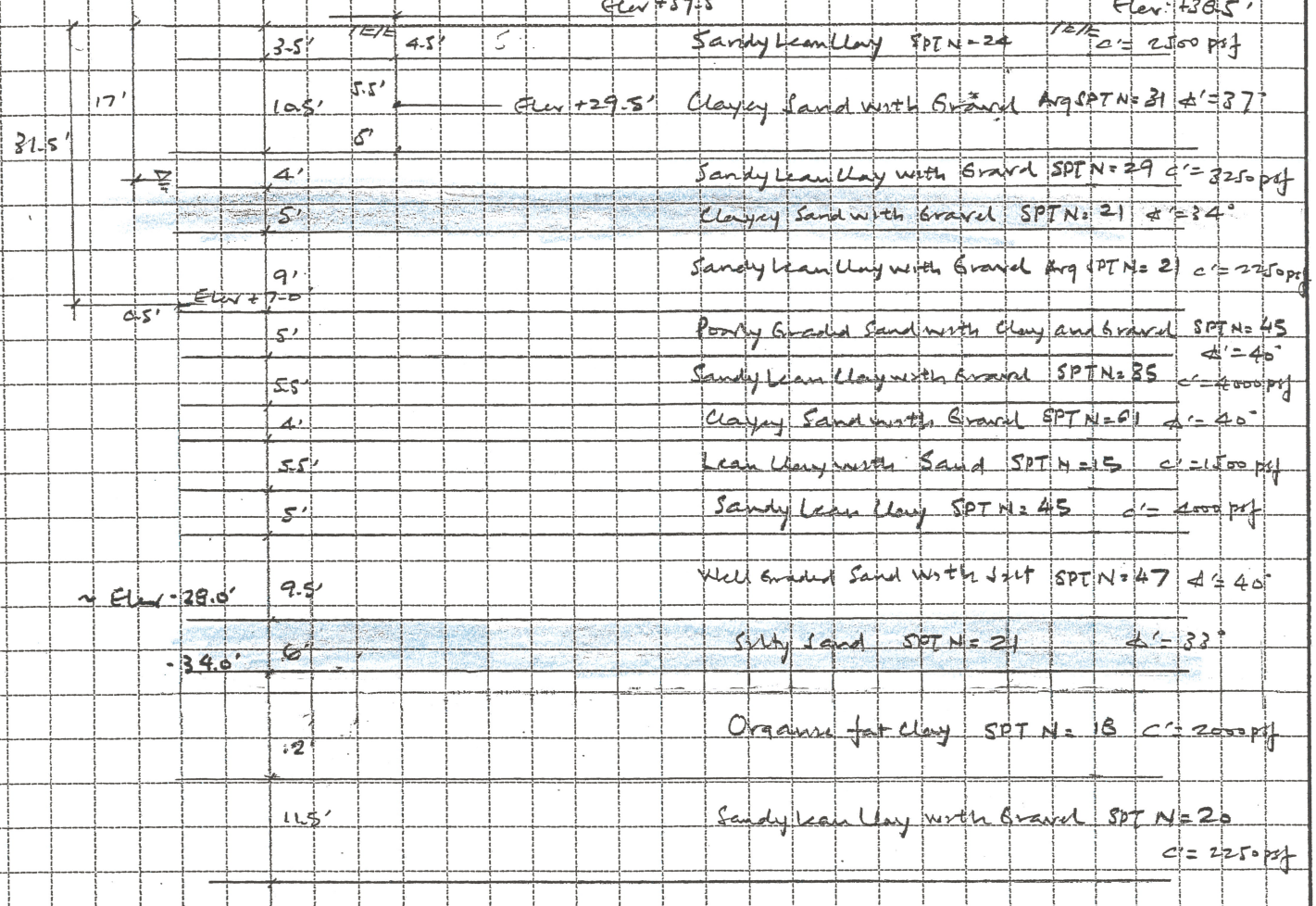
$= 1.56$ inches Say 1.6 inches

2011-145-B1

PARIKH
Practicing in the Geosciences

JOB M&N A3 NB North Novato Overhead Widen
SHEET NO 1 OF 3
CALCULATED BY A Lam DATE 11/2011
CHECKED BY DATE
SCALE

Evaluation of
Liquefaction Potential - Abutment 3 - Generalized Soil Profile 4 (R-1-NB-002) South Side



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***R-11-NO-002***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 17

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = 60%

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} (g)= 0.63
FAULT M_w = 7.9
MSF = 0.94

					CYCLIC STRESS RATIO (CSR)				LIQUEFACTION RESISTANCE ($CRR_{7.5}$)											F.S.=($CRR_{7.5}$/CSR)*MSF*Kσ*Kα		
Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	σ_v (psf)	σ_v' (psf)	γ_d	CSR	SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	2	2	26	MC	250	250	1.00		25.4	1.0	0.75	1.0	1.00	19.0	1.66	31.6				1.00	1	
2	4.5	1	32	MC	562.5	563	0.99	0.41	31.2	1.0	0.75	1.0	1.15	26.9	1.49	40.0		40.0		1.00	1	
3	10	1	36	MC	1250	1250	0.98	0.40	35.1	1.0	0.80	1.0	1.00	28.1	1.21	33.8		33.8		1.00	1	
4	15	2	31	MC	1875	1875	0.97		30.2	1.0	0.85	1.0	1.00	25.7	1.03	26.4				1.00	1	
5	20	1	23	MC	2500	2313	0.96	0.42	22.4	1.0	0.95	1.0	1.15	24.5	0.93	22.9	20%	28.3	0.38	0.94	1	0.80
6	25	2	24	SPT	3125	2625	0.94		24.0	1.0	0.95	1.2	1.15	31.5	0.88	27.6				0.90	1	
7	30	2	24	MC	3750	2938	0.92		23.4	1.0	1.00	1.0	1.00	23.4	0.82	19.3				0.86	1	
8	35	1	49	MC	4375	3250	0.89	0.49	47.8	1.0	1.00	1.0	1.15	54.9	0.78	42.8	41%	56.3		0.82	1	
9	40	2	38	MC	5000	3563	0.85		37.1	1.0	1.00	1.0	1.15	42.6	0.74	31.4				0.79	1	
10	45	1	67	MC	5625	3875	0.80	0.48	65.3	1.0	1.00	1.0	1.15	75.1	0.70	52.7	21%	61.0		0.77	1	
11	50	2	16	MC	6250	4188	0.75		15.6	1.0	1.00	1.0	1.15	17.9	0.67	12.0				0.74	1	
12	55	2	32	SPT	6875	4500	0.70		32.0	1.0	1.00	1.2	1.15	44.2	0.64	28.2				0.72	1	
13	60	1	51	MC	7500	4813	0.66	0.42	49.7	1.0	1.00	1.0	1.15	57.2	0.61	34.9	9%	36.0		0.70	1	
14	70	1	23	MC	8750	5438	0.59	0.39	22.4	1.0	1.00	1.0	1.15	25.8	0.56	14.5	24%	20.2	0.22	0.67	1	0.35
15	80	2	19	MC	10000	6063	0.55		18.5	1.0	1.00	1.0	1.15	21.3	0.52	11.1				0.64	1	
16	90	2	22	MC	11250	6688	0.52		21.5	1.0	1.00	1.0	1.15	24.7	0.48	11.9				0.62	1	
17	95.5	1	60	SPT	11937.5	7031	0.51	0.35	60.0	1.0	1.00	1.2	1.15	82.8	0.47	38.6		38.6		0.60	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$

where α and β = coefficients determined from the following relationships

for FC $\leq$ 5%	$\alpha = 0$,	$\beta = 1.0$
for 5% < FC < 35%	$\alpha = \exp(1.76-(190/FC^2))$,	$\beta = (0.99+(FC^{1.5}/1000))$
for FC $\geq$ 35%	$\alpha = 5.0$,	$\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB MSN NB HOV Lane Widening A3 Project
SHEET NO ____ OF ____
CALCULATED BY A Lam DATE 4/2012
CHECKED BY ____ DATE ____
SCALE ____

Evaluation of Post-liquefaction Settlement

Boring R-11-NO-002

Based on the result of the liquefaction potential analyses

Sample No. 14 $(N_1)_{60\text{-}CS} = 20.2$ $CSR = 0.22$

Volumetric strain = 0.3%

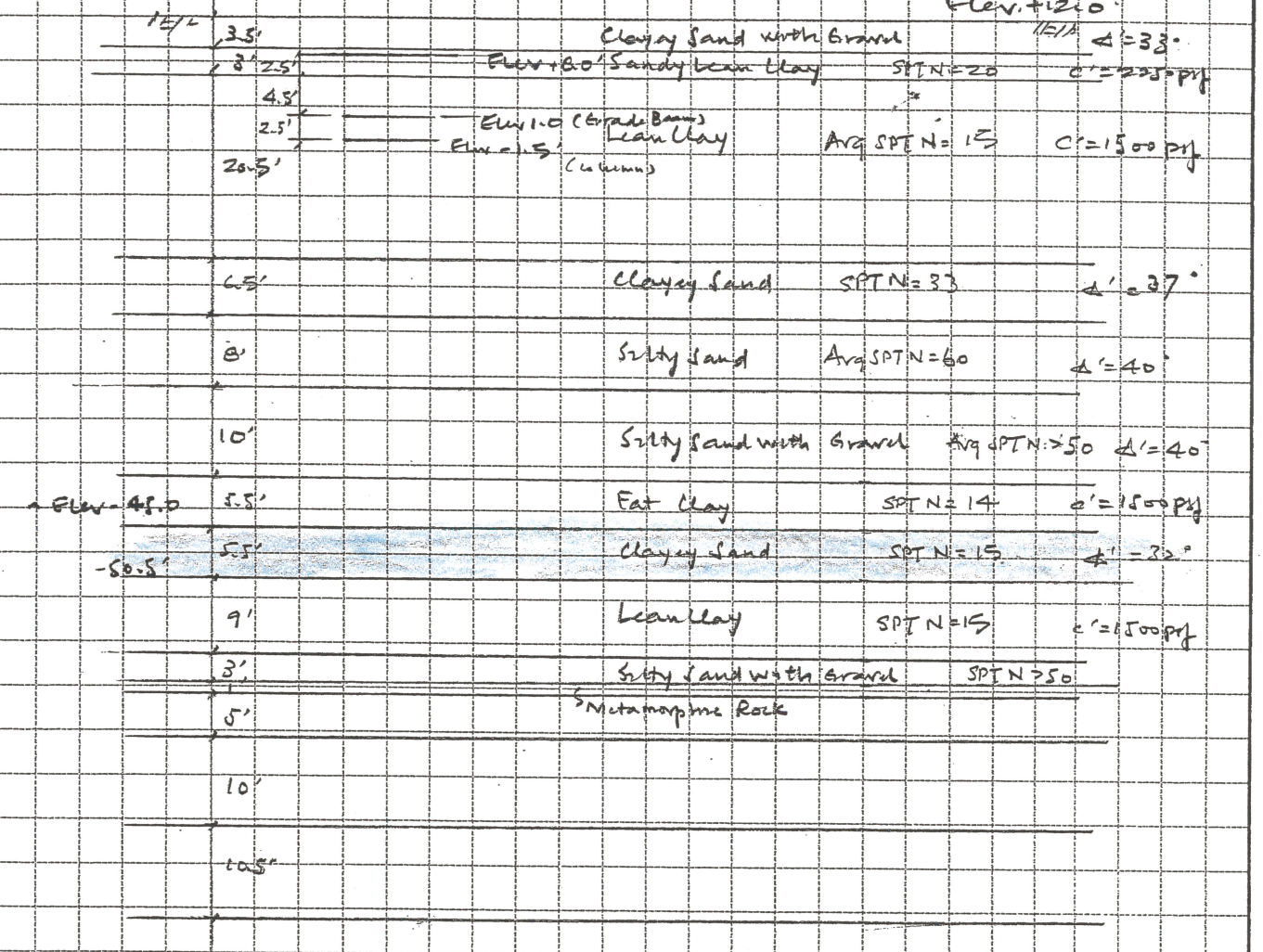
Post-liquefaction settlement = $6 \times 12 \times 0.003$

= 0.2 inches

PARIKH
Practicing in the Geosciences

JOB M&N 43 NB North Novato Overhead Hayden
SHEET NO ____ OF ____
CALCULATED BY A-Lam DATE 11/2011
CHECKED BY ____ DATE ____
SCALE ____

Pile Capacity Analysis - Bent 4 Generalized Soil Profile (R-11-NO-001)



LIQUEFACTION POTENTIAL ANALYSIS

PROJECT NAME ***North Novato Overhead Widen***
PROJECT NO. ***2011-145-BRG***
BORING NO. ***R-11-NO-001***

BOREHOLE DIA (in)= 5
GW DEPTH (ft)= 11

SOIL GROUPS
1. GRAVELS, SANDS AND NONPLASTIC SILTS
2. CLAYS AND PLASTIC SILTS

HAMMER ENERGY = *60%*

FAULT INFO
SAN ANDREAS FAULT (NORTH COAST SECTION)
a_{max} (g)= 0.63
FAULT M_w = 7.9
MSF = 0.94

*F.S.=($CRR_{7.5}$/CSR)*MSF*Kσ*Kα*

Sample No	Depth (ft)	Soil Type	Blow Count	Sampler Type	CYCLIC STRESS RATIO (CSR) σ_v (psf)	σ_v' (psf)	γ_d	CSR	LIQUEFACTION RESISTANCE ($CRR_{7.5}$) SPT-$N_{eq.}$	C_E	C_R	C_S	C_B	N_{60}	C_N	$(N_1)_{60}$	F.C.	$(N_1)_{60, CS}$	$CRR_{7.5}$	Kσ	Kα	F.S.
1	5	2	21	MC	315	625	0.99		20.5	1.0	0.75	1.0	1.15	17.7	1.45	25.7				1.00	1	
2	10	2	9	MC	630	1250	0.98		8.8	1.0	0.80	1.0	1.00	7.0	1.21	8.5				1.00	1	
3	15	2	10	MC	945	1625	0.97		9.8	1.0	0.85	1.0	1.00	8.3	1.09	9.1				1.00	1	
4	20	2	24	MC	1260	1938	0.96		23.4	1.0	0.95	1.0	1.15	25.6	1.01	25.9				1.00	1	
5	25	2	21	MC	3125	2250	0.94		20.5	1.0	0.95	1.0	1.15	22.4	0.95	21.2				0.95	1	
6	30	1	36	MC	3750	2563	0.92	0.55	35.1	1.0	1.00	1.0	1.00	35.1	0.89	31.1		31.1		0.91	1	
7	35	1	52	MC	4375	2875	0.89	0.55	50.7	1.0	1.00	1.0	1.15	58.3	0.83	48.6		48.6		0.86	1	
8	40	1	79	MC	5000	3188	0.85	0.55	77.0	1.0	1.00	1.0	1.15	88.6	0.79	69.8		69.8		0.83	1	
9	45	1	50	MC	5625	3500	0.80	0.53	48.8	1.0	1.00	1.0	1.15	56.1	0.75	41.8		41.8		0.80	1	
10	50	1	50	MC	6250	3813	0.75	0.51	48.8	1.0	1.00	1.0	1.15	56.1	0.71	39.7		39.7		0.77	1	
11	55	2	14	MC	6875	4125	0.70		13.7	1.0	1.00	1.0	1.15	15.7	0.67	10.6				0.75	1	
12	60	1	16	MC	7500	4438	0.66	0.46	15.6	1.0	1.00	1.0	1.15	17.9	0.64	11.5	7%	11.8	0.13	0.73	1	0.19
13	70	2	16	MC	8750	5063	0.59		15.6	1.0	1.00	1.0	1.15	17.9	0.59	10.6				0.69	1	
14	74.5	1	50	MC	9312.5	5344	0.57	0.41	48.8	1.0	1.00	1.0	1.15	56.1	0.57	31.9		31.9		0.67	1	

1. The correction factors C_E (Energy Ratio), C_B (Borehole Diameter), C_R (Rod Length) and C_S (Sampling Method-liner) are per Youd et al. (2001).
2. For correction of overburden, $C_N = 2.2/(1.2 + \sigma_v'/P_a)$ with a maximum value of 1.7 per Kayen et al. (1992) as cited in Youd et al. (2001).
3. The influence of Fines Contents are expressed by the following correction: $(N_1)_{60cs} = \alpha + \beta\ (N_1)_{60}$
   where α and β = coefficients determined from the following relationships
   for FC $\leq$ 5% $\alpha = 0$, $\beta = 1.0$
   for 5% < FC < 35% $\alpha = \exp(1.76-(190/FC^2))$, $\beta = (0.99+(FC^{1.5}/1000))$
   for FC $\geq$ 35% $\alpha = 5.0$, $\beta = 1.2$

Reference: Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER Workshops on Evaluation of Liquefaction Resistance of Soils, Youd, et al., ASCE Journal of Geotechnical and Geoenvironmental Engineering, October 2001, Vol. 127 No. 10

PARIKH
Practicing in the Geosciences

JOB M8N NB HOV Lane Widening A3 Project
SHEET NO ____ OF ____
CALCULATED BY A Lam DATE 4/2012
CHECKED BY ____ DATE ____
SUBJECT ____

Evaluation of Post-Liquefaction Settlement

Boring R-11-NO-001

Based on the result of the liquefaction potential analysis

Sample No. 12 $(N_1)_{60,CS} = 11.8$ CSR = 0.13

Volumetric Strain = 1 %

Post-liquefaction Settlement = 5.5 x 12 x 0.01

= 0.66 inches ~ 0.7 inches

Kobe, Japan following the 1995 Hyogo-ken Nanbu earthquake. If sand boils are produced, postearthquake settlements are likely to be irregular. The resulting differential movement can be damaging to structures, pavements, or pipelines on or near the ground surface.

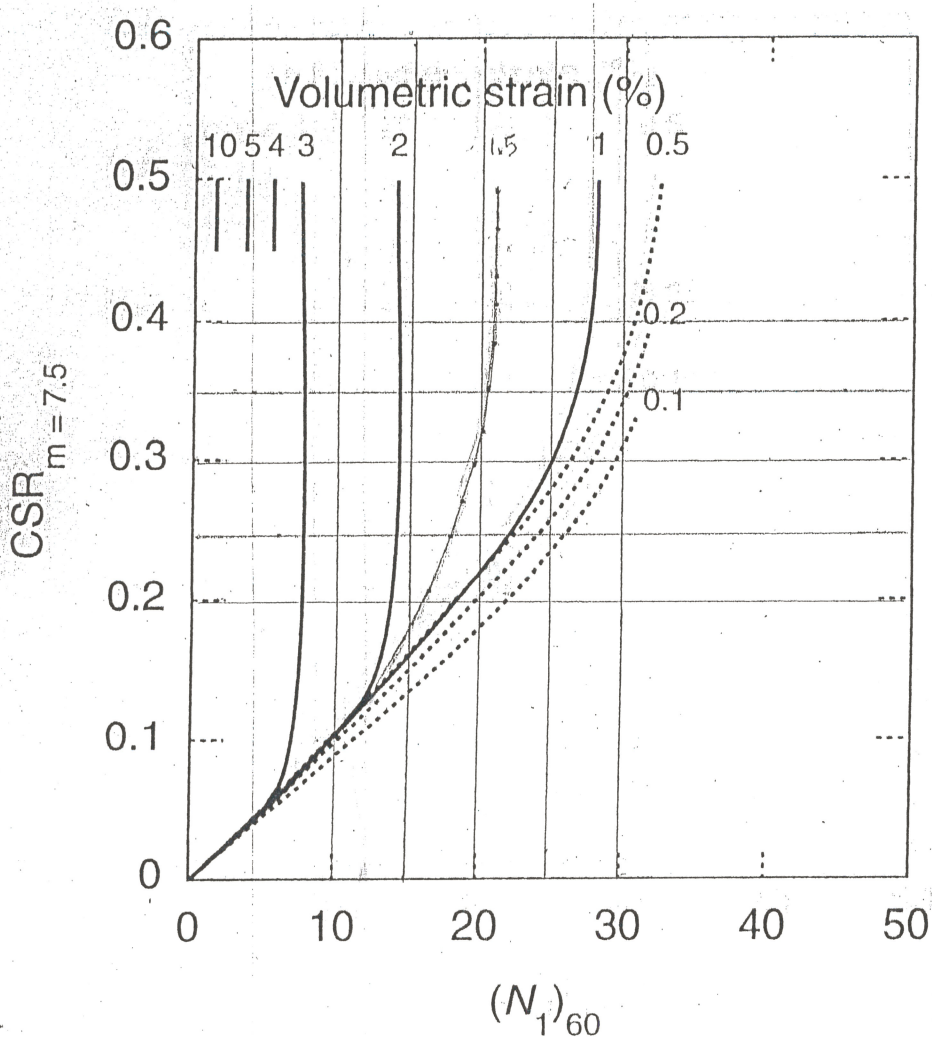


Figure 9.53 Chart for estimation of volumetric strain in saturated sands from cyclic stress ratio and standard penetration resistance. (After Tokimatsu and Seed, 1987. Evaluation of settlements in sand due to earthquake shaking, *Journal of Geotechnical Engineering,* Vol. 113, No. 8. Reprinted by permission of ASCE.)

$(N_1)_{60,CS}$

Example 9.7

Significant settlement was observed in the Marina District of San Francisco following the 1989 Loma Prieta earthquake. Much of this settlement was determined to have resulted from densi-

APPENDIX D

OSFP Review Comment & Response Form

General Project Information	Review Phase	Reviewer Information
Dist: 04 EA: 2640L1 Project Name: North Novato OH (Replace) OSFP Liaison: Tracy Bertram Phone: (916) 227-8397 e-mail: tracy_bertram@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection ☐ 65% PS&E Unchecked Details ☐ PS&E (Review No. 1) ☐ Construction Support ☒ Other: Foundation Report (Draft) **Structure Information** (Use when necessary to document comments by individual structure) Structure Name: North Novato OH (Widen) Br No: 27-0094R	Reviewer Name: John Moore Functional Unit: GS Phone Number: (510) 622-8742 e-mail: j_moore@dot.ca.gov Date of Review: 3/28/2012

Consultant Information (to be filled in by Consultant)				
Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
1	Foundation Report	FR	Foundation Report, MSN A3 – NB Widening Project, North Novato Overhead Widen (BR. #27-00974R), Novato, Marin County, California, (DRAFT), dated November 23, 2011, by Parikh Consultants, Inc., San Jose, CA, for BKF-Engineers, Pleasanton, CA		
	General and Foundation Plans	RP P	General and Foundation Plans for North Novato Overhead (widen), dated November 21, 2011, by Biggs Cardosa Associates, Inc., San Jose, CA, for the Transportation Authority of Marin (TAM), San Rafael, CA		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	
2	Foundation Report	FR Section 12.0 Lateral Pile Design	It was stated in Section 8.3 that "…the liquefaction potential at the project site is anticipated to be moderate to high." Have the strength parameters included in the recommended geotechnical parameters for L-PILE analysis been corrected for residual undrained strength? Have any blowcount corrections been made? Has lateral spreading and its effects on the bridge foundation been considered?	Comment has been incorporated. Recommended geotechnical parameters for L-PILE analysis have been corrected for residual undrained strength with the blow count correction. Lateral spreading has been discussed in the report. It is our opinion that the loose to medium dense sand exists in form of isolated pockets or lenses (approximately 2.5 feet to 6.5 feet) and lateral spreading is unlikely to occur. We will confirm this conclusion from the additional boring that has been planned.	
3	Foundation Report	FR Section 5.0 Field Exploration in 2011	In addition to the borings that have already been drilled, we recommend adding at least one additional boring, preferably two along the extents of the bridge widening alignment on Rush Landing Road. Drill the additional boring to a minimum depth of 100-feet; expect to recover intact rock and perform unconfined compressive strength tests on selected rock samples.	Comment has been incorporated. Additional boring is planned.	
4	Foundation Report	FR Page 14 P Foundation Plan	The Specified Tip Elevations between Table 5: Pile Data Table in the foundation report and the Pile Data Table on the Foundation Plan are not the same. Please check for and rectify any inconsistencies.	Comment has been incorporated. The cause of the difference has been checked and rectified.	
5	Foundation Report	FR	Section 9.8 Corrosion. Please explicitly state Caltrans' corrosion guidelines in determining what is corrosive, i.e. resistivity less than 1000 Ω-cm, pH,	Comment has been incorporated. Caltrans' corrosion guidelines in	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

			etc.	determining what is corrosive have been stated in the Foundation Report.	
			The following comments have been provided by Rifaat Nashed/A. Suja of GS-GDW.		
6	Foundation Report	FR Section 3.0 Existing Bridge and Proposed Construction Page 2	Proposed Construction The bridge number is incorrect. It is 27-0094R, not 27-00974R.	Comment has been incorporated. The bridge number has been corrected.	
#	**Doc.** **(See Note 1)**	**Page, Section, or SSP**	**Review Comments**	**Consultant Responses**	
7	Foundation Report	FR Section 5.0 Field Exploration And Laboratory Testing Page 4	Field Exploration in 2011 Laboratory test result for boring No. R-11-001 should be added in the final foundation report	Comment has been incorporated. Laboratory test result for Boring No. R-11-NO-001 has been added in the Foundation report.	
8	Foundation Report	FR Section 6.0 Subsurface Soil Conditions Page 6	The LOTB's didn't show any pocket pen measurements upon which the consistency of the clayey material identified as soft, stiff, or hard	Comment has been incorporated. Pocket penetration measurements of the clayey soil material have been shown in the LOTB.	
9	Foundation Report	FR Section 7.0 Geology Page 7	Please discuss the constituents and the engineering characteristics of each geologic unit (especially the metagraywacke of Franciscan Complex) underlies the project site.	Comment has been incorporated. The constituents and the engineering characteristics of each geologic unit underlie the project site	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

				have been discussed.	
10	Foundation Report	FR Section 9.8 Corrosion Page 7	It is not reliable to draw a conclusion of the corrosion status depending on one single sample from one single point to apply for the whole project site.	Corrosion test results of the soil sample from Boring R-11-NO-001 and the adjacent two roadway shallow borings have been included in the report. Additional corrosion test may be performed on the soil sample obtained in the additional boring proposed.	
			The following comments have been provided by Hossain Salimi of GS-GDW.		
11	Foundation Report	FR	The bridge number is incorrect on the cover. It is 27-0094R, not 27-0974R.	Comment has been incorporated. The bridge number has been corrected.	
#	**Doc.** **(See Note 1)**	**Page, Section, or SSP**	**Review Comments**	**Consultant Responses**	
12	Foundation Report	FR	The report is marked as "Draft". The Final Report needs to be submitted.	Comment has been incorporated.	
13	Foundation Report	FR	Parikh shall produce a plate containing the Probabilistic and Deterministic Response Spectra generated from Caltrans ARS On-line (V1.0.4). In addition, the ARS curve generated from the 2008 USGS Interactive Deaggregation Site with 20% increase for directivity shall also be added for comparison. This Plate shall be titled Acceleration Response Spectrum Comparisons. Parikh shall submit a plate as requested showing all the response spectra. Once that is done, a separate plate containing the governing spectrum and titled "Recommended Acceleration Response Spectrum" shall be generated. Parikh has a Recommended ARS curve, but no comparisons.	Comment has been incorporated. Plate (Plate No.: 5B) for the comparisons of acceleration response spectrum and plate (Plate No.: 5A) for the governing spectrum have been included in the final foundation report.	
14	Foundation Report	FR	A Vs30=230m/s was chosen to represent the subsurface. Assuming that new borings will be drilled for the final	A Vs_{30}=230m/s is still governing the design after	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

			report, the calculations and/or documents supporting the Vs30 values chosen shall be included in the report. Parikh shall include documents and calculations showing how the Vs30=230m/s was derived. I looked through the report and could not find any supporting document(s).	checking the Boring R-11-NO-001. Calculation for the Vs_{30} has been included in the final foundation report.	
15	Foundation Report	FR	On Page 10, the liquefaction potential at the project site is anticipated to be moderate to high. Parikh shall include documents and calculations supporting this conclusion.	Comment has been incorporated. Calculations for the evaluation of liquefaction potential have been included in the report.	
16	Foundation Report	FR	I cannot approve this report until these changes are made and the required documents are added to the final report.		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer's use)

DRAINAGE REPORT

Marin-Sonoma Narrows

04-MRN- 101 R22.0/24.4
Marin-Sonoma Narrows – MSN A3 – NB HOV Lane Widening Project
Project ID 04120003371

In Marin County
In and near Novato
From 0.2 Mile North of Atherton Avenue Overcrossing
To 1.4 Mile South of Redwood Landfill Overcrossing

Prepared for

THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION, DISTRICT 04

June 14, 2012

Design Engineer:
BKF ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94588

Job # 20087003-20

Table of Contents

1. **INTRODUCTION**
   - 1.1 Purpose and Scope 1
   - 1.2 Description & Setting 2
   - 1.3 National Flood Insurance Maps 2
   - 1.4 Methodology 3
   - 1.5 Bridge Hydraulics 3

2 **PROJECT OVERVIEW**
   - 2.1 Potential Project Impacts
     - 2.1.1 Flood Plain Encroachments 3
     - 2.1.2 Residences and Other Buildings 3
     - 2.1.3 Crops 3
   - 2.2 Existing Drainage System
     - 2.2.1 Cross Culverts – HEC-RAS Analyses 4
     - 2.2.2 Crossing Culverts 5
     - 2.2.3 Roadside Ditches 5
     - 2.2.4 Existing Stormwater Storage 5
     - 2.2.5 Existing Stormwater Treatment 5
   - 2.3 Proposed Improvements
     - 2.3.1 Crossing and Longitudinal Culverts 6
     - 2.3.2 Roadside Ditches 6
     - 2.3.3 Gutter Spread 6
     - 2.3.4 Stormwater Treatment 6
     - 2.3.5 Peak Flow Attenuation 7
   - 2.4 Unusual and Special Conditions
     - 2.4.1 Existing Facility Conditions 7
     - 2.4.2 Alternative Pipes 7
     - 2.4.3 Corrosion and Abrasion 7
     - 2.4.4 Erosion 8
     - 2.4.5 National Pollutant Discharge Elimination Permit (NPDES) 8

3 **STORMWATER ROUTING PLAN**
   - 3.1 Proposed Stormwater Routing Scheme 8

4 **DESIGN CRITERIA** 8

5 **DIVERSIONS** 8

6 **REFERENCES** 9

FIGURES:

Figure 1	Project Location Map
Figure 2	Project Vicinity Map
Figures 3A-3E	Proposed Drainage Areas
Figures 4A-4E	Storm Drain Node Identifiers
Figure 5	Existing Off-Site Drainage Areas
Figure 6	HEC-RAS Cross Section Location Map

TABLES:

Table 1A	Rational Method Parameters, Area and Slope
Table 1B	Rational Method Parameters, Runoff Coefficient
Table 1C	Rational Method Parameters, Intensity and Flow
Table 2	Creek Hydraulics at Station 449+00, Existing
Table 3A	Route 101 Culvert Hydrology
Table 3B	Route 101 Culvert Hydraulics
Table 4	Inlet on Gutter Drainage Area, 25-Year Flow
Table 5	Gutter Spread, Inlet Interception Calculations
Table 6	Inlet Sag Calculations
Table 7	Drainage Ditches Normal Depth Calculations
Table 8	Rock Slope Protection HEC-14 Method
Table 9	Hydraulic Conditions within Bioretention Areas, 25-Year Flow

APPENDIX A

Drainage Critertia
WinIDF 1.0 Output Table
Exhibit 1 - Firmette of FEMA Map Number 06041 C0175D
Exhibit 2 - Firmette of FEMA Map Number 06041 C0277D

1 INTRODUCTION

1.1 Purpose and Scope

The California Department of Transportation (Caltrans), in cooperation with Federal Highway Administration (FHWA), the Transportation Authority of Marin (TAM), and Sonoma County Transportation Authority (SCTA) propose to make improvements on United States Highway (US) 101 through the Marin/Sonoma Narrows (MSN) between State Route (SR) 37 in the City of Novato to just north of the Corona Road Overcrossing (Bridge No. 20-0160) in the City of Petaluma for a total of 16.1 miles. The project limits are divided into three segments; generally speaking, the locations include Segment A (Novato), Segment B (Novato to Petaluma), and Segment C (Petaluma).

The three project segments are further divided into sub segments (such as A1 and B1, etc.). The project segments are to be completed in two primary construction phases. Phase 1 is fully funded and includes segments A1, B1, B2/B4, B3 and C1. Phase 2 will include remaining work within or between these segments, including this project known as Marin Sonoma Narrows – Phase 2, referred to as "MSN A3" or "Project" in this report. The phase 2 projects, including this Project, were originally programmed in the RTIP and securing funding for the remaining MSN corridor work is a high priority for Caltrans and TAM. In this particular instance, TAM is seeking to apply for, and pursue, Corridor Mobility Improvement Account (CMIA) "savings," anticipated at the end of the 2012 Fiscal Year. As such, and similar to the B4 segment in Summer 2011, TAM's goal is to fund and accelerate design and PS&E documents for construction for MSN A3, to compete as a "shovel-ready" project, eligible to procure and utilize the potentially available CMIA savings.

Segment A3 will include transportation improvements along northbound US 101 only, beginning in the City of Novato and ending in Marin County, between Post Mile (PM) 22.0 and PM 22.4 the approximate project limits of Segments A1 and B1.

Throughout this stretch of US 101, the Project proposes to widen northbound US 101 within the existing median and outside shoulder in order to provide a 12-foot HOV lane and 10-foot inside and outside shoulders, thereby extending the MSN A1 HOV system to the north by approximately two miles. In addition to pavement widening, the HOV extension also proposes to widen the existing North Novato Overhead (Bridge No. 27-0094R) which is located within the southern portion of the project limits. Proposed improvements include striping, bridge and pavement widening, pavement replacement, pavement overlay, drainage inlets and culverts installation and/or replacement, and reconstruction of the beam barrier. The proposed improvements for the Project do not preclude any future MSN Phase 2 projects.

The Project location map is shown on Figure 1 and the Project vicinity map is shown on Figure 2.

The purpose of this drainage report is to present the following for the Project:

- Existing drainage conditions
- Capacities of the storm water facilities
- Recommended conveyance facilities
- Recommended treatment facilities

1.2 Description and Setting

The Project is located at the northeastern portion of Marin. The Project will require modifications to existing cross culverts and construction of supplemental longitudinal drainage facilities. The Project will not affect or redirect runoff.

Proposed Project improvements include adding an HOV lane and providing drainage improvements within northbound lanes that are consistent with ultimate project improvements.

1.3 National Flood Insurance Maps

The Project area is shown on the following Federal Emergency Management Agent (FEMA) Flood Insurance Rate Maps (FIRMs):

> Marin County, California (unincorporated areas), Panel 175. The map is Community Panel number 06041C0175D last revised May 4, 2009.
> Marin County, California (City of Novato), Panel 277. The map is Community Panel number 06041C0277D last revised May 4, 2009.

Portions of the Project are within Flood Hazard Zone VE. Zone VE is defined as a coastal flood zone with velocity hazard (wave action) and a defined base flood elevation (BFE) (in this case elevation 8). Project FIRMettes are attached as Exhibits 1-2 in Appendix A. All of the area within Zone VE is drainage facilities between the edge of pavement and the right-of-way. The lowest paved grade is elevation 8.78 and is above the BFE.

1.4 Methodology

The MSN Project improvements are evaluated using Caltrans Standard Methodology as modified and supplemented using drainage criteria presented in Appendix A. Peak flow rates through the Project area are computed using the Rational Method. The depth and velocity of flow through pipe systems is analyzed using the STORMCAD computer program, which evaluates for both surcharge and non-surcharge flow conditions. There is a box culvert at station 449+00 that is analyzed using the HEC-RAS computer program. Project drainage improvements are sized to convey the 25-year storm event.

1.5 Bridge Hydraulics

Creek crossings through the Project are within circular and box culverts. Existing large facilities include a 12-foot by 4.5-foot box culvert at Station 449+00. The box culvert is a continuation of a County 6- by 6-foot box culvert that conveys flows under Redwood Boulevard. There is an 12-foot by 5 foot RCB at Station 421+00.

2 PROJECT OVERVIEW

2.1 Potential Project Impacts

2.1.1 Flood Plain Encroachments

The Project will place fill within portions of the FEMA zone VE. The fill will not impact conveyance of flows and does not encroach on flow paths within the Flood Plain.

2.1.2 Residences and Other Buildings

No buildings are affected by the Project.

2.1.3 Crops

No crops are affected by the Project.

2.2 Existing Drainage System

Runoff through the Project area flows from the western hills toward the east, outfalling directly to the Black John Slough ultimately discharging to the Petaluma River. The Petaluma River drains to the North San Pablo Bay, which is an extension of San Francisco Bay.

The Project drainage areas consist primarily of grassed open fields, with a portion of the drainage area as grazing lands, with minor amounts of paved roadways and vegetated roadway side-slopes. There are commercial development within the lower portions of the

drainage area including office buildings, research center and hotels. Offsite slopes west of the Project are steep, with typical slopes between 2:1 and 10:1. The area downstream of the Project is tidal slough.

Ditches located adjacent to the outside shoulder convey flows to the tidal sloughs. The flow line of a portion of the ditches is in Caltrans right-of –way with remaining portions of ditches within Sonoma Marin Area Rail Transit (SMART) right-of-way convey flows to Black Jack Slough.

Drainage areas for the Project cross culverts are shown on Figures 3A through 3E. Characteristics of the drainage areas upstream of the project such as overland sheet flow, rill flow and concentrated flow are presented in Tables 1A. Runoff coefficients for the 25 and 100-year storm evens are presented in Tables 1B. Flows for the 25 and 100-year storm events are presented in Tables 1C. There is some storm drain piping within several of the drainage areas. Much of the piping directs flows lateral to the flow direction and does not appear to substantially reduce the time of concentration. For the drainage area to Station 439+00, there is a large urbanized area and the time of shallow concentrated flow is based on a velocity of 5 feet per second for stabilized slopes.

During typical storm events, runoff from the hillsides west of the Project will flow through one of 14 existing drainage facilities that convey flow under Northbound Route101. Locations of the existing Route 101 crossings culverts are shown on Figures 4A through 4E. Route 101 is raised above the overland flow path and currently acts as a barrier to overland flow. Currently, during the 100-year storm event, runoff from the northern portion of the Project will flow longitudinal along the Route 101 southbound shoulder and overtop at a low point around Station 469+00 along the southbound lanes and northbound lanes. Runoff from existing drainage areas upstream of Route 101 are shown on Figures 5A through 5B.

2.2.1 Cross Culverts – HEC-RAS Analyses

One drainage ditch that conveys flow through the Project area is evaluated using the U.S. Army Corps of Engineers HEC-RAS River Analysis System computer model. The following describes the system evaluated using the HEC-RAS model.

- Station 449+00 (Labeled as Basalt Creek on USGS maps) - A 6 by 6-foot box culvert conveys runoff under Redwood Boulevard, immediately upstream of the project. Runoff is conveyed under Route 101 within a 12 by 4.5-foot cross culvert. Immediately downstream of the project, flow is through a set of five parallel 48-inch CMP culverts. The RCB culvert conveys the 25-year event with at least one foot freeboard to edge of travelway. During the 100-year storm event, the peak water level will be elevation 11.9 at the 6 by 6-foot box culvert headwall. This is 0.1 feet below top of headwall elevation and is contained within the channel banks.

The HEC-RAS modeling results for the creek listed above are presented in Table 2. The cross section location of the above creek is presented in Figures 6. Creek analyses start at the railroad tracks downstream of the Project. For the purpose of these analyses, the starting water level at the downstream limit of the study is based on FEMA documents of the 100-year water level.

2.2.2 Crossing Culverts

Runoff from the Project area flows easterly toward the Black John Slough. Cross culverts convey flow from upstream drainage areas under Route 101. The locations of the existing culverts modeled are shown on Figures 4A through 4E. In most cases, the 25-year event peak flow rate to the existing culverts can be conveyed by the existing culverts. Three cross culverts at Stations 470+00, 473+43 and 477+37 are undersized and cannot convey the 25-year storm event. Runoff in excess of the culvert capacity will either be stored within low-lying areas upstream of the culvert or will bypass the culvert as overland flow to the next downstream facility.

For the purpose of evaluating culvert capacity, culverts are considered adequate if the 25-year design flow rate can be conveyed with a water level that is at least three-tenths of a foot below the existing edge of travelway. The three-tenths of a foot allowance is for future southbound roadway improvements and will be needed to extend the edge of travelway to the west.

There are no longitudinal culverts in the Project area.

2.2.3 Roadside Ditches

Surface flows from the hillsides west of Route 101 to the crown of southbound Route 101 are collected in roadside ditches adjacent to Route 101 and convey runoff to the cross culverts. As noted previously, there are locations where the existing cross culvert cannot convey the peak flow rate during a 25-year event. In some locations, the excess flow is conveyed in the roadside ditch to the next downstream cross culvert.

2.2.4 Existing Stormwater Storage

There is no intentional existing storage within the Project area.

2.2.5 Existing Stormwater Treatment

There are no designated existing stormwater treatment facilities in the Project site area.

2.3 Proposed Improvements

Drainage improvements are proposed to accommodate roadway widening improvements.

2.3.1 Crossing and Longitudinal Culverts

Existing flow patterns to existing cross culverts will be maintained. No extension of existing or proposed crossing culverts under roadways is required in this Project's improvements. However, the undersized culverts will be upsized beneath Northbound 101 beginning at a G2 inlet within the median. Upsizing the three undersized culverts will also solve the 100-year storm overtopping issue at Station 449+00 as previously discussed in this report. Future Southbound 101 improvements will be responsible for extending the upsized culverts underneath Southbound lanes.

Longitudinal culverts are proposed along the eastern edge of pavement and median to capture runoff associated with superelevation of the roadway and to capture runoff to ditches within the SMART right-of-way. Project longitudinal culverts will make direct connections to existing storm drain lines via new catch basins. Modeling results of the existing and proposed upsized cross culverts are presented in Tables 3A and 3B.

2.3.2 Roadside Ditches

Grading of the roadside ditches in portions of the median and along segments of Southboud 101 for stormwater treatment are proposed. The proposed linear bioretention areas for stormwater treatment will double as conveyance ditches. The ditches will have a 4-foot bottom width and a minimum depth of 0.75-feet. Normal depth calculations for proposed conveyance ditches are presented in Table 7.

2.3.3 Gutter Spread

An existing dike is located on Northbound 101 between Stations 404+00 to 411+00. Several other dikes are proposed on Northbound 101 with a low point on the shoulder edge of pavement at Station 475+25. A median barrier is proposed along the entire length of the project with a low point along Northbound 101 median at Station 442+02. Catch basins and slotted pipe drains will be installed to maintain a flow spread width no greater than the 10-foot shoulder. Drainage areas and 25-year peak flows to the gutters are presented in Table 4. Gutter spread and inlet capacities are presented in Table 5. The two inlets in a sag condition is presented in Table 6.

2.3.4 Stormwater Treatment

Stormwater will be treated by a combination of biostrips and linear bioretention areas that will double as conveyance swales. These BMP facilities will treat by filtration of stormwater though biofiltration soil consisting of a blend of compost and sand per the

Regional Water Quality Control Board (RWQCB). Stormwater treatment is evaluated separately in the Storm Water Data Report.

Stormwater treatment will occur within bioretention facilities. Rock berms are proposed within the treatment areas to spread flows and promote infiltration thoughout the length of the facility. Rock berms are proposed with spacing such that the top of the downstream berm is the same elevations as the toe of the next upstream rock berm. Flow depth through the bioretention areas is presented in Table 9. The depth of flow across the top of rock berm is shown as less than 0.25 feet. The flow velocity is less than 3 feet per second.

2.3.5 Peak Flow Attenuation

Peak Flow attenuation is not required for this Project due to the project location in a coastal flood region subject to velocity hazard (wave action). Projects culvert outfall to the FEMA Flood Hazard Zone VE. Zone VE is defined as a coastal flood zone with velocity hazard (wave action) and a defined base flood elevation (in this case elevation 8). See project FIRMettes in Appendix B.

2.4 Unusual and Special Conditions

2.4.1 Existing Facility Conditions

A site visit was conducted April 9, 2012. Several project culverts and culverts downstream of the project in the tidal region were found to contain about two feet of compacted sediment. Cleaning of the existing culverts to remove sediment is proposed for the 36-inch RCP at Station 439+00 and the 12-foot by 4.5 foot RCB at Station 449+00. Additionally, the five 48-inch CMP lines beneath the SMART tracks may require cleaning. Caltrans has easement access to the 48-inch CMP lines.

Project culvert hydraulics calculations are based on the culverts full cross sectional area available for flow.

2.4.2 Alternative Pipes

Alternative Pipe analysis are presented in the Geotechnical Design and Materials Report (GDMR).

2.4.3 Corrosion and Abrasion

Evaluation of corrosion and abrasion are provided in the GDMR.

2.4.4 Erosion

Rock slope protection (RSP) is proposed at proposed culvert outfall locations to minimize sour at pipe outfalls. The proposed RSP outlet facilities are sized using the HEC-14 methodology. Outfall facilities sizes are presented in Table 8.

2.4.5 National Pollutant Discharge Elimination Permit (NPDES)

The Project is subject to the conditions of the Caltrans' NPDES Permit for Storm Water Management during General Construction Activities. This Permit requires that the Project Resident Engineer (RE) submit a Notice of Construction (NOC) to the Regional Water Quality Control Board at least 30 days prior to the start of construction. A California Department of Fish and Game Streambed Alteration Permit, a Regional Water Quality Control Board 401 Permit and a United States Army Corps of Engineers 404 Permit are required.

Project specifications will require that the Contractor prepare a Storm Water Pollution Prevention Plan (SWPPP). The Contractor will not be allowed to start work on the project until Caltrans has deemed that the SWPPP meets the conditions of their General Permit. During the construction period, the Contractor shall be responsible for the implementation of the SWPPP. Caltrans will monitor compliance with the SWPPP. Water Pollution Control Details and Specifications will be provided to the Contractor as a part of the PS&E to be used in the development of the SWPPP.

3 STORM WATER ROUTING PLAN

3.1 Proposed Storm Water Routing Scheme

Existing flow paths will be maintained. No diversions in the natural flow path are planned for the improvements in the Project area.

4 DESIGN CRITERIA

Design criteria are presented in Appendix A.

5 DIVERSION

No diversion of runoff is proposed.

6 REFERENCES

Publications on drainage design manuals, design charts and Caltrans "as-built" plans used in the design of the Project Drainage System include the following:

1. Highway Design Manual, Fifth Edition, (2006 with updates), State of California, Department of Transportation, Sacramento, California.

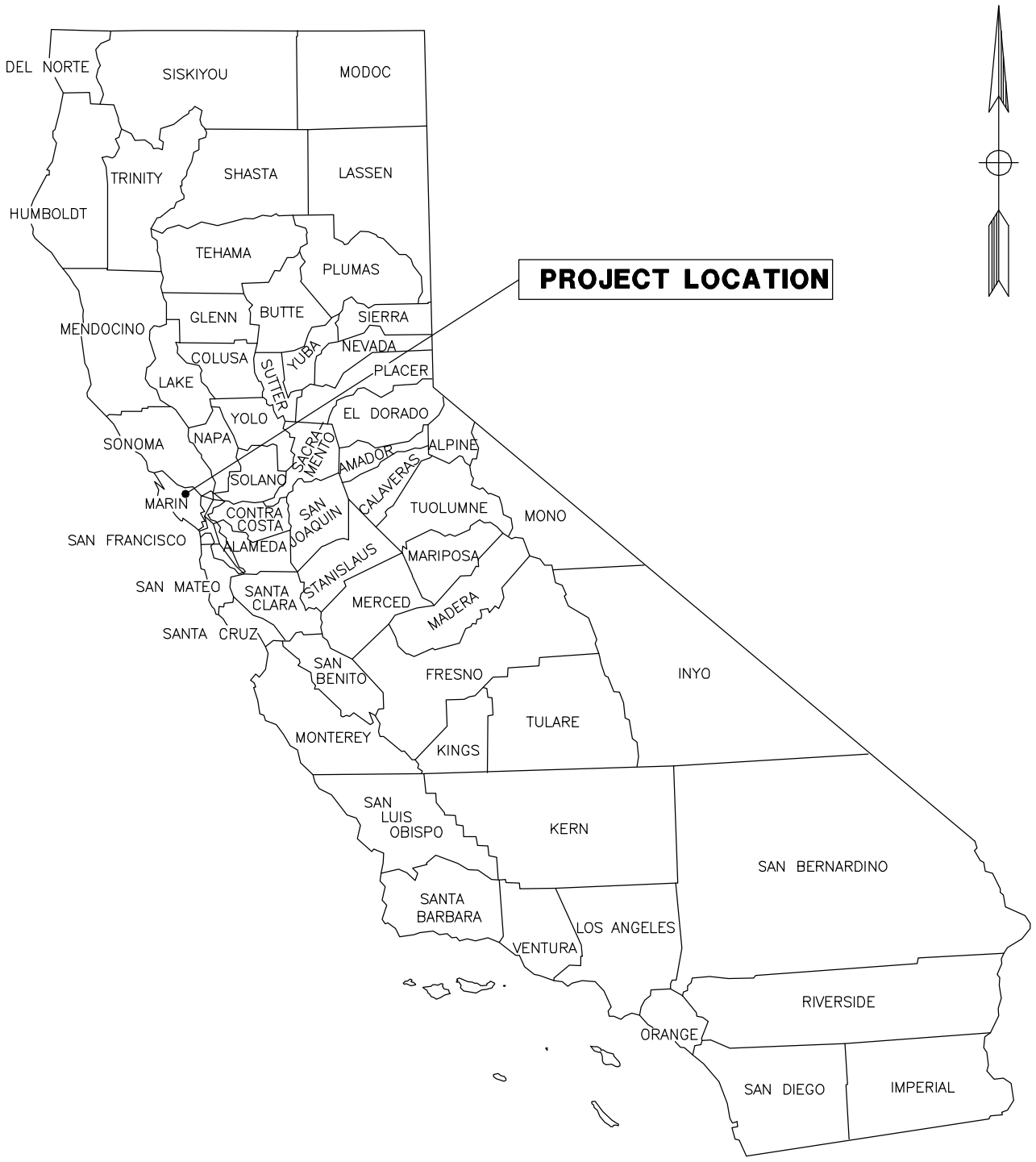
2. Standard Plans, (2010), State of California, Department of Transportation, Sacramento, California.

3. Standard Specifications, (2010), State of California, Department of Transportation, Sacramento, California.

4. Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, U.S Department of Transportation, Federal Highway Administration

5. Drainage Report for Marin Sonoma Narrows MSN B1, EA 04-264074

6. Drainage Report for Marin Sonoma Narrows MSN A1, EA 04-264061

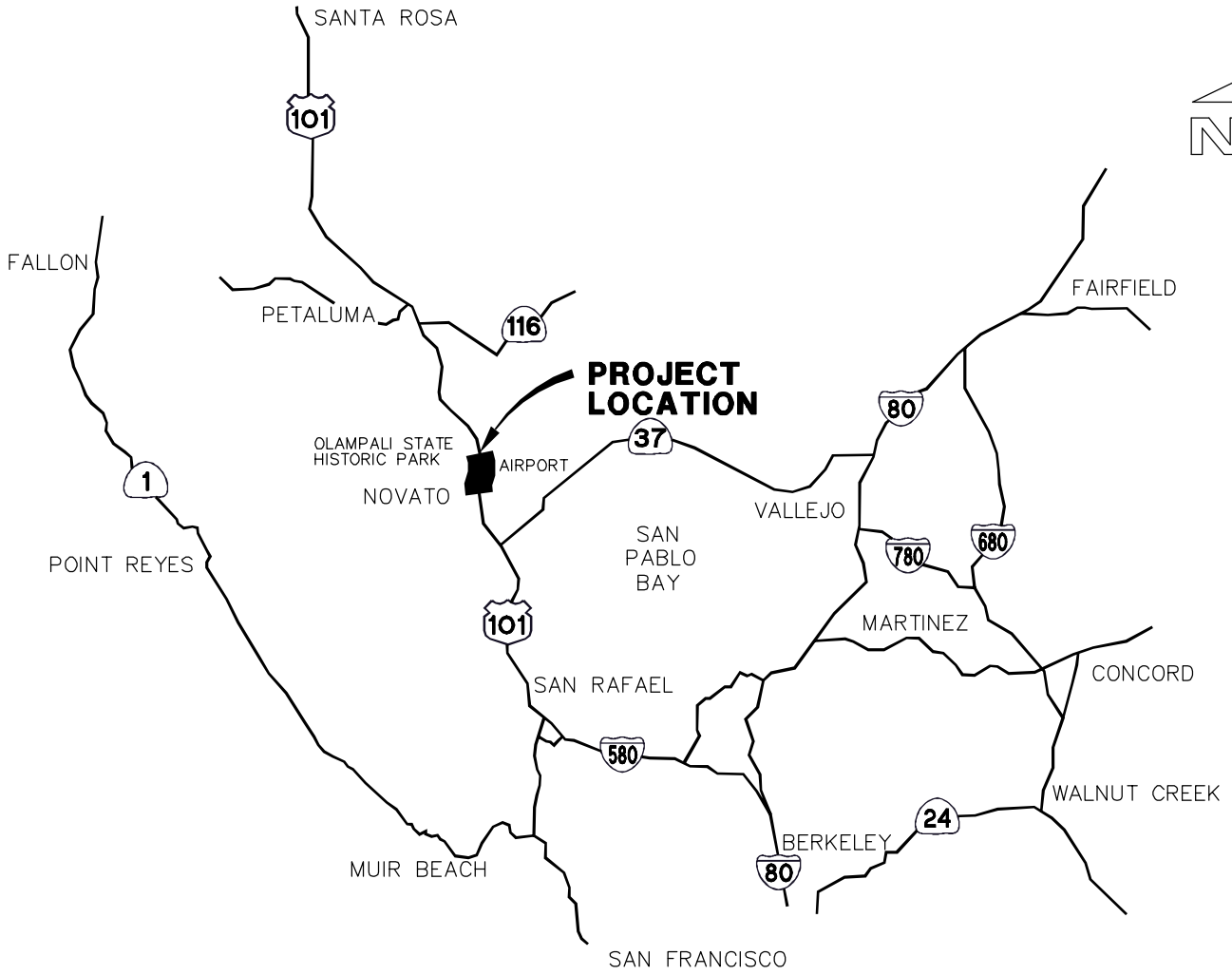


MARIN/SONOMA NARROWS - SEGMENT A3 HOV WIDENING PROJECT

IN MARIN COUNTY
FROM THE ATHERTON AVENUE OVERCROSSING
TO 1.4 MILES SOUTH OF THE REDWOOD LANDFILL OVERCROSSING
04–Mrn–101, PM R22.0/24.4

PROJECT LOCATION MAP

NOT TO SCALE



MARIN/SONOMA NARROWS - SEGMENT A3 HOV WIDENING PROJECT

IN MARIN COUNTY

FROM THE ATHERTON AVENUE OVERCROSSING

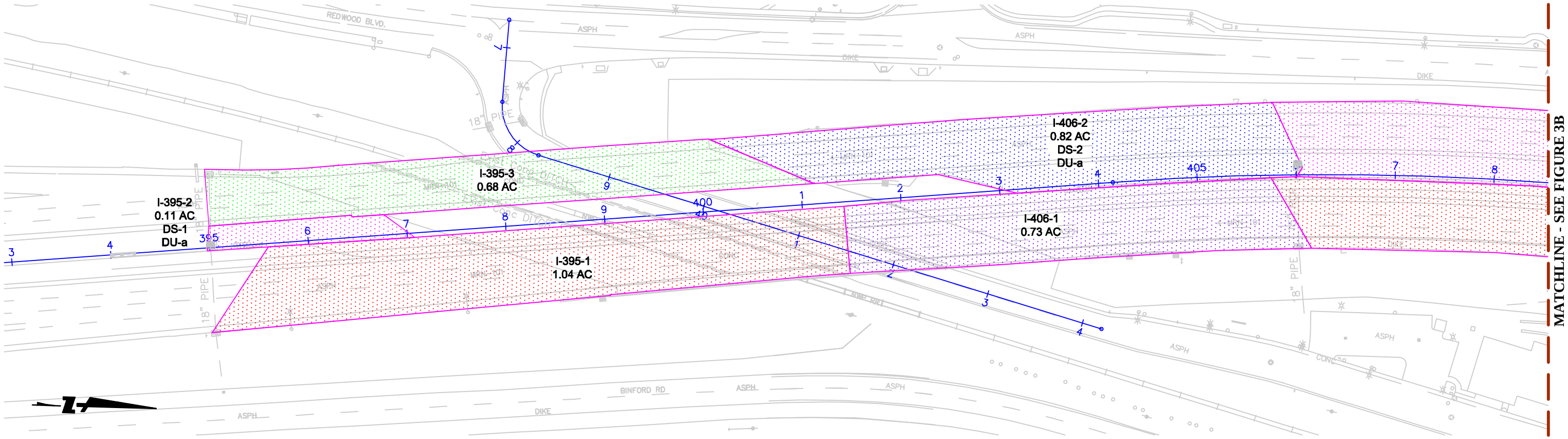
TO 1.4 MILES SOUTH OF THE REDWOOD LANDFILL OVERCROSSING

04–Mrn–101, PM R22.0/24.4

PROJECT VICINITY MAP

NOT TO SCALE

© BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

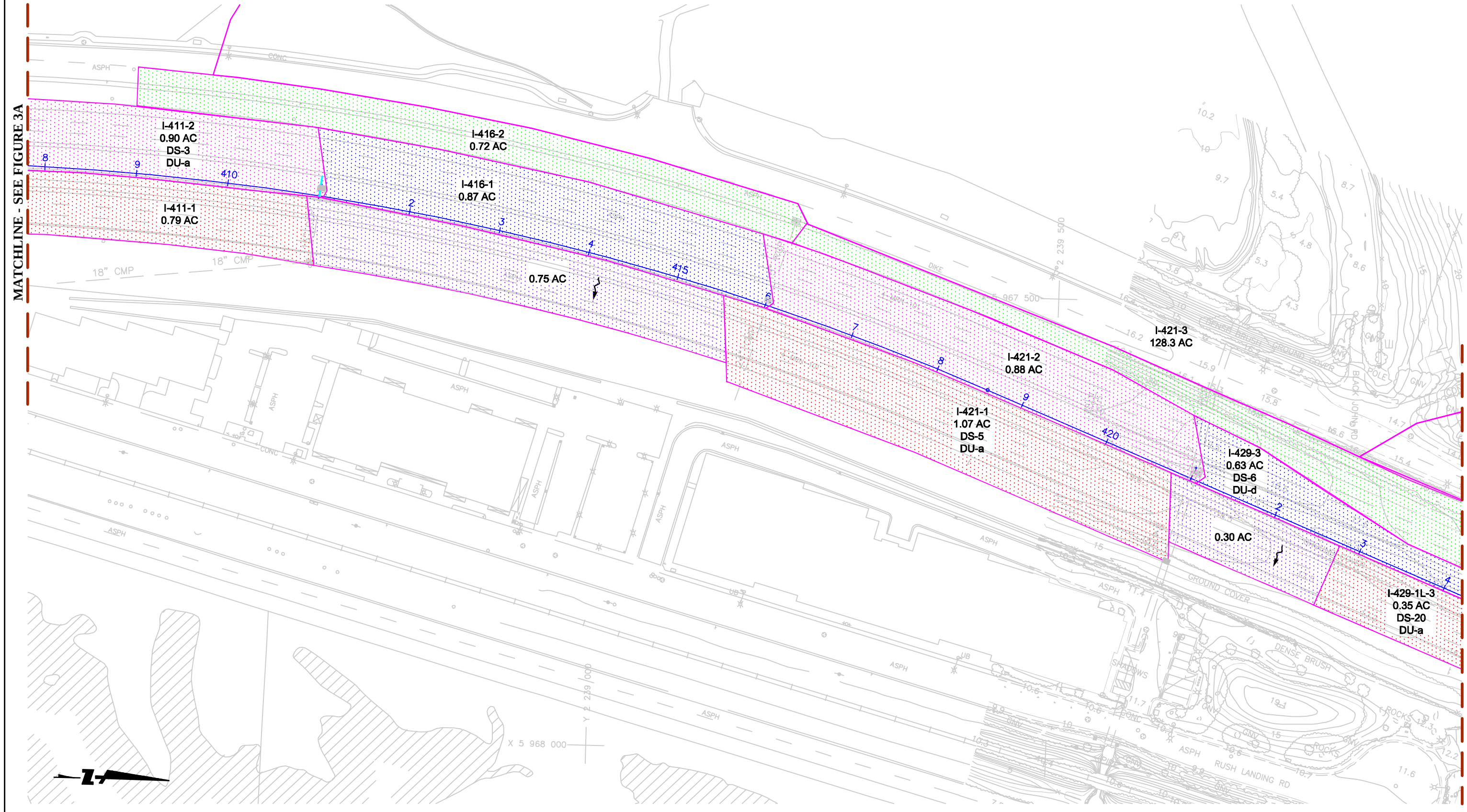
FIGURE 3A

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-re\vol4\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: \\Bkf-ro\vol4\Eng08\087003-20\DWG\FIGURES-101%MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

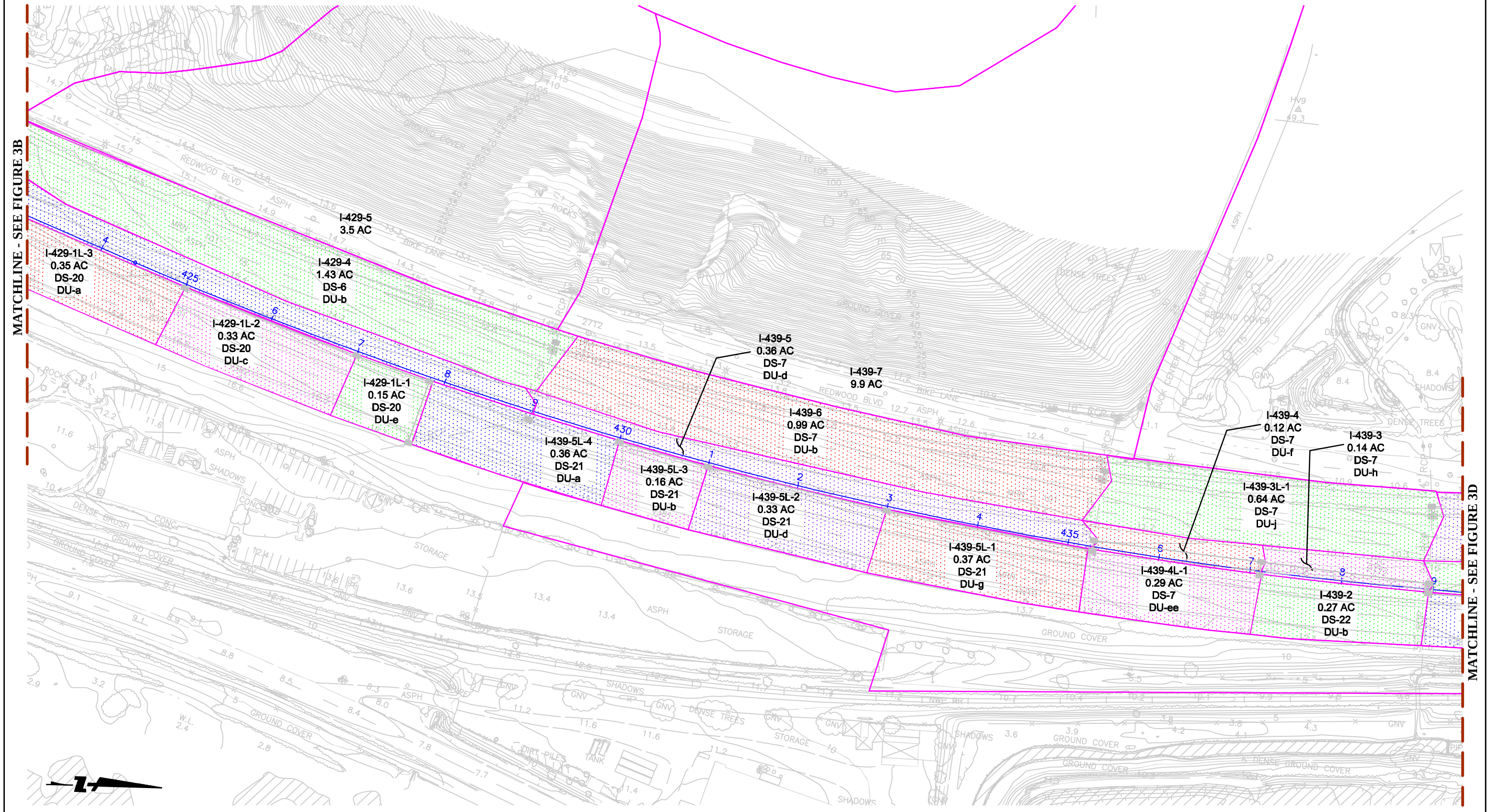
LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

FIGURE 3B
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Eng05\087003-20\DWG\FIGURES-101\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

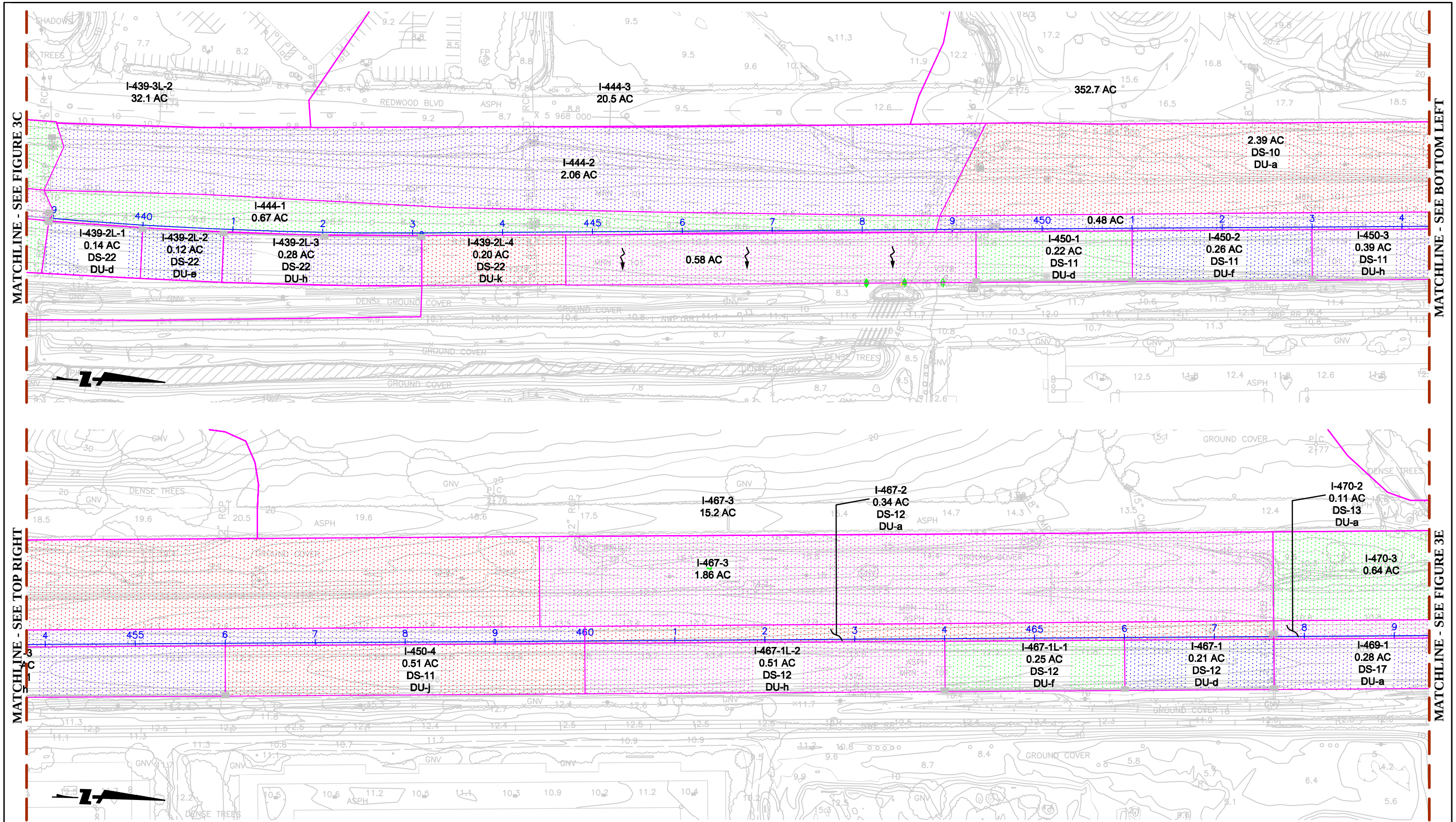
LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
~►	DRAINAGE FLOW DIRECTION

FIGURE 3C
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Eng08\087003-20\DWG\FIGURES-101%MSN-Figure-3.dwg
PLOT DATE: 08-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

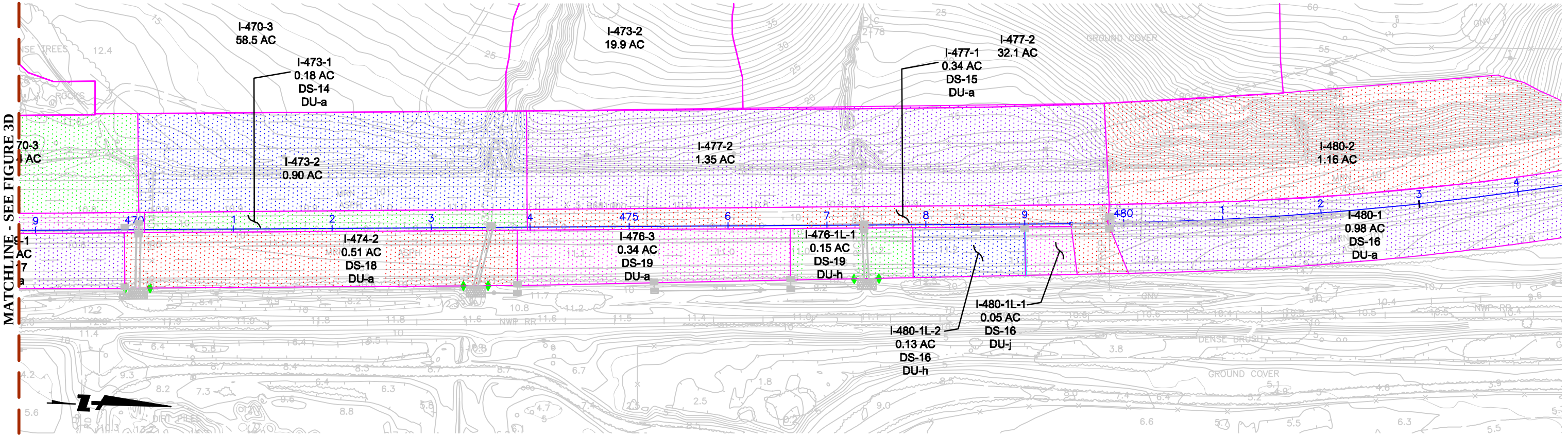
I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

FIGURE 3D

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

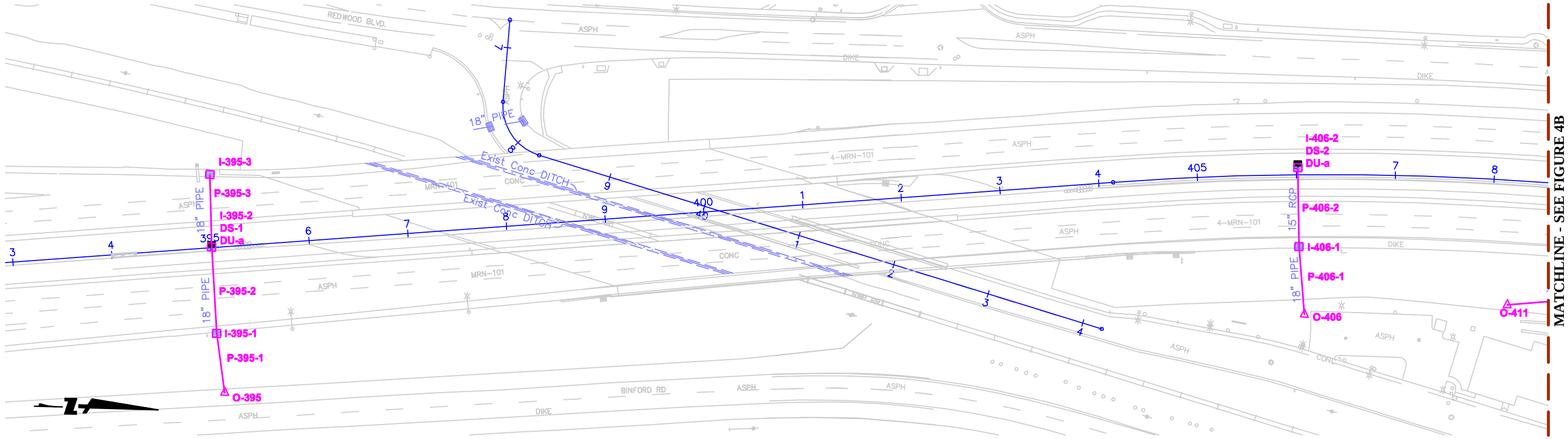
FIGURE 3E

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-revol4\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

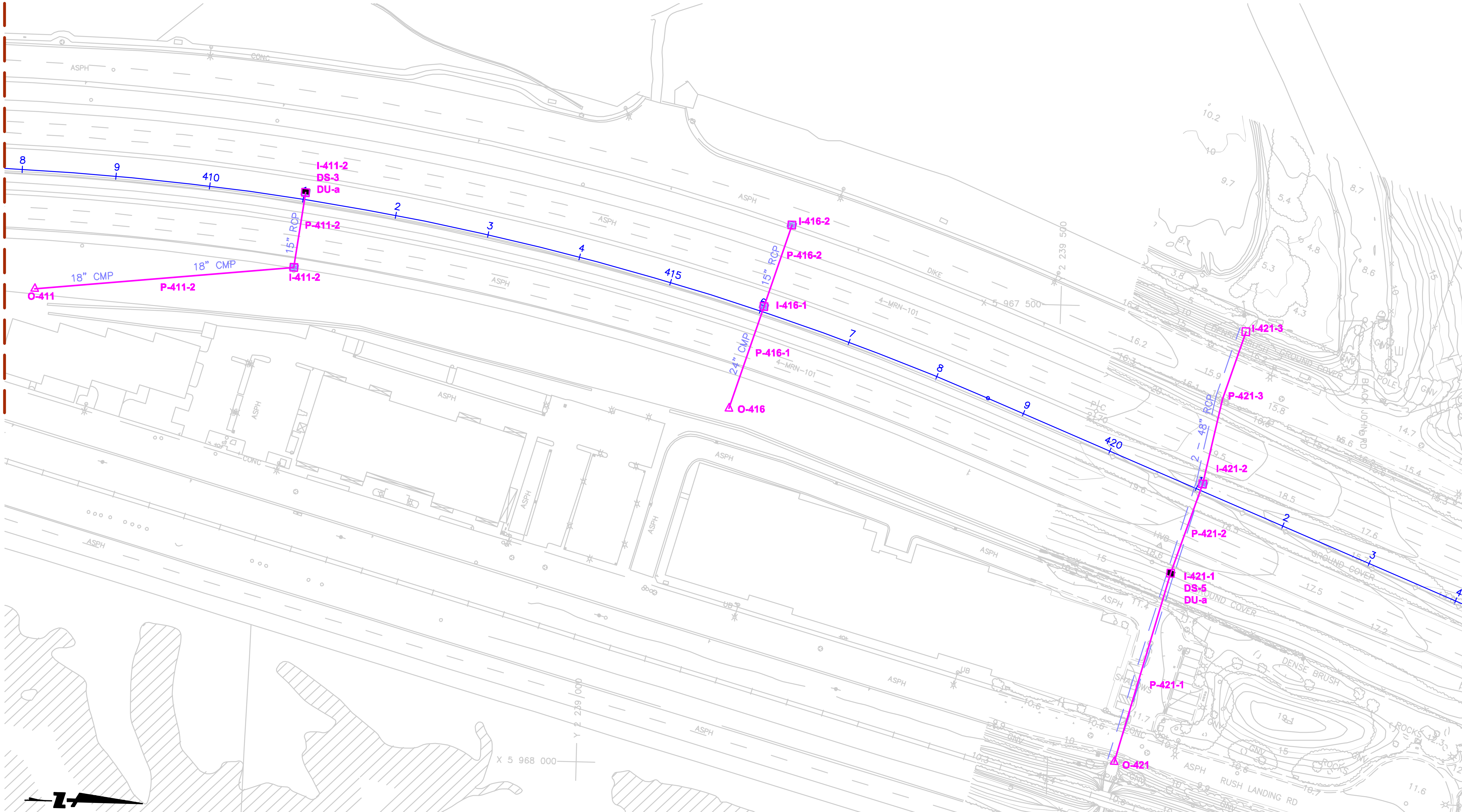
LEGEND:

I-200-X	STORMCAD SYSTEM – ELEMENT NUMBER
DS-X	DRAINAGE PLAN SYSTEM NUMBER
DU-x	DRAINAGE PLAN UNIT NUMBER

FIGURE 4A
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

©BKF Engineers



DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12 PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE

100 0 100 200

LEGEND:

I-200-X	STORMCAD SYSTEM - ELEMENT NUMBER
DS-X	DRAINAGE PLAN SYSTEM NUMBER
DU-x	DRAINAGE PLAN UNIT NUMBER

FIGURE 4B
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

© BKF Engineers

MATCHLINE - SEE FIGURE 4B

I-429-1L-3
DS-20
DU-a

P-429-1L-3
DS-20
DU-b

I-429-1L-2
DS-20
DU-c

P-429-1L-2
DS-20
DU-d

I-429-1L-1
DS-20
DU-e

P-429-1L-1
DS-20
DU-f

I-429-1
DS-20
DU-g

P-429-1

O-429

P-429-2

P-429-3

I-429-2
DS-6
DU-f

I-429-3
DS-6
DU-d

P-429-4

I-429-4
DS-6
DU-b

P-429-5

I-429-5

I-439-5L-4
DS-21
DU-f

P-439-5L-4
DS-21
DU-f

I-439-5L-3
DS-21
DU-b

P-439-5L-3
DS-21
DU-c

I-439-5L-2
DS-21
DU-d

P-439-5L-2
DS-21
DU-e

I-439-5L-1
DS-21
DU-g

P-439-6

I-439-7

P-439-7

I-439-6
DS-7
DU-b

I-439-5
DS-7
DU-d

P-439-5
DS-7
DU-e

I-439-4
DS-7
DU-f

P-439-4L-1
DS-7
DU-dd

I-439-4L-1
DS-7
DU-ee

P-439-3
DS-7
DU-g

I-439-3L-

P-439-3L-2

P-439-3L-1

I-43
DS-
DU-

I-439
DS-2
DU-c

P-439-2

I-439-1

P-439-1

O-439

18" RCP
24" RCP
30" RCP
36" RCP

MATCHLINE - SEE FIGURE 4D

DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:
I-200-X STORMCAD SYSTEM – ELEMENT NUMBER
DS-X DRAINAGE PLAN SYSTEM NUMBER
DU-x DRAINAGE PLAN UNIT NUMBER

FIGURE 4C
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

© BKF Engineers

MATCHLINE - SEE FIGURE 4C

I-439-3L-2
I-439-3L-1
DS-7
DU-j
I-439-3
DS-7
DU-h
I-439-2
DS-22
DU-c
P-439-2L-1
DS-22
DU-c
I-439-2L-1
DS-22
DU-d
P-439-2L-2
DS-22
DU-j
I-439-2L-2
DS-22
DU-e
P-439-2L-3
DS-22
DU-f
I-439-2L-3
DS-22
DU-h
P-439-2L-4
DS-22
DU-i
I-439-2L-4
DS-22
DU-k
I-444-3
P-444-3
I-444-2
P-444-2
I-444-1
P-444-1
O-444
SYSTEM MODELED IN HEC-RAC
6' x 6' RCB
24" CMP
8" CMP
4' x 4.5' RCB
24" CMP
I-450-1
DS-11
DU-d
18" RCP
P-450-1
DS-11
DU-c
O-450
DS-11
DU-b
5'-48" CMP
I-450-2
DS-11
DU-f
P-450-2
DS-11
DU-e
I-450-3
DS-11
DU-h
P-450-3
DS-11
DU-g

MATCHLINE - SEE BOTTOM LEFT

MATCHLINE - SEE TOP RIGHT

P-450-4
DS-11
DU-i
I-450-4
DS-11
DU-j
I-467-1L-2
DS-12
DU-h
P-467-1L-2
DS-12
DU-g
I-467-1L-1
DS-12
DU-f
P-467-1L-1
DS-12
DU-e
I-467-3
P-467-3
I-467-2
DS-12
DU-g
2' x 2' RCB
I-467-1
DS-12
DU-d
P-467-2
P-467-1
O-467

MATCHLINE - SEE FIGURE 4E

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER

GRAPHIC SCALE

100 0 100 200

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

FIGURE 4D

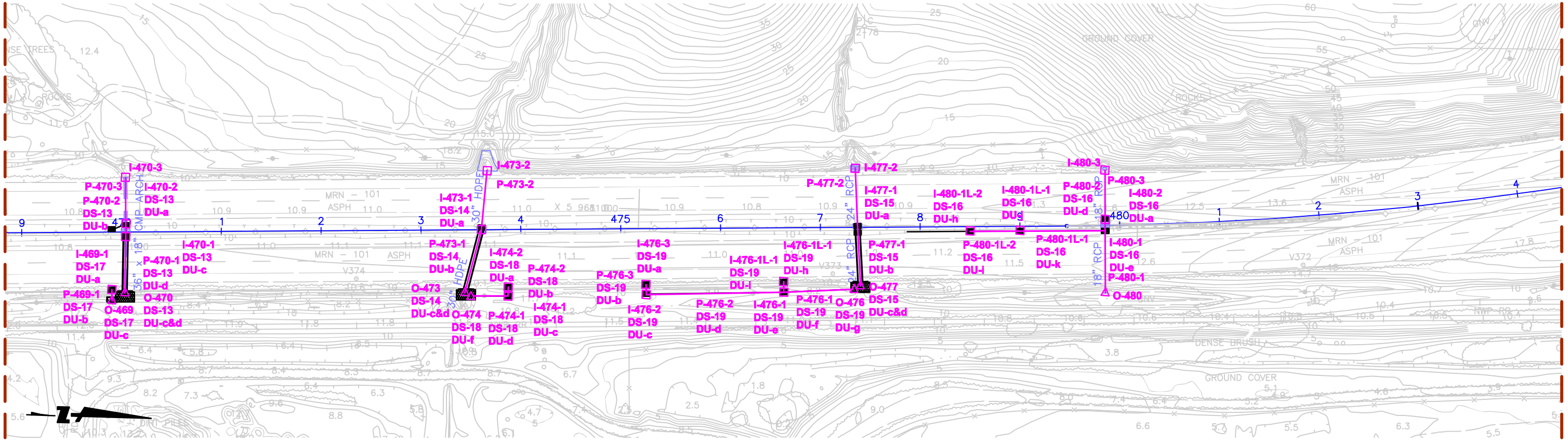
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers

MATCHLINE - SEE FIGURE 4D



DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

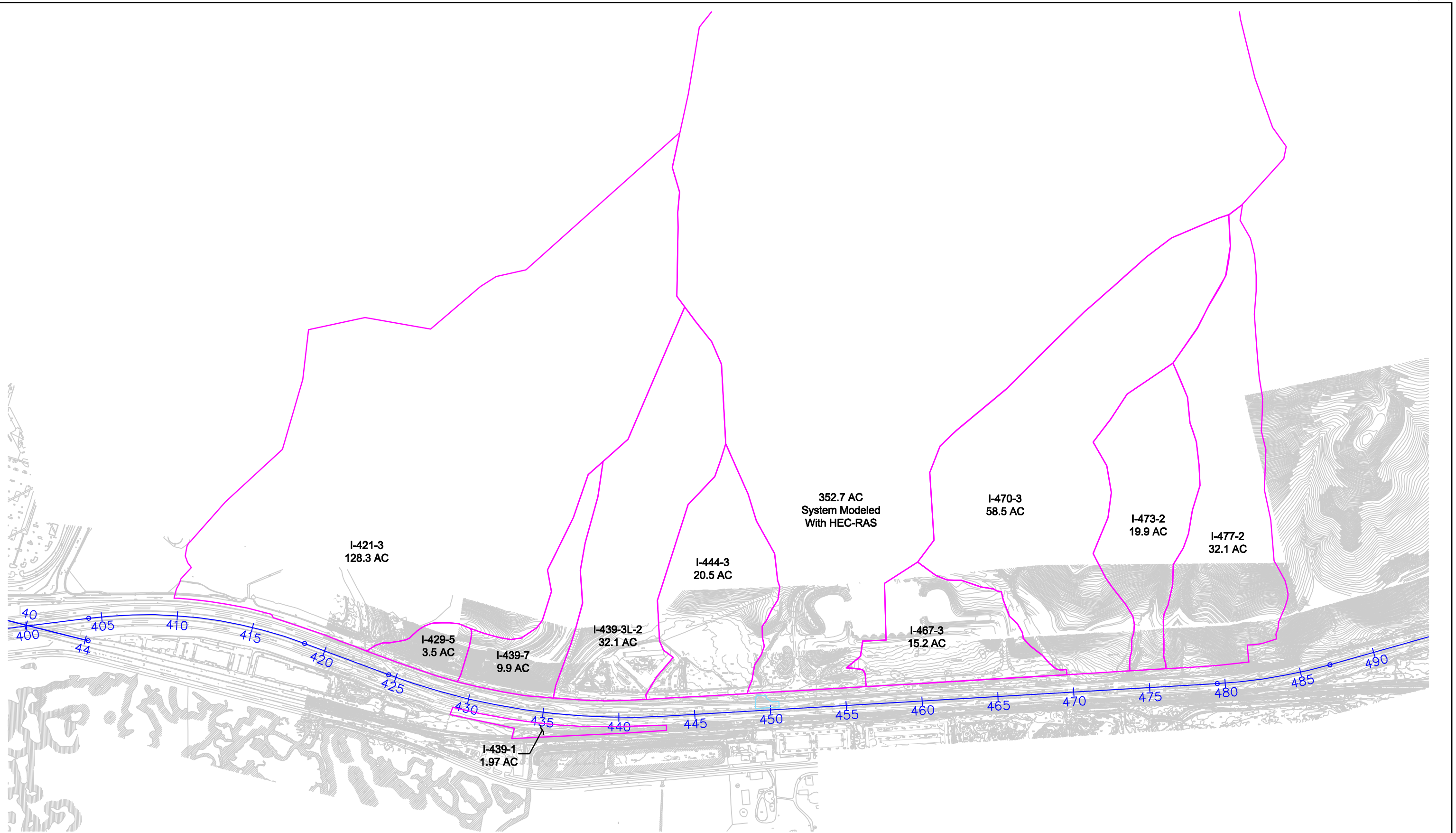
GRAPHIC SCALE
100 0 100 200

LEGEND:
I–200–X STORMCAD SYSTEM – ELEMENT NUMBER
DS–X DRAINAGE PLAN SYSTEM NUMBER
DU–x DRAINAGE PLAN UNIT NUMBER

FIGURE 4E
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BkF

©BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

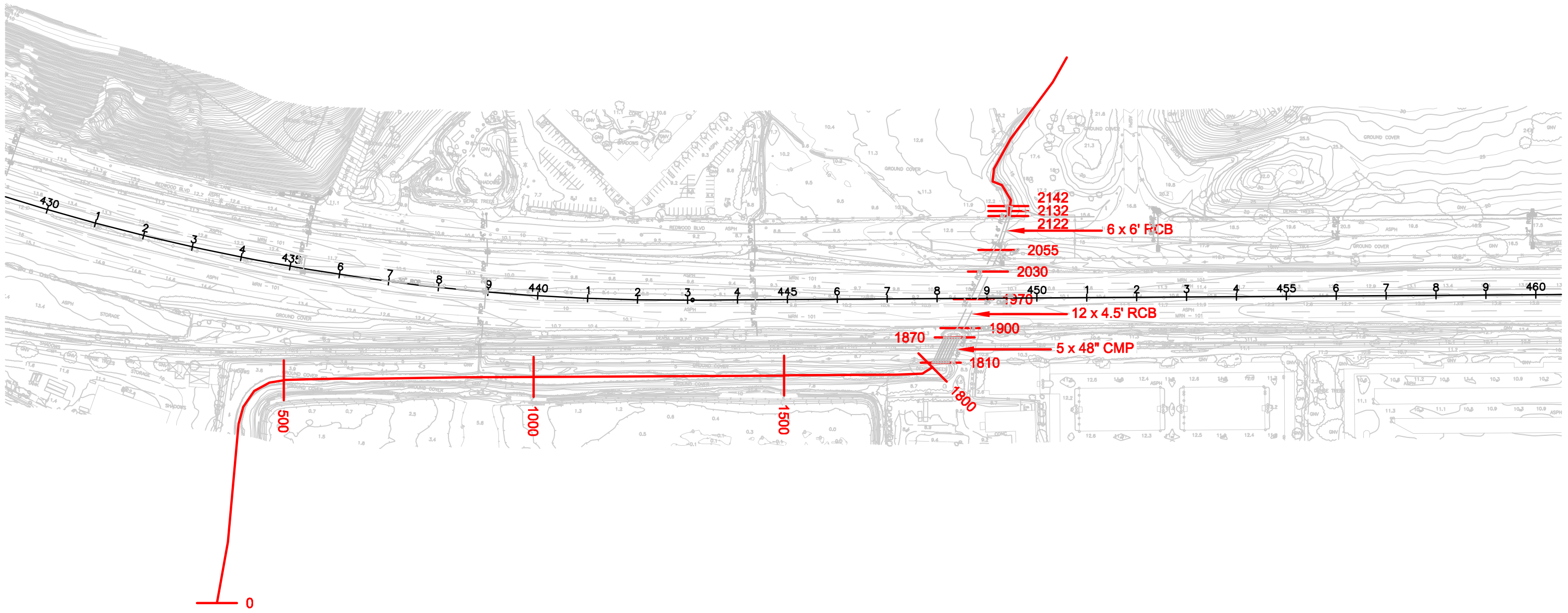
GRAPHIC SCALE
600 0 600 1200

FIGURE 5
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
OFF-SITE DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-rc\vol4\Engdb\087003-20\DWG\FIGURES-101%\MSN-Figure-5.dwg
PLOT DATE: 08-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Engdb\087003-20\DWG\FIGURES-101%\MSN-AREAS-FIG6.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
200 0 200 400

FIGURE 6
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
HEC-RAS CROSS SECTIONS FOR CREEK CROSSINGS 449+00

BkF

TABLE 1A

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Area and Slope

Drainage Area Station Outfall	Overland + Rill			Transition Elevation (feet)	End of Rill Elevation (feet)	Overland Slope (feet/ft)	Overland Length (feet)	Rill Flow Length (feet)	Rill Flow Slope (feet/ft)	Concentrated Flow Distance (feet)
	Drainage Area (acres)	Flow Path (feet)	Upstream Elevation (feet)							
449	352.7	1,642	1,560	1,440	880	0.400	300	1,342	0.42	6,385
467	15.2	300	40	35	34	0.017	86	214	0.00	779
470	58.5	2,468	740	680	120	0.200	298	2,170	0.26	1,370
473	19.9	819	440	360	200	0.267	300	519	0.31	1,290
477	32.1	2,376	760	675	150	0.283	300	2,076	0.25	782
444	20.5	1,537	210	170	11	0.133	243	1,294	0.12	365
439	42.0	2,473	360	320	12	0.133	243	2,230	0.14	660
429	3.5	318	140	20	12	0.400	300	18	0.44	0
421	128.3	2,246	520	470	80	0.167	272	1,974	0.20	2,160

TABLE 1B

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Runoff Coefficient

Drainage Area Station Outfall	Drainage Area (acres)	Upstream Elevation (feet)	Downstream Elevation (feet)	HDM C -COEFFICENT COMPONENTS							Percent Impervious (%)	10-Year Runoff Coefficient	25-Year Runoff Coefficient	100-Year Runoff Coefficient
				Overall Length (feet)	Overall Slope (feet/feet)	Relief "C"	Soil Infiltration "C"	Vegetal Cover "C"	Surface Storage "C"	Overall Pervious "C"				
449	352.7	1,560	10	8,027	.19	0.240	0.140	0.070	0.11	0.56	5	0.58	0.63	0.70
467	15.2	40	14	1,079	.02	0.110	0.140	0.070	0.11	0.43	55	0.69	0.76	0.70
470	58.5	740	9	3,838	.19	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
473	19.9	440	7	2,109	.21	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
477	32.1	760	14	3,158	.24	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
444	20.5	210	5	1,902	.11	0.240	0.070	0.070	0.11	0.49	10	0.53	0.58	0.70
439	42.0	360	4	3,133	.11	0.240	0.070	0.070	0.11	0.49	5	0.51	0.56	0.70
429	3.5	140	12	318	.40	0.315	0.070	0.070	0.11	0.57	50	0.73	0.81	0.70
421	128.3	520	3	4,406	.12	0.240	0.070	0.070	0.11	0.49	10	0.53	0.58	0.70

TABLE 1C

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Intensity and Flow

Drainage Area Station Outfall	Overland + Rill			Shallow Conc. Flow (minutes)	Conc. Flow (minutes)	Time of Conc (minutes)	25-Year Rainfall Intensity (in/hour)	100-Year Rainfall Intensity (in/hour)	25-Year Runoff Coef.	100-Year Runoff Coef.	25-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
	Drainage Area (acres)	Overland Flow Travel (minutes)	Rill Velocity (fps)									
449	352.7	6.81	4.5	5.0	21	33	1.45	1.80	0.63	0.70	324.0	445.0
467	15.2	8.94	.5	7.5	3	19	1.87	2.33	0.76	0.70	21.5	24.7
470	58.5	8.94	3.5	10.2	5	24	1.69	2.10	0.54	0.70	53.2	86.0
473	19.9	8.01	3.9	2.2	4	15	2.11	2.63	0.54	0.70	22.7	36.6
477	32.1	7.81	3.5	9.8	3	20	1.81	2.26	0.54	0.70	31.4	50.7
444	20.5	8.94	2.4	8.8	1	19	1.87	2.33	0.58	0.70	22.4	33.4
439	42.0	8.94	5.0	7.4	2	19	1.89	2.35	0.56	0.70	44.5	69.1
429	3.5	6.81	4.7	.1		10	2.51	3.12	0.81	0.70	7.1	7.7
421	128.3	8.94	3.1	10.6	7	27	1.60	1.99	0.58	0.70	119.6	178.5

Intercept Coefficient (Shallow) n = 0.15 (short pasture grass) Rainfall Intensity, 2-yr 24 3.5
Intercept Coefficient (Sheet) k = 0.213 (short grass prairie) Sheeting flow distance is 300-feet

TABLE 2

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Creek Hydraulics at Station 449+00

River Station (feet)	25-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)	Minimum Channel Elevation (feet)	Water Level 25-Year (feet)	Water Level 100-Year (feet)	Energy Grade Line 25-Year (feet)	Energy Grade Line 100-Year (feet)	25-Year Energy Grade Slope (ft/ft)	25-Year Channel Velocity (fps)	25-Year Flow Area (fps)	25-Year Top Width (sqft)	25-Year Froude Number	Length (ft)	Notes
2142	324	445	8.4	11.8	11.9	13.0	13.9	.0034	9.0	35.9	14.9	1.0		
2132	324	445	2.7	9.8	11.9	10.7	12.8	.0024	7.5	43.1	6.2	.5	10	
2122	324	445	2.4	9.8	11.9	10.6	12.8	.0021	7.2	45.1	6.2	.5	10	
2056	324	445	2.3	8.9	9.9	9.9	11.3	.0225	8.1	40.0	6.2	.6	66	6' x 6' RCB
2055	324	445	2.3	9.4	10.7	9.6	11.0	.0027	3.8	85.8	12.2	.3	1	
2030	324	445	2.2	9.1	10.1	9.4	10.5	.0029	3.9	83.9	12.2	.3	25	
1970	324	445	2.0	8.9	9.7	9.2	10.1	.0029	3.9	83.7	12.2	.3	60	12' x 4.5' RCB
1900	324	445	1.6	8.7	9.3	8.9	9.6	.0026	3.5	93.3	17.7	.3	70	
1870	324	445	1.6	8.9	9.5	8.9	9.5	.0001	.9	357.9	88.3	.1	30	
1810	324	445	1.5	8.5	8.8	8.5	8.9	.0001	.8	384.5	90.1	.1	60	5 x 48" Steel Pipes
1800	324	445	1.3	8.5	8.8	8.5	8.9	.0003	1.4	234.3	62.2	.1	10	
1500	324	445	1.2	8.3	8.6	8.4	8.6	.0008	1.8	177.9	60.9	.2	300	
1000	324	445	1.2	8.1	8.2	8.1	8.3	.0003	1.3	251.8	71.9	.1	500	
500	324	445	1.1	8.0	8.0	8.0	8.0	.0002	1.1	292.9	74.8	.1	500	
0	324	445	1.0	8.0	8.0	8.0	8.0	.0000	.3	1076.4	202.5	.0	500	

Note:
Tailwater is set Petaluma River 100-Year Flood Elevation 8.
Culvert at River Sttaion 1840 is 5 x 48" steel pipes conveying flow past the SMART tracks
This creek reach is the upper reach of the Creek labeled as Basalt Creek on USGS Topo maps.
Analyses based on Flow is Contained.

TABLE 3A

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Caltrans Culvert Hydrology - 25 Year Storm

Node [1] #	Drainage System	Drainage Unit	Ground Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Inlet Area (acres)	Lateral Area (acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	**Discharge [3] (cfs)**
Culvert Station Outfall 480																
I-480-1L-2	16	h	10.7	6.8	7.03	7.03	0.13		0.95	0.12	0.13	0.12	5.0	5.0	3.45	**0.4**
I-480-1L-1	16	j	10.7	6.6	6.93	6.93	0.05		0.95	0.05	0.05	0.17	5.0	5.4	3.37	**0.6**
I-480-3	-	-	10.0	5.1	6.51	6.51	1.16		0.95	1.10	1.16	1.10	10.0	10.0	2.51	**2.8**
I-480-2	16	a	10.6	4.8	6.48	6.46	0.98		0.95	0.93	2.14	2.03	5.0	10.2	2.49	**5.1**
I-480-1	-	-	10.0	4.8	6.43	6.41		0.05	(N/A)	0.00	2.19	2.20	0.0	10.3	2.48	**5.5**
Culvert Station Outfall 477																
I-477-2	-	-	9.3	7.1	8.41	8.41	33.45		0.56	18.62	33.45	18.62	20.3	20.3	1.88	**35.3**
I-477-1	15	a	9.1	6.1	7.48	7.45	0.34		0.95	0.32	33.79	18.94	5.0	20.4	1.88	**35.9**
Culvert Station Outfall 476																
I-476-1L-1	19	h	9.3	6.3	6.56	6.56	0.15		0.95	0.14	0.15	0.14	5.0	5.0	3.45	**0.5**
I-476-3	19	a	8.8	6.4	6.88	6.88	0.34		0.95	0.32	0.34	0.32	5.0	5.0	3.45	**1.1**
I-476-2	-	-	10.2	6.4	6.85	6.81			(N/A)	0.00	0.34	0.32	0.0	5.1	3.44	**1.1**
I-476-1	-	-	8.4	6.0	6.51	6.50		0.15	(N/A)	0.00	0.49	0.47	0.0	6.0	3.26	**1.5**
Culvert Station Outfall 474																
I-474-2	18	a	9.0	6.5	6.97	6.97	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-474-1	-	-	10.7	6.3	6.84	6.77			(N/A)	0.00	0.51	0.48	0.0	5.0	3.44	**1.7**
Culvert Station Outfall 473																
I-473-2	-	-	10.1	6.2	7.64	7.64	20.80		0.56	11.60	21.31	11.60	14.5	14.5	2.12	**24.8**
I-473-1	14	a	9.3	6.0	7.60	7.57	0.18		0.95	0.17	21.49	11.77	5.0	14.7	2.11	**25.0**
Culvert Station Outfall 470																
I-470-3	-	-	10.0	7.7	9.50	9.50	59.14		0.54	32.20	59.14	32.20	23.7	23.7	1.75	**56.9**
I-470-2	13	a	10.0	7.0	9.17	9.09	0.11		0.95	0.11	59.25	32.30	5.0	23.8	1.75	**57.0**
I-470-1	-	-	11.5	6.8	9.00	9.00			(N/A)	0.00	59.25	32.30	0.0	23.8	1.75	**56.9**
Culvert Station Outfall 469																
I-469-1	17	a	10.0	7.0	7.44	7.44	0.28		0.95	0.27	0.28	0.27	5.0	5.0	3.45	**0.9**
Culvert Station Outfall 467																
I-467-1L-2	12	h	11.8	6.8	7.60	7.60	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-467-1L-1	12	f	11.2	6.2	7.55	7.55	0.25		0.95	0.24	0.76	0.72	5.0	6.2	3.23	**2.4**
I-467-3	-	-	9.3	6.4	8.46	8.46	17.06		0.73	12.41	17.06	12.41	19.0	19.0	1.93	**24.1**
I-467-2	12	a	10.1	5.9	8.15	8.10	0.34		0.95	0.32	17.40	12.73	5.0	19.1	1.93	**24.7**
I-467-1	12	d	10.9	5.7	7.47	7.45	0.21	0.76	0.95	0.20	18.37	13.65	5.0	19.3	1.92	**26.4**
Culvert Station Outfall 450																
I-450-4	11	j	11.8	8.7	9.27	9.27	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-450-3	11	h	10.9	7.8	8.55	8.53	0.39		0.95	0.37	0.90	0.86	5.0	6.8	3.12	**2.7**
I-450-2	11	g	10.3	7.2	8.05	8.03	0.26		0.95	0.25	1.16	1.10	5.0	7.8	2.92	**3.2**
I-450-1	11	d	10.0	6.7	7.62	7.50	0.22		0.95	0.21	1.38	1.31	5.0	8.7	2.75	**3.6**
Culvert Station Outfall 444																
I-444-3	-	-	7.8	3.2	6.77	6.77	20.50		0.58	11.89	20.50	11.89	19.0	19.0	1.93	**23.1**
I-444-2	-	-	6.7	2.4	6.57	6.55	2.06		0.95	1.96	22.56	13.85	5.0	19.2	1.92	**26.8**
I-444-1	-	-	7.6	2.0	6.41	6.38	0.67		0.95	0.64	23.23	14.48	5.0	19.6	1.91	**27.9**
Culvert Station Outfall 439																
I-439-5L-4	21	a	13.6	8.2	8.63	8.63	0.36		0.95	0.34	0.36	0.34	5.0	5.0	3.45	**1.2**
I-439-5L-3	21	b	13.3	7.9	8.44	8.43	0.16		0.95	0.15	0.16	0.49	5.0	5.7	3.33	**1.7**
I-439-5L-2	21	d	12.5	7.3	8.23	8.22	0.33		0.95	0.31	0.49	0.81	5.0	6.9	3.10	**2.5**
I-439-5L-1	21	g	11.7	5.0	8.11	8.04	0.37		0.95	0.35	0.86	1.16	5.0	8.1	2.87	**3.4**
I-439-4L-1	7	ee	10.8	4.3	7.74	7.74	0.29		0.95	0.28	0.29	0.28	5.0	5.0	3.45	**1.0**
I-439-3L-2	-	-	8.7	3.3	8.70	8.70	32.10		0.56	17.98	32.10	17.98	18.6	18.6	1.95	**35.3**
I-439-3L-1	7	j	7.2	3.1	7.70	7.17	0.64		0.95	0.61	32.74	18.58	5.0	18.7	1.94	**36.4**
I-439-2L-4	22	k	9.6	5.6	8.00	8.00	0.20		0.95	0.19	0.20	0.19	5.0	5.0	3.45	**0.7**
I-439-2L-3	22	h	9.6	5.3	8.00	8.00	0.28		0.95	0.27	0.28	0.46	5.0	9.8	2.54	**1.2**
I-439-2L-2	22	e	9.7	5.0	7.98	7.98	0.12		0.95	0.11	0.40	0.57	5.0	12.6	2.28	**1.3**
I-439-2L-1	22	d	9.9	4.7	7.97	7.97	0.14		0.95	0.13	0.54	0.70	5.0	14.7	2.11	**1.5**
I-439-7	-	-	10.1	5.0	8.81	8.81	9.90		0.56	5.54	9.90	5.54	18.6	18.6	1.95	**10.9**
I-439-6	7	b	9.1	4.5	8.21	8.19	0.99		0.95	0.94	10.89	6.48	5.0	18.7	1.94	**12.7**
I-439-5	7	d	11.3	4.0	8.03	8.01	0.36	0.86	0.95	0.34	12.11	7.99	5.0	19.2	1.92	**15.5**
I-439-4	7	f	10.1	3.2	7.73	7.73	0.12	0.29	0.95	0.11	12.52	8.38	5.0	20.2	1.89	**15.9**
I-439-3	7	h	9.3	2.1	7.37	7.26	0.14	32.74	0.95	0.13	45.40	27.09	5.0	21.1	1.85	**50.5**
I-439-2	22	c	10.1	2.1	7.21	7.12	0.27	0.54	0.95	0.26	46.21	28.05	5.0	21.2	1.85	**52.3**
I-439-1	-	-	9.8	1.5	6.56	6.48	1.97		0.60	1.18	48.18	29.23	5.0	21.4	1.84	**54.2**
Culvert Station Outfall 429																
I-429-1L-3	20	a	15.6	10.5	10.97	10.97	0.35		0.95	0.33	0.35	0.33	5.0	5.0	3.45	**1.2**
I-429-1L-2	20	c	14.6	9.9	10.67	10.66	0.33		0.95	0.31	0.68	0.65	5.0	6.3	3.20	**2.1**
I-429-1L-1	20	e	14.3	9.4	10.62	10.59	0.15		0.95	0.14	0.83	0.79	5.0	6.8	3.12	**2.5**
I-429-5	-	-	12.4	7.9	11.03	11.03	3.50		0.70	2.45	3.50	2.45	10.0	10.0	2.51	**6.2**
I-429-4	6	b	10.8	7.7	10.94	10.84	1.43		0.95	1.36	4.93	3.81	5.0	10.3	2.49	**9.5**
I-429-3	-	-	12.9	6.6	11.37	11.34	0.63		0.95	0.60	5.56	4.41	5.0	10.5	2.47	**11.0**
I-429-2	-	-	13.2	6.3	11.30	11.09			(N/A)	0.00	5.56	4.41	0.0	10.6	2.46	**10.9**
I-429-1	-	-	15.6	9.3	10.56	10.53		0.83	(N/A)	0.00	6.39	5.20	0.0	11.2	2.41	**12.6**
Culvert Station Outfall 421																
I-421-3	-	-	15.0	3.9	6.90	6.90	128.30		0.58	74.41	128.30	74.41	26.7	26.7	1.64	**122.8**
I-421-2	-	-	17.0	2.9	6.80	6.76	0.88		0.95	0.84	129.18	75.25	5.0	27.0	1.63	**123.3**
I-421-1	5	a	16.3	2.7	6.60	6.58	1.07		0.90	0.96	130.25	76.21	5.0	27.4	1.61	**123.8**
Culvert Station Outfall 416																
I-416-2	-	-	18.0	14.5	15.64	15.64	0.72		0.95	0.68	0.72	0.68	5.0	5.0	3.45	**2.4**
I-416-1	-	-	24.2	14.1	15.53	15.52	0.87		0.95	0.83	1.59	1.51	5.0	5.4	3.37	**5.1**
Culvert Station Outfall 411																
I-411-2	3	a	32.4	29.1	29.81	29.81	0.90		0.95	0.86	0.90	0.86	5.0	5.0	3.45	**3.0**
I-411-1	-	-	30.6	17.0	18.11	17.90	0.79		0.95	0.75	1.69	1.61	5.0	5.2	3.42	**5.5**
Culvert Station Outfall 406																
I-406-2	2	a	38.9	35.3	35.98	35.98	0.82		0.95	0.78	0.82	0.78	5.0	5.0	3.45	**2.7**
I-406-1	-	-	37.7	31.8	32.72	32.68	0.73		0.95	0.69	1.55	1.47	5.0	5.2	3.42	**5.1**
Culvert Station Outfall 395																
I-395-3	-	-	36.0	30.6	31.20	31.20	0.68		0.95	0.65	0.68	0.65	5.0	5.0	3.45	**2.3**
I-395-2	1	a	35.8	30.3	30.99	30.98	0.11		0.95	0.11	0.79	0.75	5.0	5.3	3.39	**2.6**
I-395-1	-	-	36.2	12.0	12.97	12.93	1.04		0.95	0.99	1.83	1.74	5.0	5.8	3.30	**5.8**

Notes
(1) ft = feet, in/hr = inches/hour rainfall, cfs = cubic feet per second
(2) Cumlative Area = Inlet CA + Lateral Inlet CA
(3) Discharge is from the Rational Method, Q = CIA

TABLE 3B

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Caltrans Culvert Hydraulics - 25 Year Storm

Pipe #	Drainage System	Drainage Unit	Upstream Node	Downstream Node	Total Discharge [3] (cfs) [1]	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Constructed Slope (ft/ft)	Pipe Roughness (Mannings n)	Invert Elevation Upstream	Invert Elevation Downstream	Ground/Rim Elevation Upstream	Ground/Rim Elevation Downstream	HGL [2] [4] Elevation Upstream	HGL [2] [4] Elevation Downstream	**Freeboard [2] (feet)**	Upstream Cover (feet)	Velocity (ft/s)	Energy Grade (feet)	EGL Freeboard (feet)
Culvert Station Outfall 480																					
P-480-1L-2	16	i	I-480-1L-2	I-480-1L-1	0.4	5.6	18	50	0.003	0.013	6.75	6.61	10.74	10.74	7.03	6.93	**3.7**	2.5	1.9	7.08	3.7
P-480-1L-1	16	k	I-480-1L-1	I-480-1	0.6	5.7	18	85	0.003	0.013	6.61	6.36	10.74	9.97	6.93	6.64	**3.8**	2.6	2.1	7.00	3.7
P-480-3	-	-	I-480-3	I-480-2	2.8	7.3	18	50	0.005	0.013	5.05	4.81	9.99	10.64	6.51	6.48	**3.5**	3.4	3.9	6.74	3.2
P-480-2	16	d	I-480-2	I-480-1	5.1	6.1	18	12	0.003	0.013	4.81	4.77	10.64	9.97	6.46	6.43	**4.2**	4.3	2.9	6.59	4.1
P-480-1	-	-	I-480-1	OF-480	5.5	15.8	18	63	0.023	0.013	4.77	3.34	9.97	6.46	6.41	6.24	**3.6**	3.7	3.1	6.56	3.4
Culvert Station Outfall 477																					
P-477-2	-	-	I-477-2	I-477-1	35.3	90.7	4x2 RCB	58	0.017	0.013	7.07	6.09	9.27	9.09	8.41	7.48	**0.9**	0.2	10.5	10.12	-0.8
P-477-1	15	b	I-477-1	OF-477	35.9	52.6	4x2 RCB	58	0.006	0.013	6.09	5.76	9.09	7.26	7.45	7.00	**1.6**	1.0	7.2	8.26	0.8
Culvert Station Outfall 476																					
P-476-1L-1	19	i	I-476-1L-1	I-476-1	0.5	9.0	18	11	0.007	0.013	6.30	6.22	9.30	8.42	6.56	6.51	**2.7**	1.5	2.7	6.67	2.6
P-476-3	19	b	I-476-3	I-476-2	1.1	3.1	15	9	0.002	0.013	6.38	6.36	8.75	10.16	6.88	6.85	**1.9**	1.1	2.3	6.96	1.8
P-476-2	19	d	I-476-2	I-476-1	1.1	5.7	18	138	0.003	0.013	6.36	5.96	10.16	8.42	6.81	6.51	**3.4**	2.3	2.5	6.91	3.3
P-476-1	19	f	I-476-1	OF-476	1.5	5.6	18	71	0.003	0.013	5.96	5.76	8.42	7.26	6.50	6.24	**1.9**	1.0	2.7	6.61	1.8
Culvert Station Outfall 474																					
P-474-2	18	b	I-474-2	I-474-1	1.7	5.4	15	10	0.007	0.013	6.45	6.38	8.95	10.70	6.97	6.86	**2.0**	1.3	3.9	7.20	1.7
P-474-1	18	d	I-474-1	OF-474	1.7	7.6	18	38	0.005	0.013	6.28	6.08	10.70	7.58	6.77	6.56	**3.9**	2.9	3.5	6.96	3.7
Culvert Station Outfall 473																					
P-473-2	-	-	I-473-2	I-473-1	24.8	41.0	4x2 RCB	58	0.003	0.013	6.19	5.99	10.09	9.29	7.64	7.60	**2.5**	1.9	5.4	8.10	2.0
P-473-1	14	b	I-473-1	OF-473	25.0	-26.0	4x2 RCB	65	-0.001	0.013	5.99	6.08	9.29	8.58	7.57	7.15	**1.7**	1.3	3.1	7.72	1.6
Culvert Station Outfall 470																					
P-470-3	-	-	I-470-3	I-470-2	56.9	85.5	4x2 RCB	46	0.015	0.013	7.65	6.96	9.98	9.96	9.50	9.17	**0.5**	0.3	11.6	11.60	-1.6
p-470-2	13	b	I-470-2	I-470-1	57.0	67.2	4x2 RCB	14	0.009	0.013	6.96	6.83	9.96	11.51	9.09	9.00	**0.9**	1.0	7.1	9.88	0.1
p-470-1	13	b	I-470-1	OF-470	56.9	38.1	4x2 RCB	57	0.003	0.013	6.83	6.66	11.51	8.66	9.00	8.51	**2.5**	2.7	7.1	9.79	1.7
Culvert Station Outfall 469																					
P-469-1	17	b	I-469-1	OF-469	0.9	5.5	18	11	0.003	0.013	7.04	7.01	10.04	8.51	7.44	7.37	**2.6**	1.5	2.3	7.52	2.5
Culvert Station Outfall 467																					
P-467-1L-2	12	g	I-467-1L-2	I-467-1L-1	1.7	5.7	18	200	0.003	0.013	6.77	6.18	11.81	11.21	7.60	7.55	**4.2**	3.5	2.8	7.72	4.1
P-467-1L-1	12	e	I-467-1L-1	I-467-1	2.4	5.7	18	166	0.003	0.013	6.18	5.69	11.21	10.91	7.55	7.47	**3.7**	3.5	3.1	7.70	3.5
P-467-3	-	-	I-467-3	I-467-2	24.1	29.1	2x2 RCB	44	0.010	0.013	6.37	5.92	9.28	10.12	8.46	8.15	**0.8**	0.9	6.0	9.02	0.3
P-467-2	-	-	I-467-2	I-467-1	24.7	16.8	2x2 RCB	68	0.003	0.013	5.92	5.69	10.12	10.91	8.10	7.53	**2.0**	2.2	6.2	8.69	1.4
P-467-1	-	-	I-467-1	OF-467	26.4	40.0	2x2 RCB	14	0.019	0.013	5.69	5.42	10.91	8.49	7.45	6.86	**3.5**	3.2	10.7	9.22	1.7
Culvert Station Outfall 450																					
P-450-4	11	i	I-450-4	I-450-3	1.7	5.8	18	300	0.003	0.013	8.71	7.81	11.81	10.91	9.27	8.55	**2.5**	1.6	2.8	9.39	2.4
P-450-3	11	g	I-450-3	I-450-2	2.7	5.7	18	201	0.003	0.013	7.81	7.22	10.91	10.31	8.53	8.05	**2.4**	1.6	3.2	8.69	2.2
P-450-2	11	e	I-450-2	I-450-1	3.2	5.7	18	175	0.003	0.013	7.22	6.71	10.31	10.01	8.03	7.62	**2.3**	1.6	3.3	8.20	2.1
P-450-1	11	c	I-450-1	OF-450	3.6	6.1	18	9	0.003	0.013	6.71	6.68	10.01	8.18	7.50	7.41	**2.5**	1.8	3.6	7.70	2.3
Culvert Station Outfall 444																					
P-444-3	-	-	I-444-3	I-444-2	23.1	45.0	30	64	0.012	0.013	3.16	2.39	7.80	6.66	6.77	6.57	**1.0**	2.1	4.7	7.11	0.7
P-444-2	-	-	I-444-2	I-444-1	26.8	43.6	36	89	0.004	0.013	2.39	2.01	6.66	7.61	6.55	6.41	**0.1**	1.3	3.8	6.77	-0.1
P-444-1	-	-	I-444-1	OF-444	27.9	45.7	36	81	0.005	0.013	2.01	1.63	7.61	8.00	6.38	6.24	**1.2**	2.6	3.9	6.62	1.0
Culvert Station Outfall 439																					
P-439-5L-4	21	f	I-439-5L-4	I-439-5L-3	1.2	5.7	18	100	0.003	0.013	8.16	7.87	13.61	13.26	8.63	8.44	**5.0**	4.0	2.5	8.73	4.9
P-439-5L-3	21	c	I-439-5L-3	I-439-5L-2	1.7	5.7	18	200	0.003	0.013	7.87	7.28	13.26	12.46	8.43	8.23	**4.8**	3.9	2.8	8.55	4.7
P-439-5L-2	21	e	I-439-5L-2	I-439-5L-1	2.5	5.7	18	228	0.003	0.013	7.28	6.61	12.46	11.72	8.22	8.11	**4.2**	3.7	3.1	8.37	4.1
P-439-5L-1	7	ff	I-439-5L-1	I-439-5	3.4	33.2	18	10	0.100	0.013	4.96	3.96	11.72	11.25	8.04	8.03	**3.7**	5.3	1.9	8.10	3.6
P-439-4L-1	7	dd	I-439-4L-1	I-439-4	1.0	32.1	18	12	0.093	0.013	4.27	3.15	10.80	10.14	7.74	7.73	**3.1**	5.0	0.5	7.74	3.1
Outside of Caltrans - Right-of-Way																					
P-439-3L-2	-	-	I-439-3L-2	I-439-3L-1	35.3	13.0	24	64	0.003	0.013	3.33	3.12	8.70	7.17	8.72	7.17	**ABOVE RIM**	3.4	11.2	10.67	-2.0
P-439-3L-1	-	-	I-439-3L-1	I-439-3	36.4	24.9	24	84	0.012	0.013	3.12	2.10	7.17	9.27	9.54	7.37	**ABOVE RIM**	2.1	11.6	11.62	-4.5
P-439-2L-4	22	i	I-439-2L-4	I-439-2L-3	0.7	5.6	18	108	0.003	0.013	5.64	5.33	9.64	9.58	8.00	8.00	**1.6**	2.5	0.4	8.00	1.6
P-439-2L-3	22	f	I-439-2L-3	I-439-2L-2	1.2	5.6	18	112	0.003	0.013	5.33	5.01	9.58	9.65	8.00	7.98	**1.6**	2.8	0.7	8.01	1.6
P-439-2L-2	22	j	I-439-2L-2	I-439-2L-1	1.3	6.0	18	90	0.003	0.013	5.01	4.72	9.65	9.85	7.98	7.97	**1.7**	3.1	0.7	7.99	1.7
P-439-2L-1	22	c	I-439-2L-1	I-439-2	1.5	5.4	18	105	0.003	0.013	4.72	4.44	9.85	10.06	7.97	7.94	**1.9**	3.6	0.9	7.98	1.9
P-439-7	-	-	I-439-7	I-439-6	10.9	10.6	18	56	0.010	0.013	5.02	4.45	10.12	9.11	8.81	8.21	**1.3**	3.6	6.2	9.40	0.7
P-439-6	-	-	I-439-6	I-439-5	12.7	32.9	30	76	0.006	0.013	4.45	3.96	9.11	11.25	8.19	8.12	**0.9**	2.2	2.6	8.29	0.8
P-439-5	7	e	I-439-5	I-439-4	15.5	27.2	30	184	0.004	0.013	3.96	3.15	11.25	10.14	8.01	7.75	**3.2**	4.8	3.2	8.16	3.1
P-439-4	7	g	I-439-4	I-439-3	15.9	31.0	30	184	0.006	0.013	3.15	2.10	10.14	9.27	7.73	7.45	**2.4**	4.5	3.2	7.89	2.2
P-439-3	7	ff	I-439-3	I-439-2	50.5	21.1	36	10	0.001	0.013	2.10	2.09	9.27	10.06	7.26	7.21	**2.0**	4.2	7.1	8.05	1.2
P-439-2	22	b	I-439-2	I-439-1	52.3	53.0	36	92	0.006	0.013	2.09	1.51	10.06	9.80	7.12	6.56	**2.9**	5.0	7.4	7.97	2.1
P-439-1	-	-	I-439-1	OF-439	54.2	36.9	36	36	0.003	0.013	1.51	1.40	9.80	9.80	6.48	6.24	**3.3**	5.3	7.7	7.39	2.4
Culvert Station Outfall 429																					
P-429-1L-3	20	b	I-429-1L-3	I-429-1L-2	1.2	5.7	18	200	0.003	0.013	10.51	9.92	15.61	14.57	10.97	10.67	**4.6**	3.6	2.5	11.07	4.5
P-429-1L-2	20	d	I-429-1L-2	I-429-1L-1	2.1	6.2	18	84	0.003	0.013	9.92	9.63	14.57	14.30	10.66	10.62	**3.9**	3.2	3.2	10.81	3.8
P-429-1L-1	20	f	I-429-1L-1	I-429-1	2.5	19.8	18	70	0.035	0.013	9.43	6.95	14.30	15.61	10.59	10.56	**3.7**	3.4	7.6	11.50	2.8
P-429-5	-	-	I-429-5	I-429-4	6.2	5.6	18	56	0.003	0.013	7.87	7.71	12.44	10.84	11.03	10.84	**1.4**	3.1	3.5	11.22	1.2
P-429-4	-	-	I-429-4	I-429-3	9.5	13.2	18	72	0.016	0.013	7.71	6.57	10.84	12.91	11.96	11.37	**ABOVE RIM**	1.6	5.4	12.41	-1.6
P-429-3	-	-	I-429-3	I-429-2	11.0	28.0	24	17	0.015	0.013	6.57	6.31	12.91	13.20	11.34	11.30	**1.6**	4.3	3.5	11.53	1.4
P-429-2	-	-	I-429-2	I-429-1	10.9	-33.6	24	133	-0.022	0.013	6.31	9.25	13.20	15.61	11.09	10.57	**2.1**	4.9	3.5	11.28	1.9
P-429-1	-	-	I-429-1	OF-429	12.6	42.9	24	95	0.036	0.013	9.25	5.83	15.61	10.63	10.53	6.58	**5.1**	4.4	11.9	12.72	2.9
Culvert Station Outfall 421																					
P-421-3	-	-	I-421-3	I-421-2	122.8	223.4	48	167	0.006	0.013	3.90	2.89	15.00	16.99	6.90	6.80	**8.1**	7.1	9.1	8.19	6.8
P-421-2	-	-	I-421-2	I-421-1	123.3	113.2	48	103	0.002	0.013	2.89	2.73	16.99	16.25	6.76	6.60	**10.2**	10.1	4.9	7.13	9.9
P-421-1	-	-	I-421-1	OF-421	123.8	130.6	48	208	0.002	0.013	2.73	2.30	16.25	10.00	6.58	6.24	**9.7**	9.5	5.9	7.12	9.1
Culvert Station Outfall 416																					
P-416-2	-	-	I-416-2	I-416-1	2.4	4.1	15	88	0.004	0.013	14.47	14.12	18.00	24.21	15.64	15.53	**2.4**	2.3	3.5	15.82	2.2
P-416-1	-	-	I-416-1	OF-416	5.1	3.9	24	117	0.001	0.024	14.12	14.00	24.21	19.70	15.52	14.80	**8.7**	8.1	1.6	15.56	8.6
Culvert Station Outfall 411																					
P-411-2	-	-	I-411-2	I-411-1	3.0	14.2	15	84	0.048	0.013	29.12	25.09	32.37	30.59	29.81	25.48	**2.6**	2.0	9.1	31.10	1.3
P-411-1	-	-	I-411-1	OF-411	5.5	11.5	18	277	0.041	0.024	16.99	5.70	30.59	12.00	17.90	6.43	**12.7**	12.1	6.4	18.54	12.0
Culvert Station Outfall 406																					
P-406-2	-	-	I-406-2	I-406-1	2.7	12.9	15	86	0.040	0.013	35.32	31.91	38.94	37.71	35.98	32.72	**3.0**	2.4	8.3	37.05	1.9
P-406-1	-	-	I-406-1	OF-406	5.1	70.6	18	68	0.452	0.013	31.81	1.06	37.71	12.60	32.68	6.24	**5.0**	4.4	23.2	41.03	-3.3
Culvert Station Outfall 395																					
P-395-3	-	-	I-395-3	I-395-2	2.3	7.2	18	70	0.005	0.013	30.62	30.29	36.00	35.82	31.20	30.99	**4.8**	3.9	3.6	31.40	4.6
P-395-2	-	-	I-395-2	I-395-1	2.6	6.0	18	90	0.003	0.013	30.29	30.00	35.82	36.20	30.98	30.61	**4.8**	4.0	3.3	31.14	4.7
P-395-1	-	-	I-395-1	OF-395	5.8	31.7	18	66	0.091	0.013	12.00	6.00	36.20	12.00	12.93	6.43	**23.3**	22.7	13.6	15.82	20.4

Notes
(1) ft = feet, cfs = cubic feet per second, ft/s = feet per second
(2) Freeboard is HGL (Hydraulic Grade Line) below Rim of Inlet
(3) Discharge is from the Rational Method, Q = CIA
(4) Downstream HGL set to 6.24 Mean Higher High Water of Mare Island near San Pablo Bay

TABLE 4

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Inlet on gutter Drainage Area, 25-year Flow

Drainage System	Drainage Unit	Inlet Type	Alignment	Station	AREA ft^2	C=0.95 CA ft^2	C=0.95 CA acres	Intensity in/hr	Flow cfs
-	-	EX	J1R (Rt)	406+00	31,699	30,114	0.69	3.45	2.39
-	-	EX	J1R (Rt)	411+00	34,746	33,009	0.76	3.45	2.61
20	a	G2	J1R (Med)	425+00	15,442	14,670	0.34	3.45	1.16
20	c	G2	J1R (Med)	427+00	14,436	13,714	0.31	3.45	1.09
20	e	G2	J1R (Med)	427+84	6,562	6,234	0.14	3.45	0.49
21	a	G2	J1R (Med)	430+00	15,666	14,883	0.34	3.45	1.18
21	b	G2	J1R (Med)	431+00	7,262	6,899	0.16	4.45	0.70
21	d	G2	J1R (Med)	433+00	14,364	13,646	0.31	3.45	1.08
21	g	MGDO	J1R (Med)	435+27	16,150	15,343	0.35	3.45	1.22
7	ee	G2	J1R (Med)	437+11	12,851	12,208	0.28	3.45	0.97
22	b	G2	J1R (Med)	438+95	11,554	10,976	0.25	3.45	0.87
22	d	G2	J1R (Med)	440+00	6,157	5,849	0.13	3.45	0.46
22	e	G2	J1R (Med)	440+90	5,079	4,825	0.11	3.45	0.38
22	h	G2	J1R (Med)	442+02	12,294	11,679	0.27	3.45	0.93
22	k	MGDO	J1R (Med)	443+10	8,871	8,427	0.19	3.45	0.67
11	d	G2	J1R (Rt)	449+26	9,731	9,244	0.21	3.45	0.73
11	f	G2	J1R (Rt)	450+00	16,800	15,960	0.37	3.45	1.26
11	h	G2	J1R (Rt)	453+00	16,800	15,960	0.37	3.45	1.26
11	j	G2	J1R (Rt)	456+00	22,391	21,271	0.49	3.45	1.68
12	h	G2	J1R (Rt)	464+00	22,408	21,288	0.49	3.45	1.69
12	f	G2	J1R (Rt)	466+00	11,200	10,640	0.24	3.45	0.84
12	d	G2	J1R (Rt)	467+66	9,301	8,836	0.20	3.45	0.70
17	a	G2	J1R (Rt)	469+89	12,535	11,908	0.27	3.45	0.94
18	a	G2	J1R (Rt)	473+20	22,235	21,123	0.48	3.45	1.67
19	a	G2	J1R (Rt)	475+25	14,911	14,165	0.33	3.45	1.12
19	h	G2	J1R (Rt)	477+14	6,365	6,047	0.14	3.45	0.48
16	h	G2	J1R (Med)	478+50	5,644	5,362	0.12	3.45	0.42
16	j	G2	J1R (Med)	479+00	2,407	2,287	0.05	3.45	0.18

TABLE 5

BKF #087003-20
MSN HOV A3 IMPROVEMENTS
DRAINAGE REPORT
Gutter Spread, Inlet Interception Calculations

Drainage System	Drainage Unit	Alignment (Location)	Inlet[1]	Station	Bypass to Downstream Station	Flow Previous (cfs)	25-year Inflow (cfs)	Total Flow cfs	Manning's Roughness "n"	Longitudinal Slope (ft/foot)	Cross Slope V:H (ft/foot)	Depth (feet)	Spread (feet)	Shoulder (feet)	Area (square feet)	Velocity ft/s	Inlet Width (feet)	Frontal Flow Efficiency	Splash Over Velocity (fps)	Splash-Over Efficiency	Frontal Inflow[2] (cfs)	Side Bypass (cfs)	Inlet Length (feet)	Sideflow Capture Efficiency	Sideflow[2] (cfs)	Captured Flow (cfs)	Flow Bypass (cfs)	Percent Bypass (%)
-	-	J1R (Rt)	EX	406+00	406+00		2.39	2.39	0.016	0.0154	0.050	0.26	5.2	10.0	0.68	3.51	1.97	0.72	5.9	1.00	1.71	0.67	3.33	0.36	0.24	1.95	0.43	18%
-	-	J1R (Rt)	EX	411+00		0.43	2.61	3.05	0.016	0.0154	0.050	0.29	5.7	10.0	0.82	3.73	1.97	0.68	5.9	1.00	2.06	0.99	3.33	0.33	0.33	2.39	0.66	22%
														10.0														
20	a	J1R (Med)	G2	425+00	427+00		1.16	1.16	0.016	0.0063	0.020	0.17	8.4	10.0	0.70	1.66	1.97	0.51	5.9	1.00	0.60	0.57	3.33	0.46	0.26	0.86	0.31	26%
20	c	J1R (Med)	G2	427+00	427+84	0.31	1.09	1.39	0.016	0.0039	0.020	0.20	9.8	10.0	0.96	1.45	1.97	0.45	5.9	1.00	0.63	0.76	3.33	0.52	0.40	1.03	0.37	26%
20	e	J1R (Med)	G2	427+84	430+00	0.37	0.49	0.86	0.016	0.0035	0.020	0.17	8.3	10.0	0.70	1.24	1.97	0.51	5.9	1.00	0.44	0.42	3.33	0.59	0.25	0.69	0.17	20%
21	a	J1R (Med)	G2	430+00	433+00	0.17	1.18	1.35	0.016	0.0035	0.020	0.20	9.9	10.0	0.97	1.39	1.97	0.45	6.9	1.00	0.61	0.75	3.33	0.54	0.40	1.01	0.34	25%
21	b	J1R (Med)	G2	431+00	435+27	0.34	0.70	1.05	0.016	0.0035	0.020	0.18	9.0	10.0	0.80	1.30	1.97	0.48	5.9	1.00	0.51	0.54	3.33	0.57	0.31	0.81	0.23	22%
21	d	J1R (Med)	G2	433+00	435+27	0.34	1.08	1.42	0.016	0.0035	0.020	0.20	10.1	10.0	1.01	1.40	1.97	0.44	5.9	1.00	0.63	0.80	3.33	0.54	0.43	1.05	0.37	26%
21	g	J1R (Med)	MGDO	435+27	437+11	0.37	1.22	1.58	0.016	0.0051	0.020	0.20	9.8	10.0	0.95	1.66	3.94	0.75	5.9	1.00	1.19	0.40	3.33	0.46	0.18	1.37	0.22	14%
7	ee	J1R (Med)	G2	437+11	438+95	0.22	0.97	1.18	0.016	0.0051	0.020	0.18	8.8	10.0	0.77	1.54	1.97	0.49	6.9	1.00	0.58	0.60	3.33	0.49	0.29	0.88	0.30	26%
22	b	J1R (Med)	G2	438+95	440+00	0.30	0.87	1.17	0.016	0.0031	0.020	0.19	9.6	10.0	0.92	1.28	1.97	0.46	6.9	1.00	0.54	0.63	3.33	0.58	0.37	0.90	0.27	23%
22	d	J1R (Med)	G2	440+00	440+90	0.27	0.46	0.73	0.016	0.0020	0.020	0.17	8.7	10.0	0.76	0.96	1.97	0.50	7.9	1.00	0.36	0.37	3.33	0.69	0.26	0.62	0.11	15%
22	e	J1R (Med)	G2	440+90	442+02	0.11	0.38	0.50	0.016	0.0010	0.020	0.17	8.6	10.0	0.73	0.67	1.97	0.50	6.9	1.00	0.25	0.25	3.33	0.81	0.20	0.45	0.05	9%
22	h	J1R (Med)	G2	442+02		0.08	0.93	1.01	0.016		0.020	0.15	7.5	10.0	SEE TABLE 6 "INLETS IN SAG CONDITION"													
22	k	J1R (Med)	MGDO	443+10	442+02		0.67	0.67	0.016	0.0010	0.020	0.19	9.6	10.0	0.92	0.73	3.94	0.76	6.9	1.00	0.51	0.16	3.33	0.79	0.13	0.63	0.03	5%
														10.0														
11	d	J1R (Rt)	G2	449+26		0.15	0.73	0.89	0.016	0.0030	0.037	0.22	5.9	10.0	0.64	1.37	1.97	0.66	2.9	1.00	0.59	0.30	3.33	0.69	0.21	0.79	0.09	11%
11	f	J1R (Rt)	G2	450+00	449+26	0.16	1.26	1.43	0.016	0.0030	0.050	0.29	5.8	10.0	0.85	1.67	1.97	0.67	3.9	1.00	0.95	0.48	3.33	0.68	0.32	1.27	0.15	11%
11	h	J1R (Rt)	G2	453+00	450+00	0.21	1.26	1.47	0.016	0.0030	0.050	0.30	5.9	10.0	0.87	1.68	1.97	0.66	4.9	1.00	0.97	0.50	3.33	0.67	0.34	1.31	0.16	11%
11	j	J1R (Rt)	G2	456+00	453+00		1.68	1.68	0.016	0.0030	0.050	0.31	6.2	10.0	0.97	1.74	1.97	0.64	5.9	1.00	1.08	0.61	3.33	0.66	0.40	1.48	0.21	12%
														10.0														
12	h	J1R (Rt)	G2	464+00	466+00		1.69	1.69	0.016	0.0030	0.050	0.31	6.2	10.0	0.97	1.74	1.97	0.64	7.9	1.00	1.08	0.61	3.33	0.66	0.40	1.48	0.21	12%
12	f	J1R (Rt)	G2	466+00	467+66	0.21	0.84	1.05	0.016	0.0030	0.050	0.26	5.2	10.0	0.68	1.55	1.97	0.72	8.9	1.00	0.75	0.29	3.33	0.71	0.21	0.96	0.09	8%
12	d	J1R (Rt)	G2	467+66	469+89	0.09	0.70	0.79	0.016	0.0030	0.050	0.23	4.7	10.0	0.55	1.44	1.97	0.77	8.9	1.00	0.60	0.18	3.33	0.73	0.13	0.74	0.05	6%
17	a	J1R (Rt)	G2	469+89	473+20	0.05	0.94	0.99	0.016	0.0030	0.050	0.25	5.1	10.0	0.65	1.53	1.97	0.73	9.9	1.00	0.72	0.27	3.33	0.71	0.19	0.91	0.08	8%
18	a	J1R (Rt)	G2	473+20	475+25	0.08	1.67	1.75	0.016	0.0030	0.050	0.32	6.3	10.0	1.00	1.76	1.97	0.63	10.9	1.00	1.11	0.64	3.33	0.66	0.42	1.53	0.22	13%
19	a	J1R (Rt)	G2	475+25		0.27	1.12	1.39	0.016		0.033	0.19	5.6	10.0	SEE TABLE 6 "INLETS IN SAG CONDITION"													
19	h	J1R (Rt)	G2	477+14	475+25		0.48	0.48	0.016	0.0030	0.026	0.15	5.8	10.0	0.44	1.08	1.97	0.67	11.9	1.00	0.32	0.16	3.33	0.71	0.11	0.43	0.05	10%
														10.0														
16	h	J1R (Med)	G2	478+50		0.03	0.42	0.45	0.016	0.0052	0.010	0.09	9.7	10.0	0.45	1.01	1.97	0.45	11.9	1.00	0.21	0.25	3.33	0.50	0.12	0.33	0.13	28%
16	j	J1R (Med)	G2	479+00	478+50	0.00	0.18	0.18	0.016	0.0052	0.010	0.07	6.9	10.0	0.22	0.81	1.97	0.59	12.9	1.00	0.11	0.07	3.33	0.60	0.04	0.15	0.03	16%
														10.0														

Notes: 1. See Table 4 for tributary area, runoff coefficient, rainfall intensity and 25-year flow for each inlet.

For all grate types with L = 3 feet, Rf = 1 if V<5.9 fps (Chart 7, HEC-12)
Inlet modeled on Ground is Caltrans Type 24 grate detail on Pg D77A
Width is 1.97 ft
Length is 3.33 ft

For all grate types with L = 3 feet, Rf = 1 if V<5.9 fps (Chart 7, HEC-12)
Inlet modeled on Ground is 2 Caltrans Type 24 grate detail on Pg D77A
Width is 3.94 ft
Length is 3.33 ft

TABLE 6

BKF #087003-20
MSN HOV A3 IMPROVEMENTS
Inlet Sag Calculations

Station	Flow			Inlet Position & Shape					Weir Calculation					Orifice Calculation					
	previous (cfs)	Inlet (cfs)	Total (cfs)	Location	Width (ft)	Length (ft)	Perimeter (ft)	Area (ft^2)	Cw	Cclogging	Perimeter (ft)	H (ft)	H (in)	Co	Cclogging	Area (ft^2)	g (ft/s^2)	H (ft)	H (in)
442+02	0.08	0.93	1.01	In Sag	1.97	3.33	7.27	6.56	3	0.8	7.27	0.15	1.79	0.6	0.5	6.56	32.2	0.00	0.05
475+25	0.27	1.12	1.39	In Sag	1.97	3.33	7.27	6.56	3	0.8	7.27	0.19	2.22	0.6	0.5	6.56	32.2	0.01	0.09

Weir Discharge Q=CW*Cclogging*LP*H3/2
Q - Discharge
Cw - Weir Coefficient
Cclogging - Clogging Coefficient
LP - Perimeter
H - Height

Orifice Discharge Q=Co*Cclogging*A*(2*g*H).5
Q - Discharge
Co - Orifice Coefficient
Cclogging - Clogging Coefficient
A - Area
g- Gravitational Acceleration
H - Height

Flanking Inlets at Sag Calculations
(per section 4.4.6.3, HEC 22)

Step 1. Find rate of vertical curvature, K.

K= L / (Send-S beg)
K = 800 ft / (0.30% - (-1.200%))
K = 533 ft/ %

Step 2. Determine depth at design spread.

d= Sx T
d= (0.05) (10)
d = 0.5 ft

Step 3. Determine the depth for the flanker locations.

d = 63% of depth over inlet at bottom of sag location, per section 4.4.6.3, HEC 22
d= (.63) (0.5)
d= .32 ft

Step 4. Compute distance from sag point per following equation.

X= (200 d K)0.5
X= ((200) (.18) (533))^0.5
X= 138 ft ----------> Flank inlets 138 ft from sag point

TABLE 7

BKF# 097084
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Drainage Ditches Normal Depth, 25-Year Storm

Begin Ditch Station	End Ditch Station	25-Year Rainfall Intensity (in/hour)	Pavement Drainage Area [1] (acres)	Runoff Coefficient	Total 25-year Flow (cfs)	Swale Slope (ft/foot)	Side-slope (H:V)	Bottom Width (feet)	25-Year Ditch Depth (feet)	Wetter Perimeter Top Width (feet)	Manning's Roughness ("n")	25-year Flow Area (sq feet)	25-year Wetted Perimeter (feet)	25-year Flow (cfs)	25-Year Velocity (fps)	25-Year Velocity Head (feet)	Freeboad .2 x Energy Head (feet)	25-Year Required Depth (feet)	Construction Documents Depth (feet)	Meet Convayence and Freeboard Requirement
Median Ditches																				
402+50	406+00	3.45	0.82	0.95	2.69	0.0070	4	4	.41	7.30	0.0500	2.33	7.40	2.69	1.15	0.02	0.09	0.50	0.75	Yes
406+00	411+00	3.45	0.90	0.95	2.95	0.0168	4	4	.34	6.73	0.0500	1.83	6.82	2.95	1.61	0.04	0.08	0.42	0.75	Yes
Southbound Shoulder Ditches																				
423+00	429+00	3.45	1.43	0.95	4.69	0.0050	4	4	.61	8.84	0.0500	3.89	8.99	4.69	1.21	0.02	0.13	0.73	0.75	Yes
429+00	435+00	3.45	0.99	0.95	3.24	0.0030	4	4	.57	8.57	0.0500	3.59	8.71	3.24	.90	0.01	0.12	0.69	0.75	Yes
435+00	439+00	3.45	0.64	0.95	2.10	0.0080	4	4	.35	6.78	0.0500	1.87	6.86	2.10	1.12	0.02	0.07	0.42	0.75	Yes
439+00	444+00	3.45	0.92	0.95	3.02	0.0025	4	4	.58	8.61	0.0500	3.64	8.75	3.02	.83	0.01	0.12	0.69	0.75	Yes
449+35	446+00	3.45	0.71	0.95	2.33	0.0035	4	4	.46	7.68	0.0500	2.69	7.79	2.33	.87	0.01	0.09	0.55	0.75	Yes
459+50	449+35	3.45	1.24	0.95	4.06	0.0035	4	4	.62	8.94	0.0500	3.99	9.09	4.06	1.02	0.02	0.13	0.74	0.75	Yes
459+50	467+50	3.45	1.18	0.95	3.87	0.0040	4	4	.58	8.65	0.0500	3.67	8.79	3.87	1.05	0.02	0.12	0.70	0.75	Yes

Notes: 1. Pavement Drainage Area includes all unpaved shoulder within the Caltrans right-of-way modeled consevatively as pavement with a C=0.95 for simplicity.

TABLE 8

BKF# 087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rock Slope Protection Calculations HEC-14 Method

						HEC-14 Calculations					Construction Documents		
Alignment	Drainage System	Drainage Unit	25-Yeak Peak Flow Rate (cfs)	Diamater (inches)	(feet)	$D_{adjusted}$ [1]	D_{50} [2] (feet)	(inches)	Apron Length (feet)	Apron Depth [3] (feet)	D_{50} (inches)	Apron Length (feet)	Apron Depth (feet)
J1R	11	a	3.6	18	1.5	N / A	0.11	1.3	6	0.4	6	6	1.25
J1R	17	d	0.9	18	1.5	N / A	0.02	0.2	6	0.1	6	6	1.25
J1R	18	e	1.7	18	1.5	N / A	0.04	0.5	6	0.1	6	6	1.25
J1R	19	e	1.5	18	1.5	N / A	0.03	0.4	6	0.1	6	6	1.25

N/A - Not Applicable

Notes:
1. HEC-14 Equation 10.5 - Diameter adjustment for supercritical flow only (Diameter adjustment is used for calculations D_{50} only and does not represent a physical change in diameter.)
2. HEC-14 Equation 10.4 - D_{50} sizing for circular culverts
3. Apron Depth are based on calculated D_{50}

TABLE 9

BKF# 087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Hydraulic Condition within Bioretention Areas (25-Year Flow Rate)

River Station		25-Year Peak Flow (cfs)	Minimum Channel Elev. (ft)	Water Surface Elevation (ft)	Flow Depth (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Velocity Channel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Linear bioretention areas - 4 foot bottom width												
251		2.1	8.75	9.20	0.45	0	9.22	0.00263	0.9	2.6	7.6	0.24
140.5	Rock Berm	2.1	8.44	9.06	0.62	0	9.06	0.00081	0.6	4.0	8.9	0.14
139.5		2.1	8.76	9.01	0.25	8.95	9.06	0.02351	1.8	1.3	6.0	0.64
139		2.1	8.76	8.95	0.19	8.95	9.04	0.06029	2.4	0.9	5.5	0.98
138		2.1	8.42	8.87	0.45	0	8.88	0.00268	0.9	2.6	7.6	0.24
27.5		2.1	8.09	8.71	0.62	0	8.71	0.00094	0.7	3.6	7.7	0.15
26.5	Rock Berm	2.1	8.41	8.66	0.25	8.6	8.71	0.02348	1.8	1.3	6.0	0.64
26		2.1	8.41	8.60	0.19	8.6	8.69	0.06029	2.4	0.9	5.5	0.98
25		2.1	8.07	8.50	0.43	8.26	8.51	0.00335	1.0	2.4	7.4	0.26
0		2.1	8.00	8.19	0.19	8.19	8.28	0.06029	2.4	0.9	5.5	0.98

Notes Rock Berm every 110-feet based on 0.3% slopea and 4-inch height

APPENDIX A

Drainage Criteria

INTRODUCTION

The following Technical Memorandum documents the design criteria and parameters used for the layout and sizing of drainage improvements for the proposed Marin Sonoma Narrows A3 HOV Improvements, Drainage Report.

DESIGN CRITERIA AND PARAMETERS

Design flow rates to Project facilities are computed using the Rational Method. Depth of flow and flow velocity through Project facilities are computed using Manning's Equation.

Peak Flow Rate – Rational Method

The following parameters are used for computing the peak flow rate:

Drainage Area – Project drainage areas are delineated using contours developed from Project aerial topography, where available. USGS is used to extend drainage areas to the west. Drainage areas are based on natural drainage paths. Local grading for roadways and trails may direct flows away from natural drainage paths.

Runoff Coefficient - Runoff Coefficients were calculated using Figure 819.2A of the Caltrans Highway Design Manual, page 810-18 of the September 2006 version with the following inputs –

Soil types and Infiltration properties are taken from the USDA soil service soil classification website.

Relief is from the site topographic map.

Site visits and aerial photos are used to classify Vegetal Cover and Surface Storage. In general, vegetal cover is excellent and surface storage is normal.

Rainfall Intensity - Rainfall intensities are identified for the following three (3) nearby rainfall measuring stations using the Caltrans WINIDF v1.0 computer program.

Novato FS#1 - 2.4 miles from the MSN site - elevation 35

Petaluma FS No. 2 – 8.2 miles from the MSN site - elevation 16

Nacasio Dam – 10.0 miles from the MSN site - elevation 315.

The Novato Fire Station #1 gage corresponds best to site conditions and is recommended for use on the project. The Petaluma gage provides rainfall intensities about 12% less intense than the Novato gage, corresponding to a mean annual precipitation about 18 percent lower than for the Novato rain gage. The Nacasio gages provide rainfall totals about 10 percent higher than the Novato Fire Station #1 gage. Theis rain gages is at a higher elevation and has more intense rainfall intensities. The IDF for the Novato FS#1 rain gage has a rainfall intensity of 1.5 inches per hour for a 30-minute duration rainfall event.

Time of Concentration

The time of concentration (Tc) is computed as the sum of overland flow time, shallow flow time and concentrated flow. If the initial Tc calculated is less than 5 minutes, a 5-minute Time of Concentration factor is used. See Table 1C for the Times of Concentration. Equations used are presented in Section 816.6 of the Highway Design Manual. Sheet flow travel time is used for the initial flow path and is calculated using the equation presented in Section 816.6 (1) and is based on the Kinematic Wave equation. A coefficient of 0.15 is used representing short prairie grass. The 2-year, 24-hour precipitation amount of 3.5 inches per 24 hours is used in the analyses. The length of overland flow is calculated such that $n * L / S^{1/2}$ is equal to 100 with a maximum length of overland flow of 300 feet. After this distance, the time of concentration is calculated based on shallow concentrated flow. As a simplification, the slope for overland flow is computed using the initial 300 feet of the flow path and the slope for shallow flow uses the same point as the upper point for calculating the slope of the shallow concentrated flow. Refining the transition point location would result in a minor change to the slope and will not significantly change the total time of concentration. The shallow concentrated flow equation is used to a point where there are defined channels on the topographic maps. A k factor of 0.213 is used representing short pasture grasses. A flow velocity of 5 feet per second is used to calculated travel time as concentrated flows. The flow velocity is based on an average of the flow velocities computed in the HEC-RAS analyses for the upper reaches of the modeled Creeks. The total time of concentration is the combined overland flow, shallow concentrated flow and concentrated flow travel times. For the drainage area to Station 439, a shallow concentrated flow velocity of 5 feet per second is used based on developed conditions.

Any travel time within project facilities is added to the inlet time of concentration to calculate flow at downstream locations.

Flow Depth and Velocity – Manning's Equation

Water Levels in Creeks

Water levels in Creeks are computed using the US Army Corps of Engineers HEC-RAS River Analysis System Computer Model. A Manning's Roughness factor of 0.045 is used for the vegetation-lined channels.

The downstream water level is set based on the following:

- Elevation 6.24, (MHHW of Mare Island near San Pablo Bay, Drainage Report – Marin-Sonoma Narrows Segment A (Phase 1), dated February 22, 2010, NAVD 1988)

Flow Depth adjacent to Caltrans Travelway

The HEC-22 method is used to calculate flow depths on the shoulder. Flow is calculated using the Equation:

$$Q = K_c / n * S_x^{1.67} * S_L^{0.5} * T^{2.67}$$

Or T = (Q * N / (Kc * Sx1.67 * Sl.5) 1 /2.67

Where: $K_c = 0.56$

n = 0.016

S_x = Cross Slope

S_L = Longitudinal Slope

T Spread Width (feet)

Highway drainage improvements are sized to convey the 25-year storm event within the shoulder with no inundation of the travel way.

Inlets capacity in sag locations is calculated using the orifice equation, with 50 percent flow reduction for clogging and the weir equation with a coefficient of 3.0 and a 20 percent reduction in flow to account for clogging. The more restrictive equation is used to determine ponding depth.

The flow capacity of inlets on a continuous grade is determined based on a spill-over velocity of 5.9 feet per second, and no reduction in surface area to account for clogging.

Closed conduits systems are designed using the following Caltrans Standards:

- Max HGL in an inlet 0.75-feet below grate elevation HDM 838.3
- Inlets in series are spaced apart 20-feet minimum HDM 837.3
- Max concentrated sheet flow across pavement 0.10 cfs HDM 831.4

- Energy Gradient should not rise above the lip of intake HDM 838.3
- Min pipe diameter under roadbed 18-inches HDM 838.4
- Min pipe design slope, half full velocity of 3.0-feet/second HDM 838.4
- Max pipe access spacing HDM 838.5
- Manning's Coefficient HDM Table 851.2

WINIDF 1.0 OUTPUT TABLE

10/10/2011

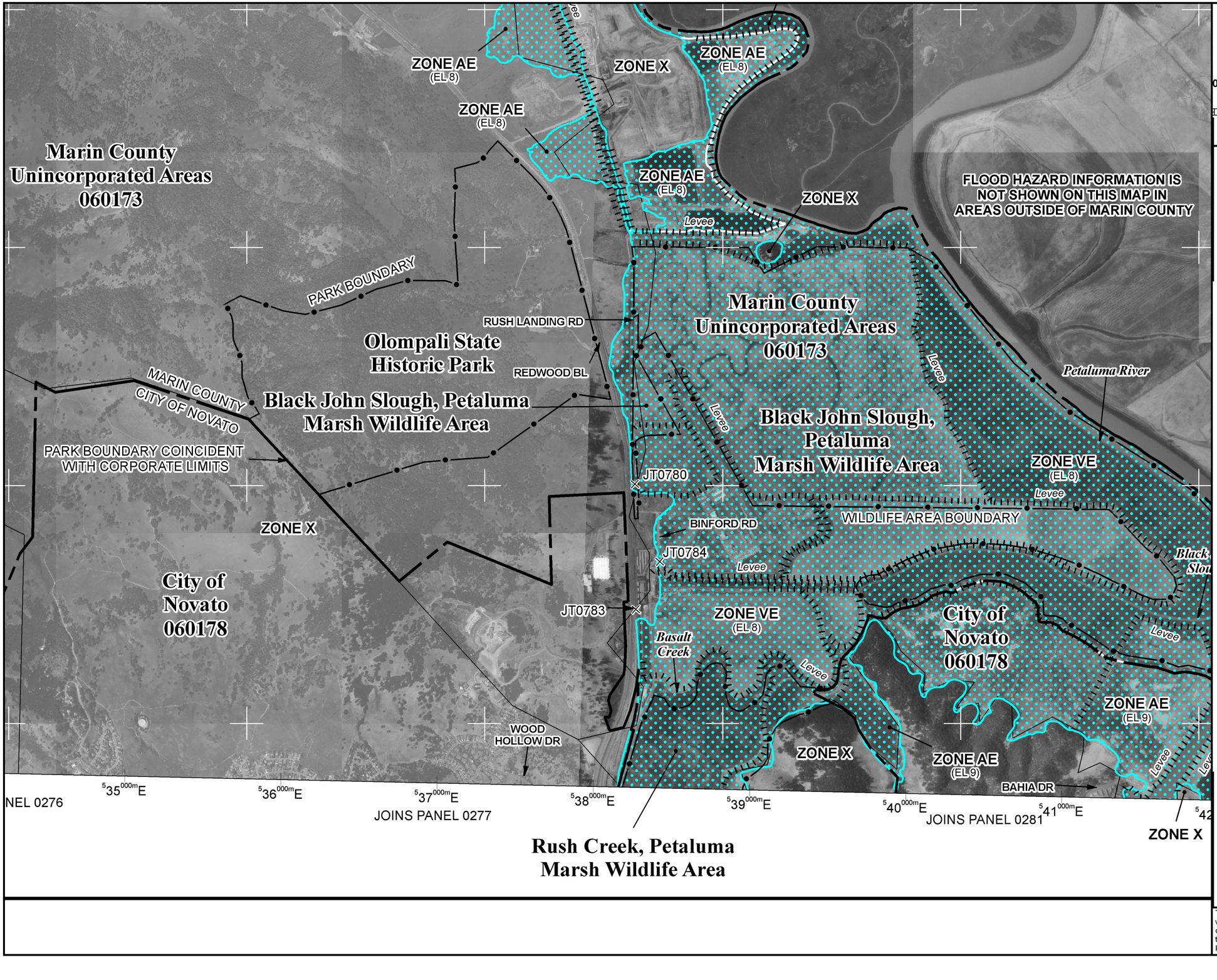
Input values: Lat.: 38.105 deg. Long.: 122.537 deg. Return Period: 2 yrs.

Selected Station(s)	Station ID	Elev.	Lat.	Long.	Dist.
		ft	deg.	deg.	miles
NOVATO FS #1	E206290001	35	38.105	122.537	0.00

Output table (Intensities in inches/hour):

Dur.\RP	2-yr	2-yr	10-yr	25-yr	50-yr	100-yr	10000-yr
5-min	1.713	1.725	2.885	3.450	3.889	4.297	6.900
10-min	1.246	1.254	2.098	2.508	2.827	3.124	5.016
15-min	1.034	1.041	1.741	2.081	2.346	2.592	4.163
30-min	0.751	0.757	1.265	1.513	1.706	1.884	3.026
60-min	0.546	0.550	0.920	1.100	1.240	1.370	2.200
120-min	0.397	0.400	0.669	0.800	0.901	0.996	1.599
4-hr	0.289	0.291	0.486	0.581	0.655	0.724	1.163
8-hr	0.210	0.211	0.353	0.423	0.476	0.526	0.845
16-hr	0.153	0.154	0.257	0.307	0.346	0.383	0.615
24-hr	0.127	0.127	0.213	0.255	0.287	0.318	0.510

a = 0.5463 b = -0.460 1.00 min



MAP SCALE 1" = 2000'

000 0 2000 4000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0175D

FIRM

FLOOD INSURANCE RATE MAP

MARIN COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 175 OF 531

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARIN COUNTY	060173	0175	D
NOVATO, CITY OF	060178	0175	D

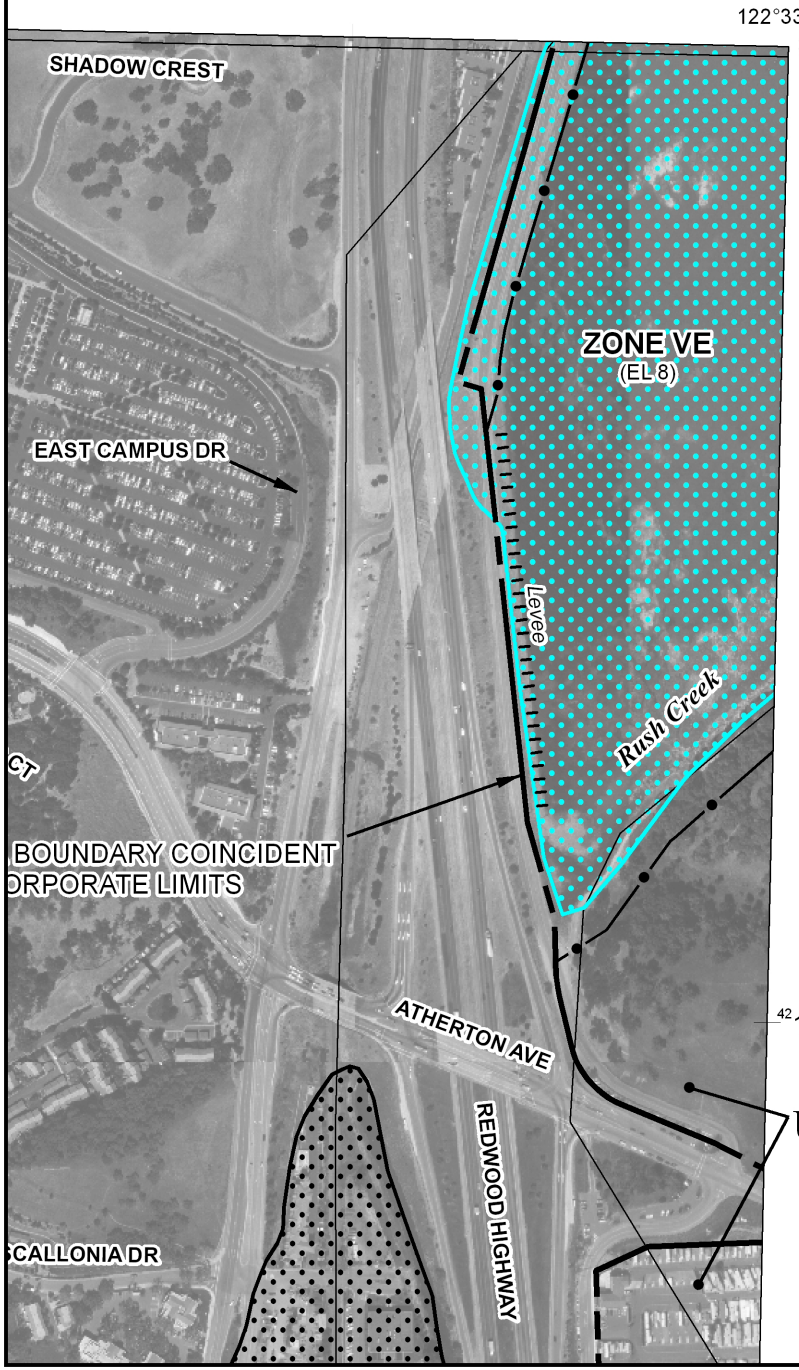
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06041C0175D

EFFECTIVE DATE
MAY 4, 2009

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



Marin County Unincorporated Areas 060173

MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0277D

FIRM

FLOOD INSURANCE RATE MAP

MARIN COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 277 OF 531

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARIN COUNTY	060173	0277	D
NOVATO, CITY OF	060178	0277	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06041C0277D

EFFECTIVE DATE
MAY 4, 2009

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

STORMWATER QUALITY INFORMATION HANDOUT

For Construction on

STATE HIGHWAY

IN MARIN COUNTY
IN AND NEAR NOVATO
FROM 0.2 MILE NORTH OF ATHERTON AVENUE OVERCROSSING
TO 1.4 MILES SOUTH OF REDWOOD LANDFILL OVERCROSSING

04-MRN-101 R22.2/24.3
CONTRACT No. 04-2640L4

STORMWATER QUALITY INFORMATION HANDOUT

1. Notice of Intent (to be file with project)
2. Project Location Map
3. Layouts
4. Erosion Control Plans and Details
5. Drainage Plans
6. Temporary Drainage
7. Temporary Water Pollution Control Plans
8. Drainage Report
9. Risk Level Assessment
10. Sampling Analysis Locations and Discharge Points
11. Wetlands and Waters of the US Delineation Maps
12. SFRWQCB 401 Certification

NOTICE OF INTENT

State Water Resources Control Board

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF THE
GENERAL PERMIT TO DISCHARGE STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY (WQ ORDER No. 99-08-DWQ)

I. NOI STATUS (SEE INSTRUCTIONS)

MARK ONLY ONE ITEM 1. ☐ New Construction 2. ☐ Change of Information for WDID# _____

II. PROPERTY OWNER

Name	Contact Person		
Mailing Address	Title		
City	State	Zip	Phone

Owner Type (*check one*) 1.[ ] Private Individual 2.[ ]Business 3.[ ]Municipal 4.[ ]State 5.[ ]Federal 6.[ ]Other

III. DEVELOPER/CONTRACTOR INFORMATION

Developer/Contractor	Contact Person		
Mailing Address	Title		
City	State	Zip	Phone

IV. CONSTRUCTION PROJECT INFORMATION

Site/Project Name	Site Contact Person		
Physical Address/Location	Latitude _____ º	Longitude _____ º	County
City (or nearest City)	Zip	Site Phone Number	Emergency Phone Number

A. Total size of construction site area: _____ Acres B. Total area to be disturbed: _____ Acres (% of total _____)	C. Percent of site imperviousness (including rooftops): Before Construction: _____% After Construction: _____%	D. Tract Number(s): _____, _____ E. Mile Post Marker: _____

F. Is the construction site part of a larger common plan of development or sale? ☐ YES ☐ NO	G. Name of plan or development:
H. Construction commencement date: _____/_____/_____ I. % of site to be mass graded: _____	J. Projected construction dates: Complete grading: _____/_____/_____ Complete project: _____/_____/_____

K. Type of Construction (Check all that apply):

1. ☐ Residential 2. ☐ Commercial 3. ☐ Industrial 4. ☐ Reconstruction 5. ☐ Transportation
6. ☐ Utility Description: _____ 7. ☐ Other (Please List): _____

V. BILLING INFORMATION

SEND BILL TO:	Name	Contact Person	
☐ OWNER (as in II. above)			
☐ DEVELOPER (as in III. above)	Mailing Address	Phone/Fax	
☐ OTHER (enter information at right)	City	State	Zip

VI. REGULATORY STATUS

A. Has a local agency approved a required erosion/sediment control plan?..... ☐ YES ☐ NO

Does the erosion/sediment control plan address construction activities such as infrastructure and structures?..... ☐ YES ☐ NO

Name of local agency: _____ Phone: _____

B. Is this project or any part thereof, subject to conditions imposed under a CWA Section 404 permit of 401 Water Quality Certification?..... ☐ YES ☐ No

If yes, provide details: _____

VII. RECEIVING WATER INFORMATION

A. Does the storm water runoff from the construction site discharge to (Check all that apply):

1. ☐ **Indirectly to waters of the U.S.**
2. ☐ **Storm drain system - Enter owner's name:_____**
3. ☐ **Directly to waters of U.S. (e.g. , river, lake, creek, stream, bay, ocean, etc.)**

B. Name of receiving water: (river, lake, creek, stream, bay, ocean): _____

VIII. IMPLEMENTATION OF NPDES PERMIT REQUIREMENTS

A. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) (check one)

☐ A SWPPP has been prepared for this facility and is available for review: Date Prepared: ____/____/____ Date Amended: ____/____/____

☐ A SWPPP will be prepared and ready for review by (enter date): ____/____/____

☐ A tentative schedule has been included in the SWPPP for activities such as grading, street construction, home construction, etc.

B. MONITORING PROGRAM

☐ A monitoring and maintenance schedule has been developed that includes inspection of the construction BMPs before anticipated storm events and after actual storm events and is available for review.

If checked above: A qualified person has been assigned responsibility for pre-storm and post-storm BMP inspections to identify effectiveness and necessary repairs or design changes..... ☐ YES ☐ NO

Name: _____ Phone: _____

C. PERMIT COMPLIANCE RESPONSIBILITY

A qualified person has been assigned responsibility to ensure full compliance with the Permit, and to implement all elements of the Storm Water Pollution Prevention Plan including:

1. Preparing an annual compliance evaluation..... ☐ YES ☐ NO

Name: _____ Phone: _____

2. Eliminating all unauthorized discharges..... ☐ YES ☐ NO

IX. VICINITY MAP AND FEE (must show site location in relation to nearest named streets, intersections, etc.)

Have you included a vicinity map with this submittal? ..... ☐ YES ☐ NO

Have you included payment of the annual fee with this submittal?..... ☐ YES ☐ NO

X. CERTIFICATIONS

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. In addition, I certify that I have read the entire General Permit, including all attachments, and agree to comply with and be bound by all of the provisions, requirements, and prohibitions of the permit, including the development and implementation of a Storm Water Pollution Prevention Plan and a Monitoring Program Plan will be complied with."

Printed Name: _____

Signature: _____ **Date:** _____

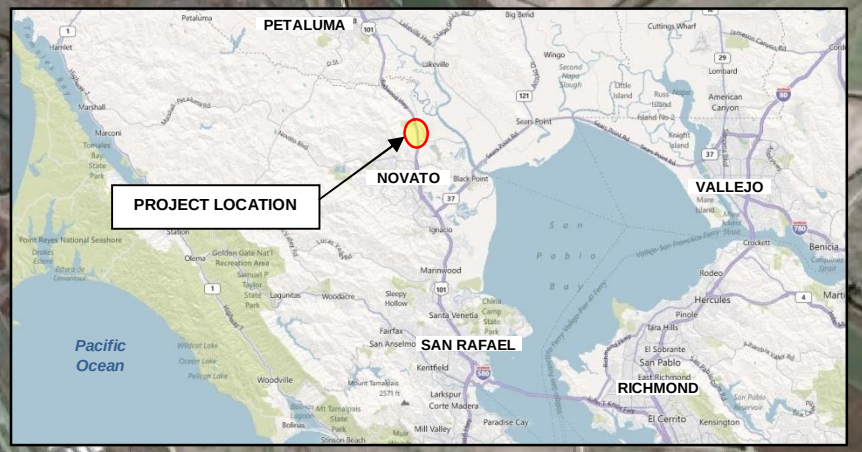
Title: _____

PROJECT LOCATION MAP

PROJECT LOCATION MAP

MARIN/SONOMA NARROWS – SEGMENT A3
NORTHBOUND US 101 HOV WIDENING
IN THE CITY OF NOVATO
IN AND NEAR MARIN COUNTY
FROM 0.2 MILE NORTH OF ATHERTON AVENUE OVERCROSSING
TO 1.4 MILE SOUTH OF REDWOOD LANDFILL OVERCROSSING

NO SCALE



Marin County

Petaluma River

PROJECT LOCATION

Novato

Atherton Ave

Simmons La

101

N

LAYOUTS

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. FOR MBGR LAYOUT AND CONNECTIONS TO STRUCTURES AND BARRIERS, SEE Std PLANS.
3. FOR DTBB CONNECTIONS TO EXISTING DTBB, SEE CONSTRUCTION DETAILS.
4. FOR PAVEMENT CONFORM AND COLD PLANE DETAILS, SEE CONSTRUCTION DETAILS.
5. FOR DIKE TRANSITION, SEE CONSTRUCTION DETAILS.
6. FOR DRAINAGE EASEMENTS, SEE DRAINAGE PLANS.
7. FOR UTILITY EASEMENTS, SEE UTILITY PLANS.

LEGEND:

- NEW STRUCTURAL SECTION
- STRUCTURE WIDENING
- VARIABLE DEPTH HMA OVERLAY
- HMA-O OVERLAY
- COLD PLANE AC PAVEMENT & HMA PAVEMENT
- REMOVE BASE & SURFACING
- (No.) CURVE DATA
- CITY OR COUNTY R/W
- C|F CUT/FILL LINE
- [No.] STRUCTURAL SECTION NUMBER (SEE TYPICAL CROSS SECTIONS)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

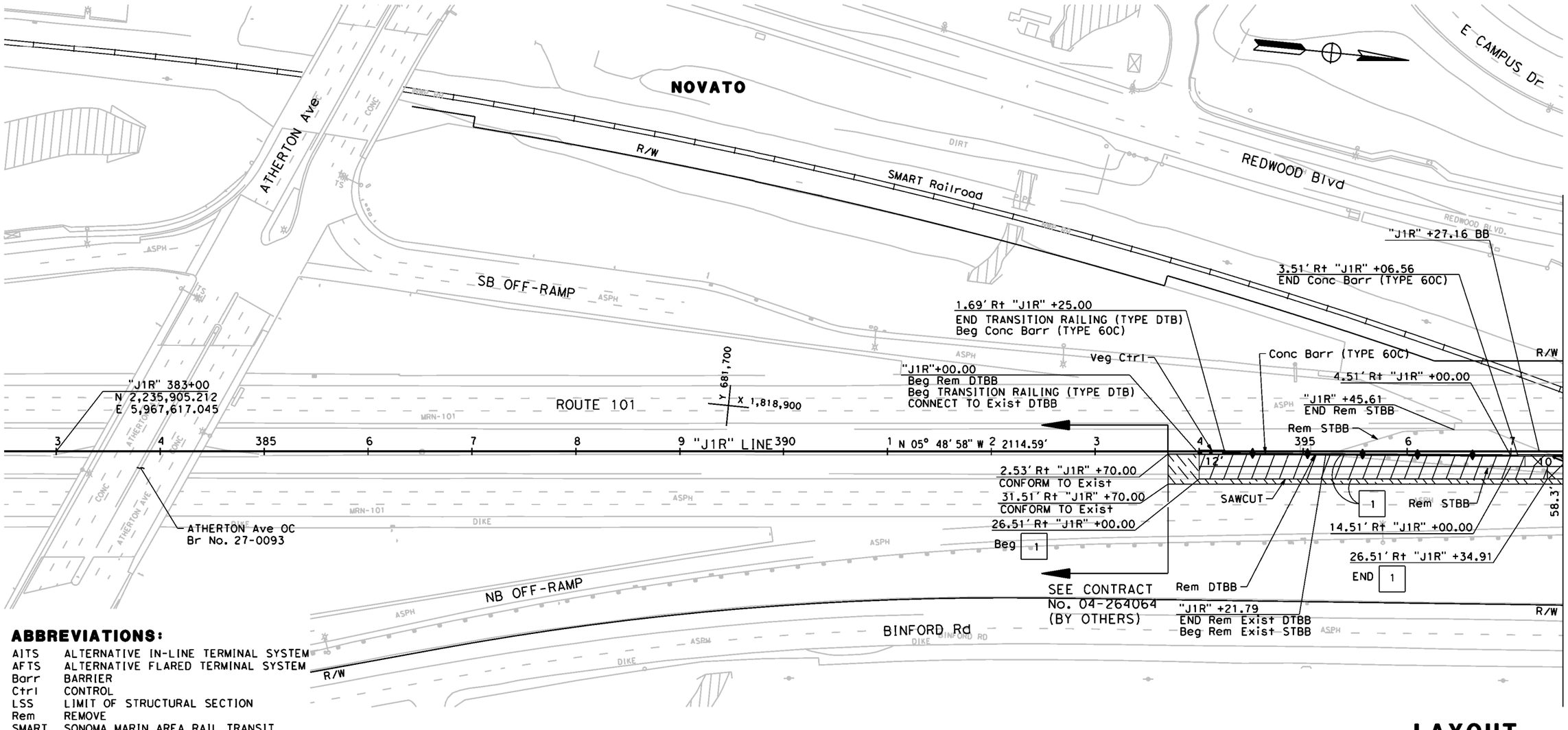
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



ABBREVIATIONS:

AITS	ALTERNATIVE IN-LINE TERMINAL SYSTEM
AFTS	ALTERNATIVE FLARED TERMINAL SYSTEM
Barr	BARRIER
Ctrl	CONTROL
LSS	LIMIT OF STRUCTURAL SECTION
Rem	REMOVE
SMART	SONOMA MARIN AREA RAIL TRANSIT
Veg	VEGETATION
w/	WITH

LAYOUT

SCALE: 1" = 50'

L-1

REVISED BY	AL		
DATE REVISED	4/16/12		
ARMANDO LARA	GORDON SWEET		
CALCULATED-DESIGNED BY	CHECKED BY		
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI		

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 — DATE PLOTTED =5/4/2012 — TIME PLOTTED =11:53:07 AM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ea001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

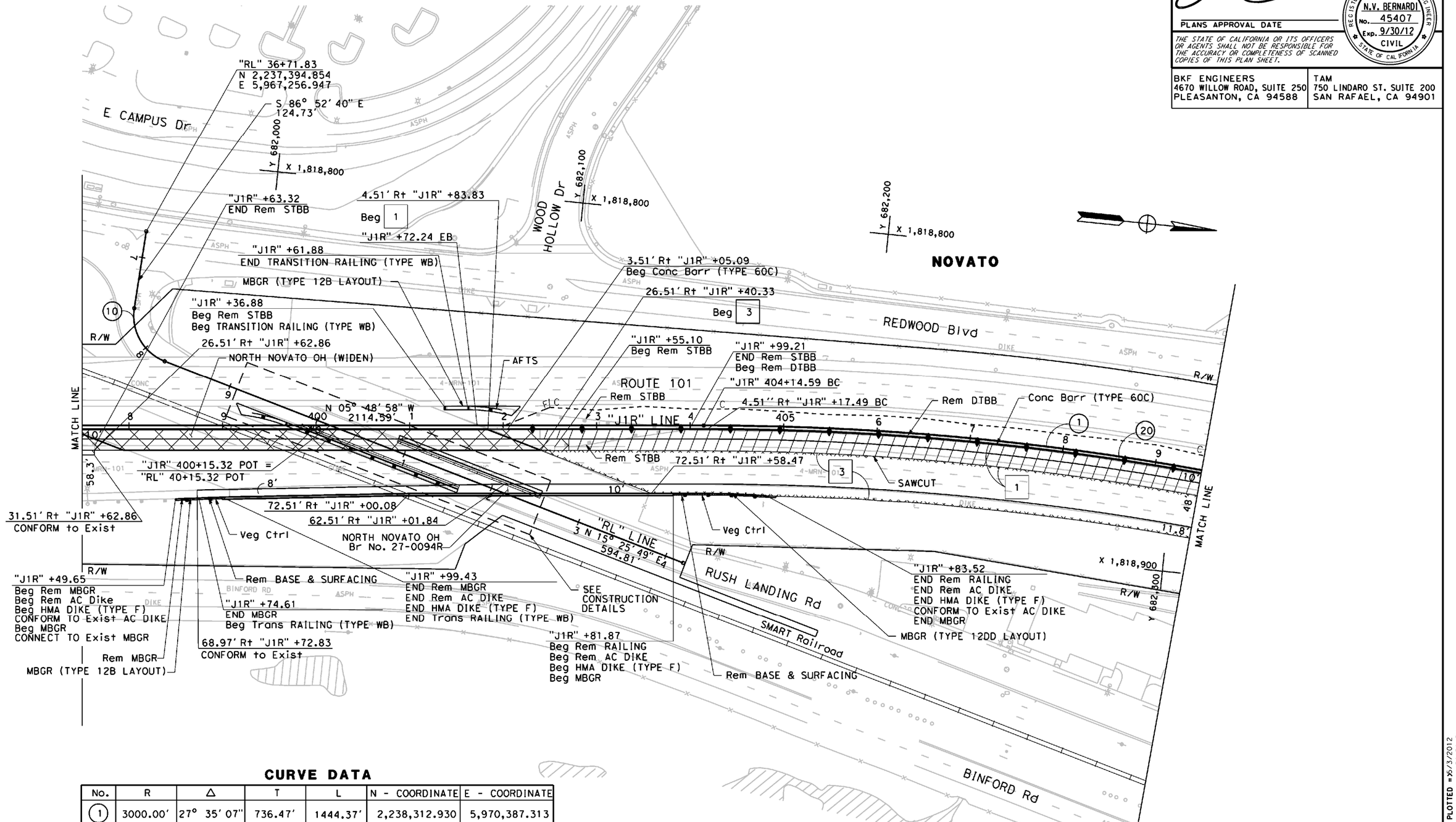
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



CURVE DATA

No.	R	Δ	T	L	N - COORDINATE	E - COORDINATE
(1)	3000.00'	27° 35' 07"	736.47'	1444.37'	2,238,312.930	5,970,387.313
(10)	52.00'	77° 41' 31"	41.88'	70.51'	2,237,442.265	5,967,342.506
(20)	2997.00'	27° 35' 07"	735.73'	1442.92'	2,238,315.964	5,970,388.525

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

LAYOUT
SCALE: 1" = 50'

L-2

REVISED BY	DATE REVISED
AL	4/16/12

CALCULATED-DESIGNED BY: ARMANDO LARA
CHECKED BY: GORDON SWEET
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION DATE PLOTTED =>5/3/2012
TIME PLOTTED =>4:56:58 PM

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	N - COORDINATE	E - COORDINATE
(1)	3000.00′	27° 35′ 07"	736.47′	1444.37′	2,238,312.930	5,970,387.313
(20)	2997.00′	27° 35′ 07"	735.73′	1442.92′	2,238,315.964	5,970,388.525

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

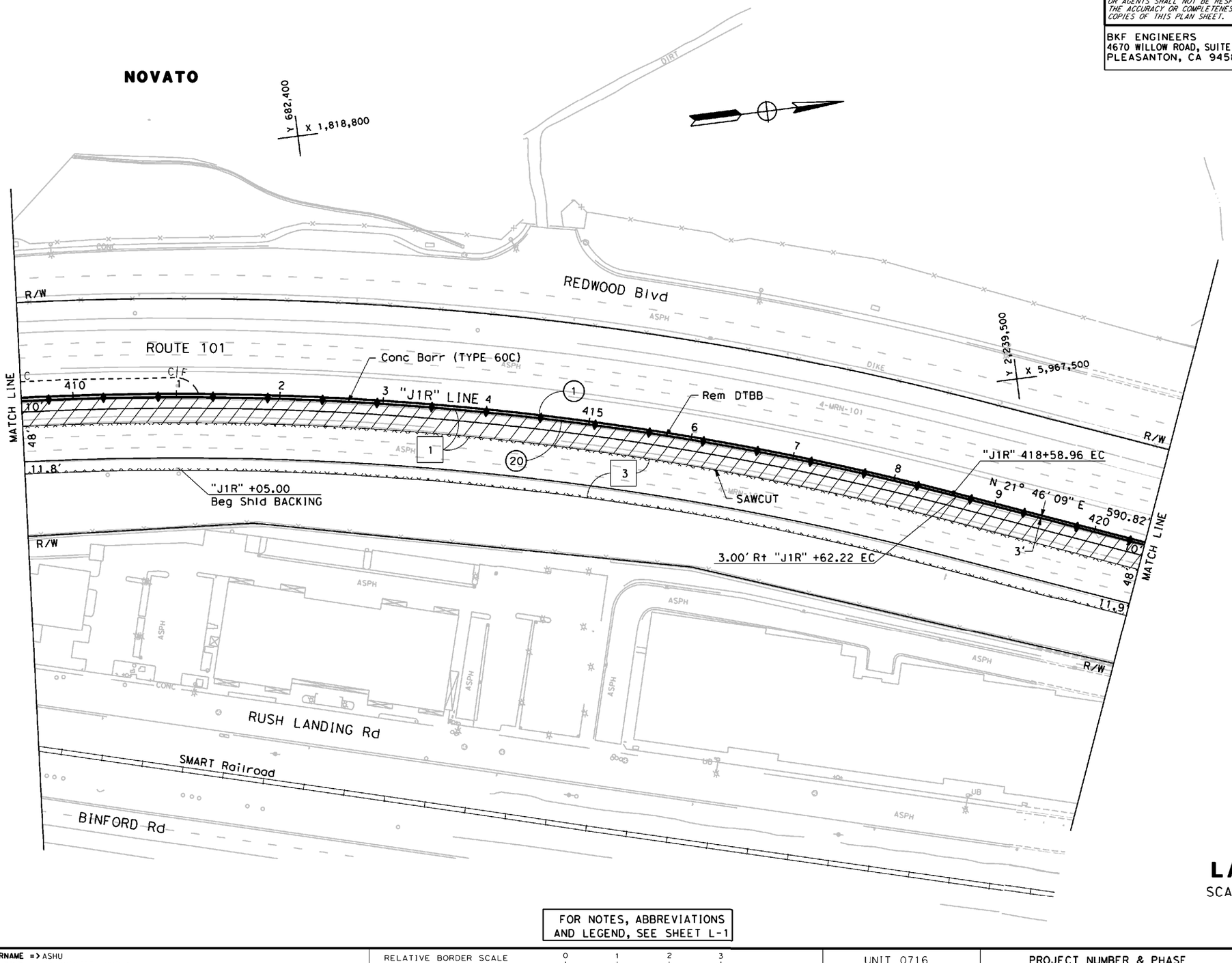
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



LAYOUT

SCALE: 1" = 50′

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-3

REVISED BY	DATE REVISED
AL	4/16/12

CALCULATED-DESIGNED BY: ARMANDO LARA
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION: DATE PLOTTED =5/3/2012
04-16-12 TIME PLOTTED =14:57:22 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ea003.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	N - COORDINATE	E - COORDINATE
(2)	4500.00'	23° 49' 14"	949.14'	1870.86'	2,241,633.329	5,963,637.375

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

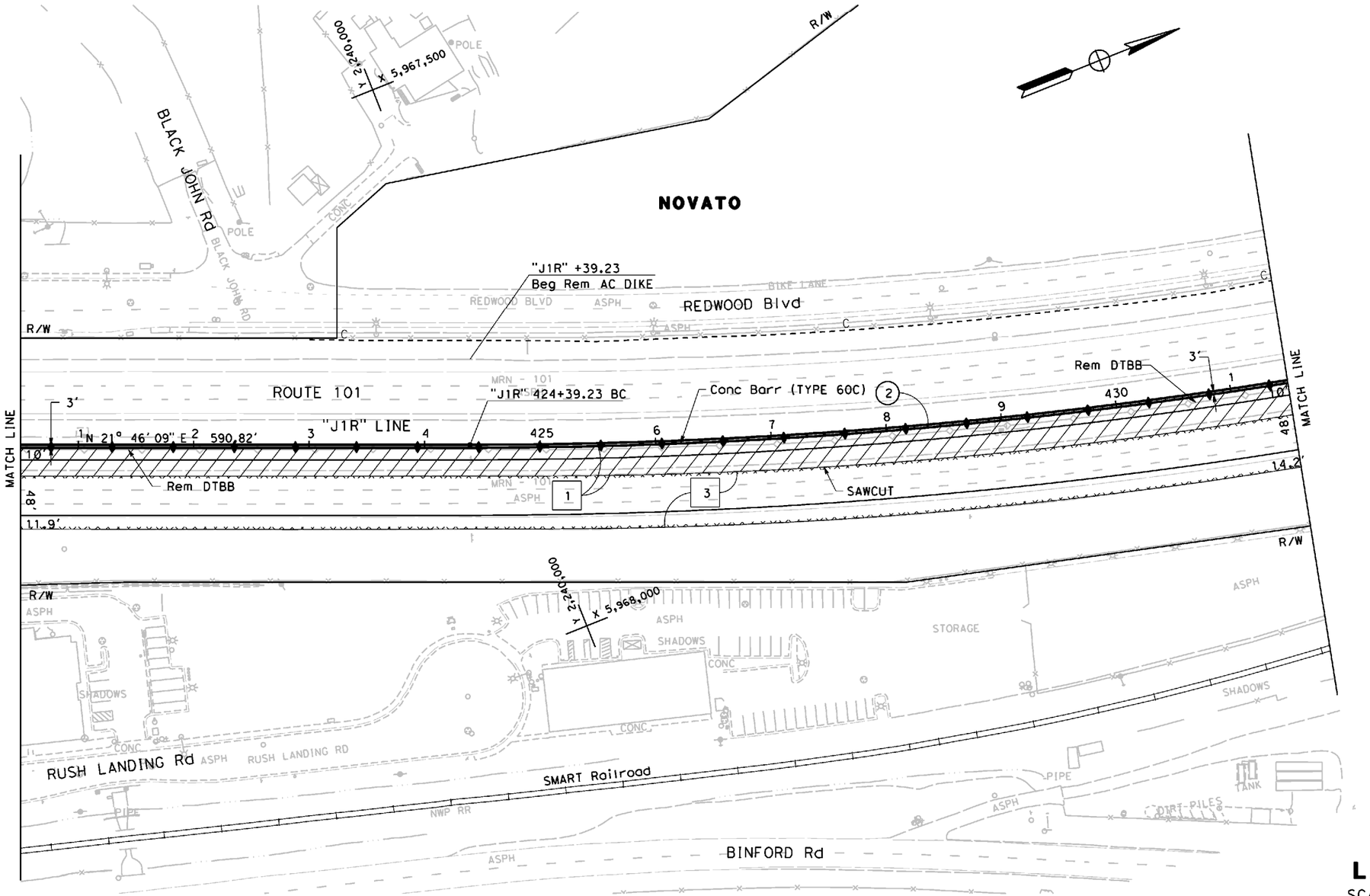
PLANS APPROVAL DATE

N.V. BERNARDI
No. 45407
Exp. 9/30/12
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



LAYOUT
SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-4

CALCULATED-DESIGNED BY	ARMANDO LARA	REVISED BY	AL
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12
DATE PLOTTED = 5/3/2012
TIME PLOTTED = 9:45:44 PM

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT.
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	N - COORDINATE	E - COORDINATE
(2)	4500.00′	23° 49′ 14"	949.14′	1870.86′	2,241,633.329	5,963,637.375
(21)	4554.55′	10° 41′ 50"	426.42′	850.35′	2,241,569.327	5,963,630.471
(22)	4561.55′	01° 33′ 06"	21.97′	43.94′	2,241,569.327	5,963,630.471
(23)	4559.00′	03° 40′ 02"	145.95′	291.80′	2,241,633.329	5,963,637.375
(24)	4549.00′	03° 40′ 05"	145.66′	291.23′	2,241,633.329	5,963,637.375

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

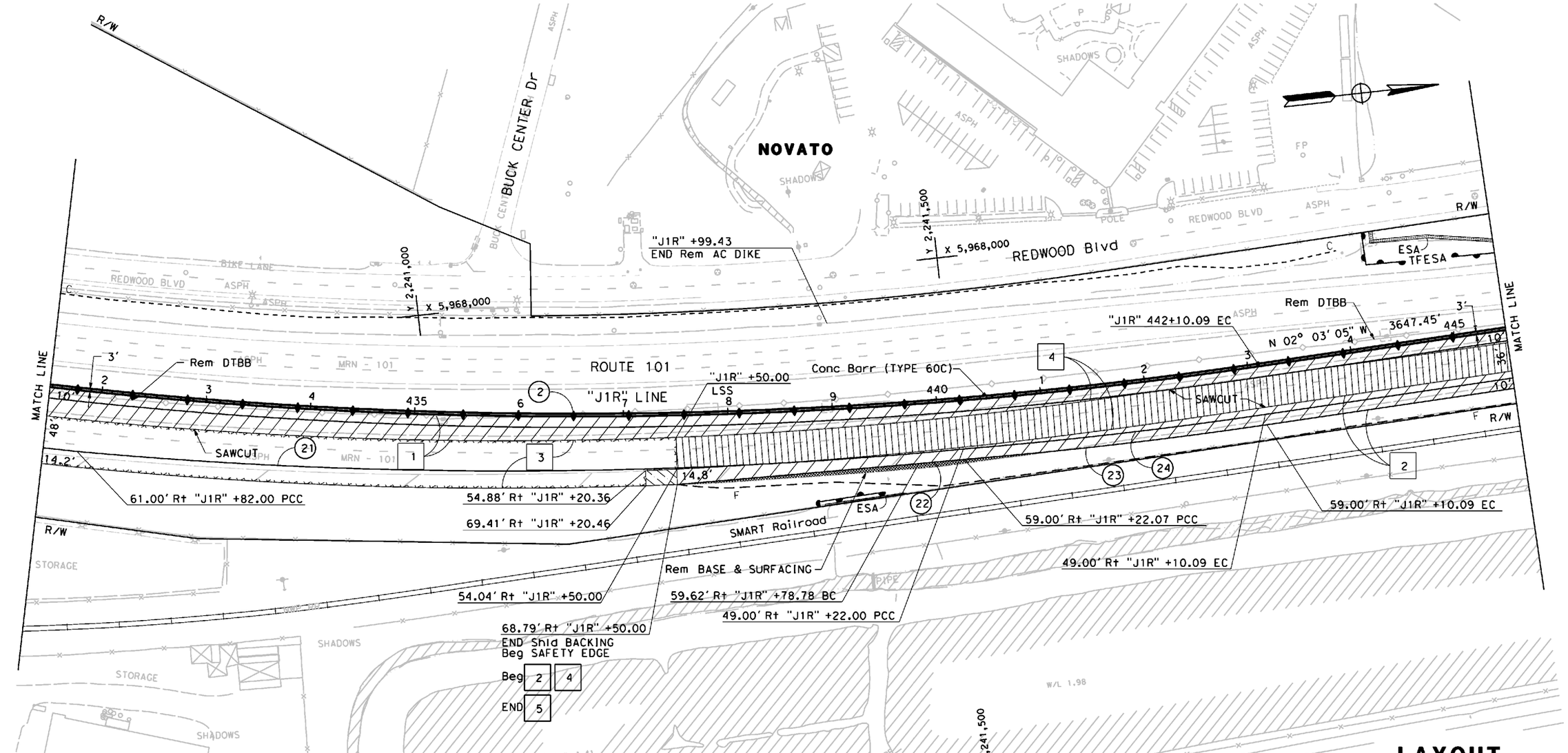
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



LAYOUT
SCALE: 1" = 50′

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-5

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
CALCULATED-DESIGNED BY: ARMANDO LARA
CHECKED BY: GORDON SWEET
REVISED BY: AL
DATE REVISED: 4/16/12

LAST REVISION: 04-16-12
DATE PLOTTED => 05/3/2012
TIME PLOTTED => 14:58:04 PM

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

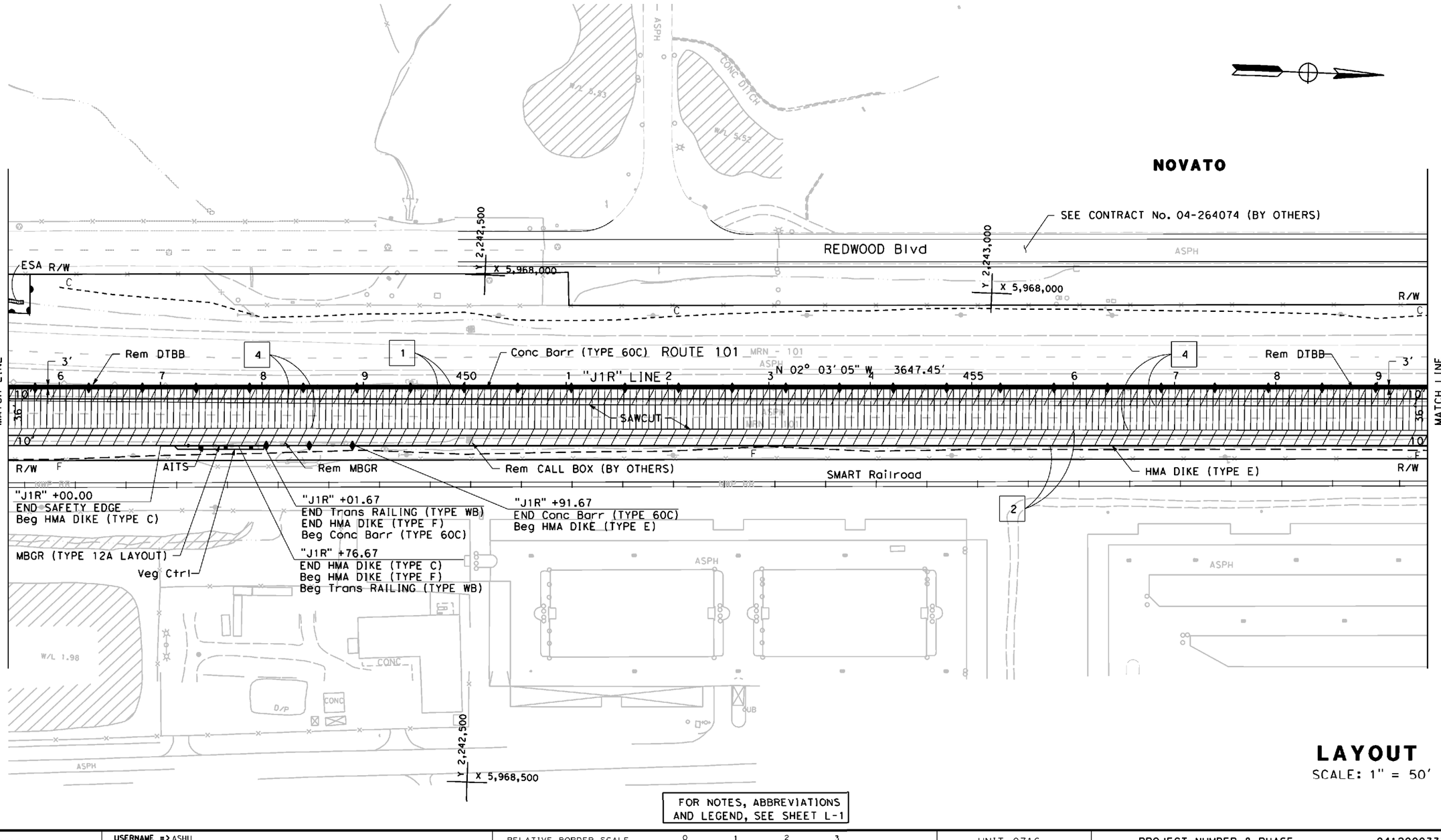
REVISED BY	DATE REVISED
AL	4/16/12

ARMANDO LARA — GORDON SWEET — CALCULATED-DESIGNED BY — CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR
NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans



LAYOUT
SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-6

LAST REVISION 04-16-12
DATE PLOTTED =>5/3/2012
TIME PLOTTED =>14:58:29 PM

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

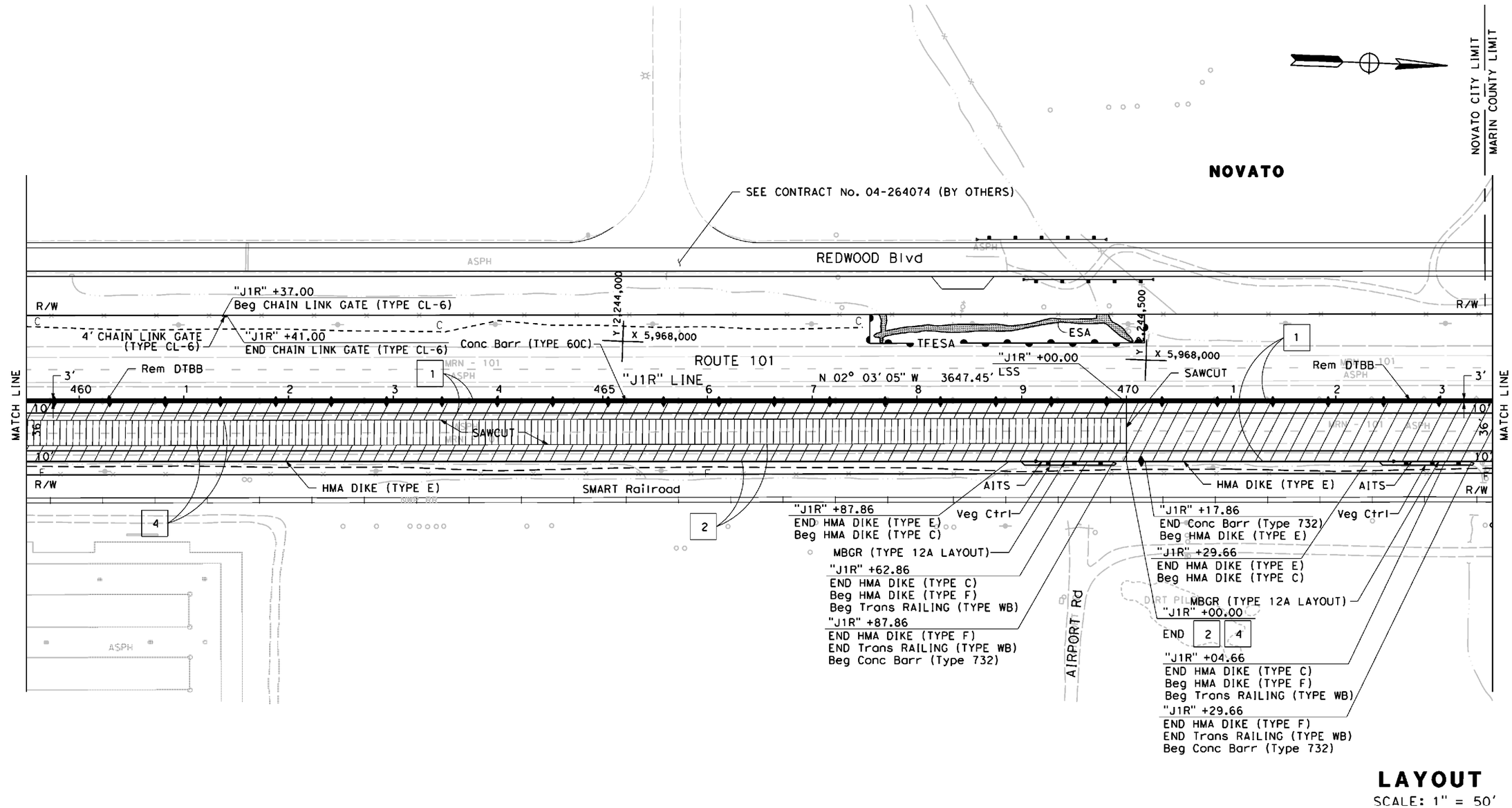
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



LAYOUT

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-7

REVISED BY	DATE REVISED
AL	4/16/12

CALCULATED-DESIGNED BY: ARMANDO LARA
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION 04-16-12
DATE PLOTTED =>5/3/2012
TIME PLOTTED =>14:58:51 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ea007.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	N - COORDINATE	E - COORDINATE
(3)	3500.00′	12° 20′ 25"	378.37′	753.82′	2,245,303.700	5,964,506.547
(25)	2520.00′	04° 17′ 38"	94.47′	188.86′	2,245,421.315	5,965,522.891
(26)	3000.00′	04° 13′ 07"	110.49′	220.88′	2,245,366.467	5,965,055.051
(27)	2500.00′	04° 17′ 54"	93.82′	187.55′	2,245,456.160	5,965,514.736
(28)	500.00′	03° 52′ 42"	16.93′	33.85′	2,245,680.492	5,967,497.976

Y 2,245,500
X 5,967,500

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

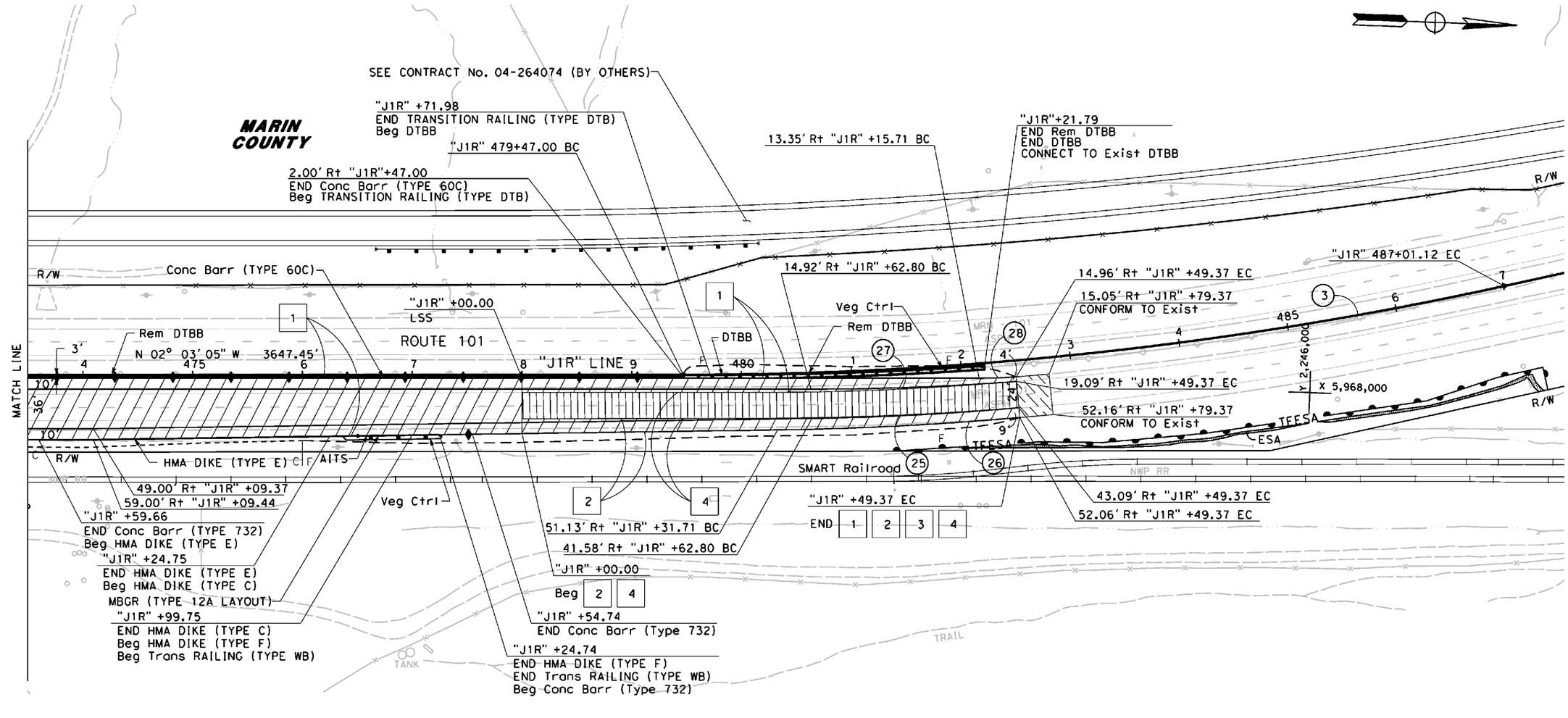
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



LAYOUT

SCALE: 1" = 50′

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

L-8

REVISED BY	DATE REVISED
AL	4/16/12

CALCULATED-DESIGNED BY: ARMANDO LARA
CHECKED BY: GORDON SWEET
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION 04-16-12
DATE PLOTTED = 25/5/2012
TIME PLOTTED = 14:59:11 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ea008.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

EROSION CONTROL PLANS AND DETAILS

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

LEGEND:

EROSION CONTROL (TYPE 1)
IMPORTED BIOFILTRATION SOIL
HYDROMULCH
HYDROSEED (SEED TYPE 1)
ROLLED EROSION CONTROL PRODUCT (NETTING) (TYPE A)

EROSION CONTROL (TYPE 2)
COMPOST
INCORPORATE MATERIALS
HYDROMULCH
HYDROSEED (SEED TYPE 2)

EROSION CONTROL (TYPE 3)
COMPOST
HYDROMULCH
HYDROSEED (SEED TYPE 2)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

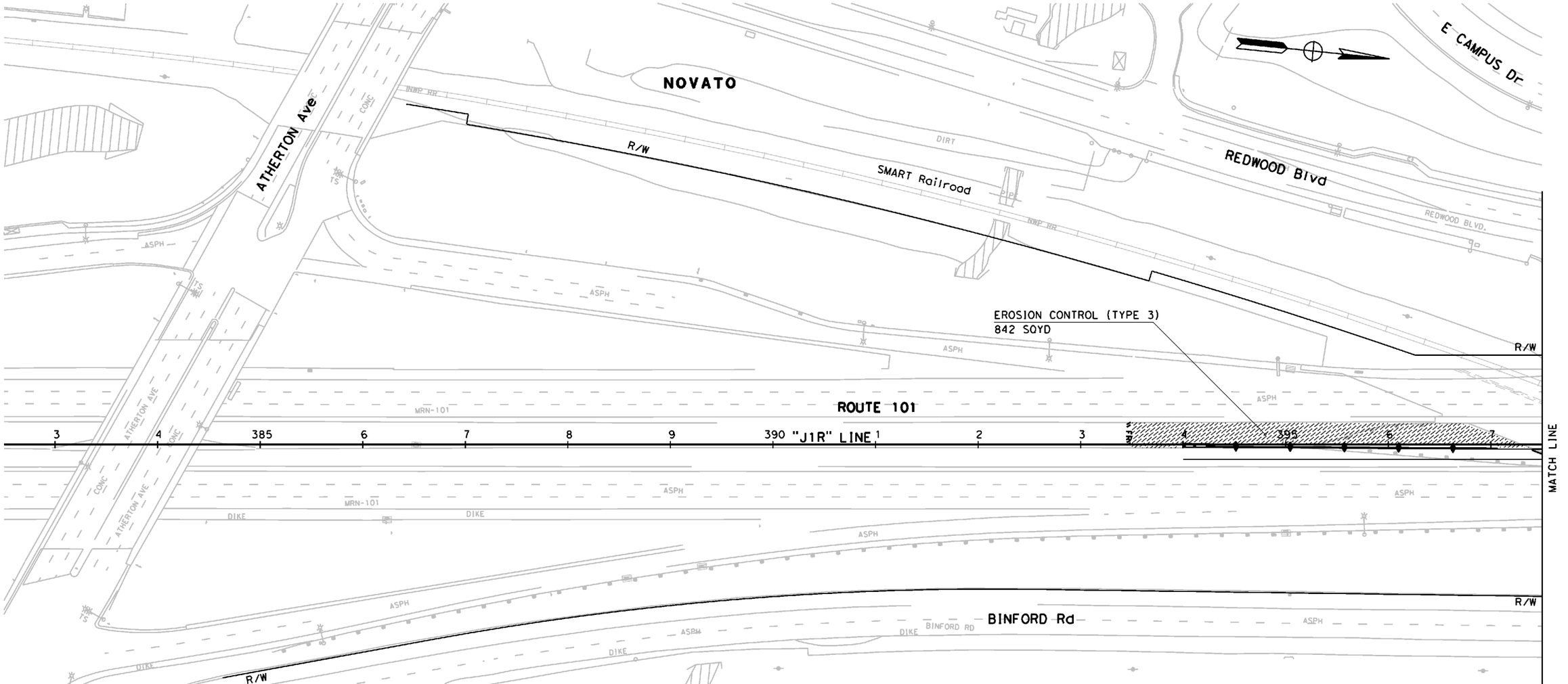
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

REVISED BY	DATE REVISED
MV	4/16/12

MARY VIDRA — CALCULATED-DESIGNED BY
GORDON SWEET — CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12 | DATE PLOTTED =>5/3/2012 | TIME PLOTTED =>4:50:39 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ge001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

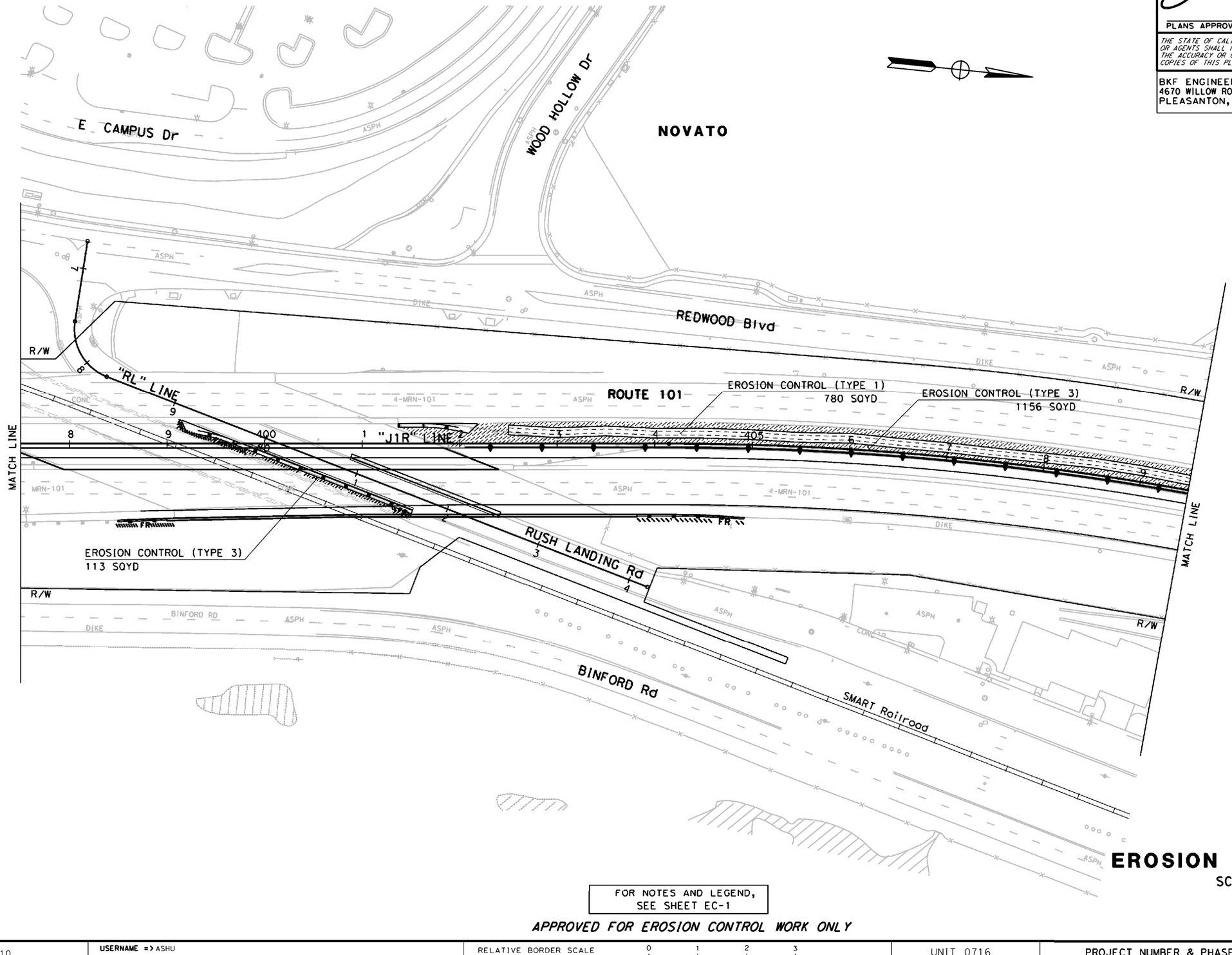
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-2

FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

REVISED BY	MV	
DATE REVISED	4/16/12	
CALCULATED-DESIGNED BY	MARY VIDRA	
CHECKED BY	ROBERTO SORIANO	
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI	
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	Caltrans	

LAST REVISION 04-16-12
DATE PLOTTED =>5/3/2012
TIME PLOTTED =>4:51:05 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ge002.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

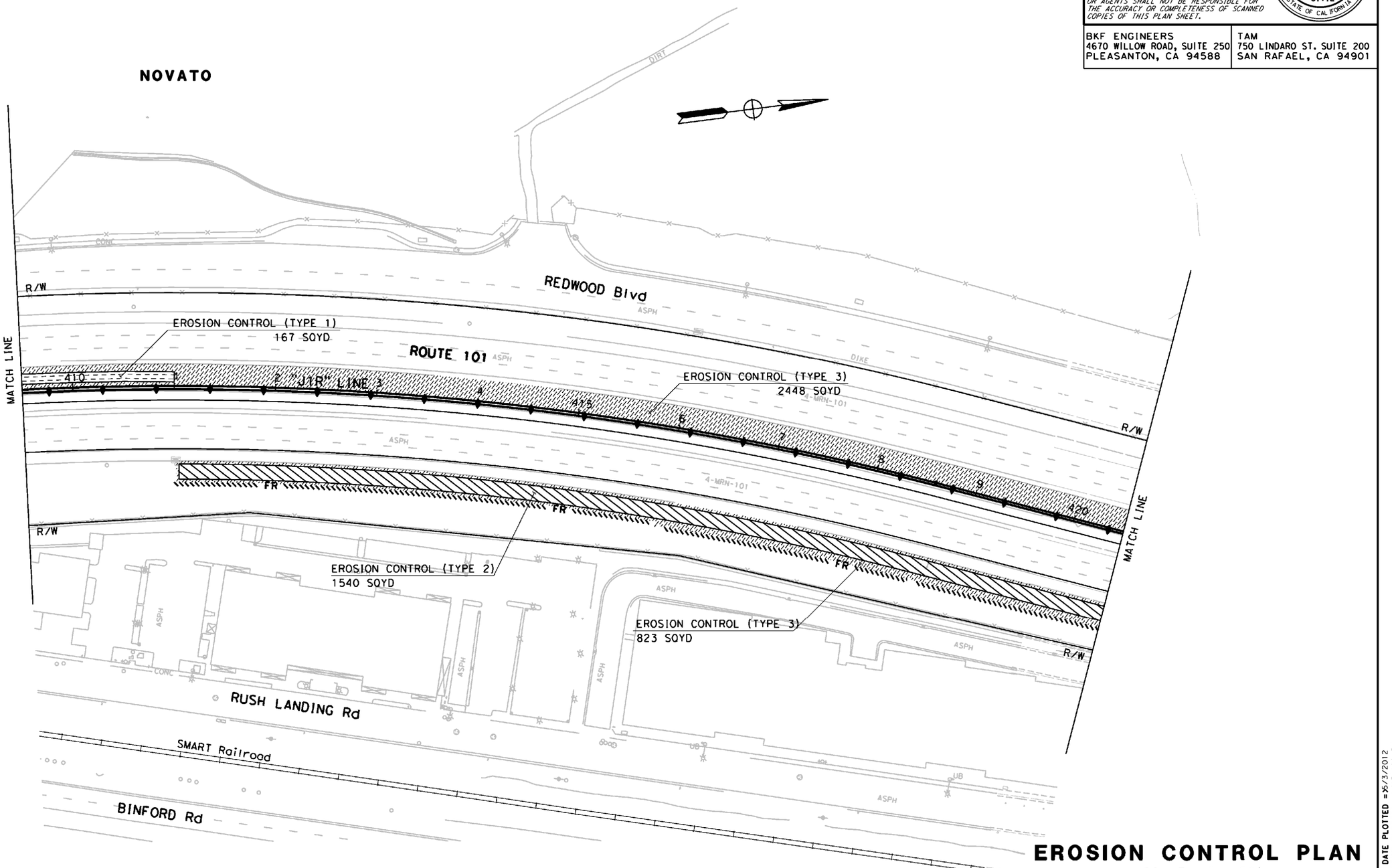
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-3

REVISED BY	DATE REVISED
MV	4/16/12

CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12
DATE PLOTTED = 5/3/2012
TIME PLOTTED = 14:51:26 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337ge003.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

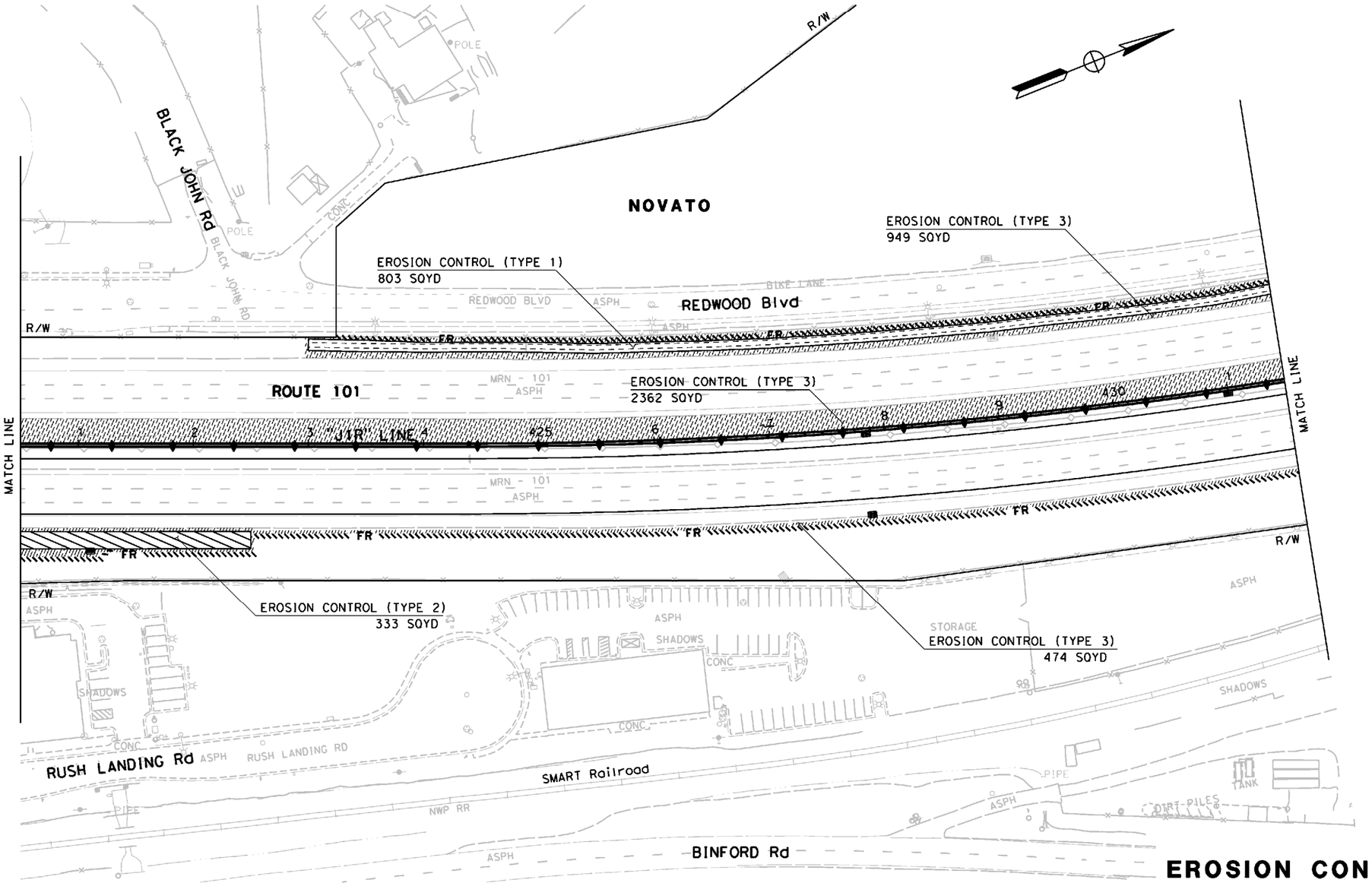
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-4

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET

REVISED BY: MV
DATE REVISED: 4/16/12

LAST REVISION 04-16-12
DATE PLOTTED = 26/3/2012
TIME PLOTTED = 3:45:48 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337ge004.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

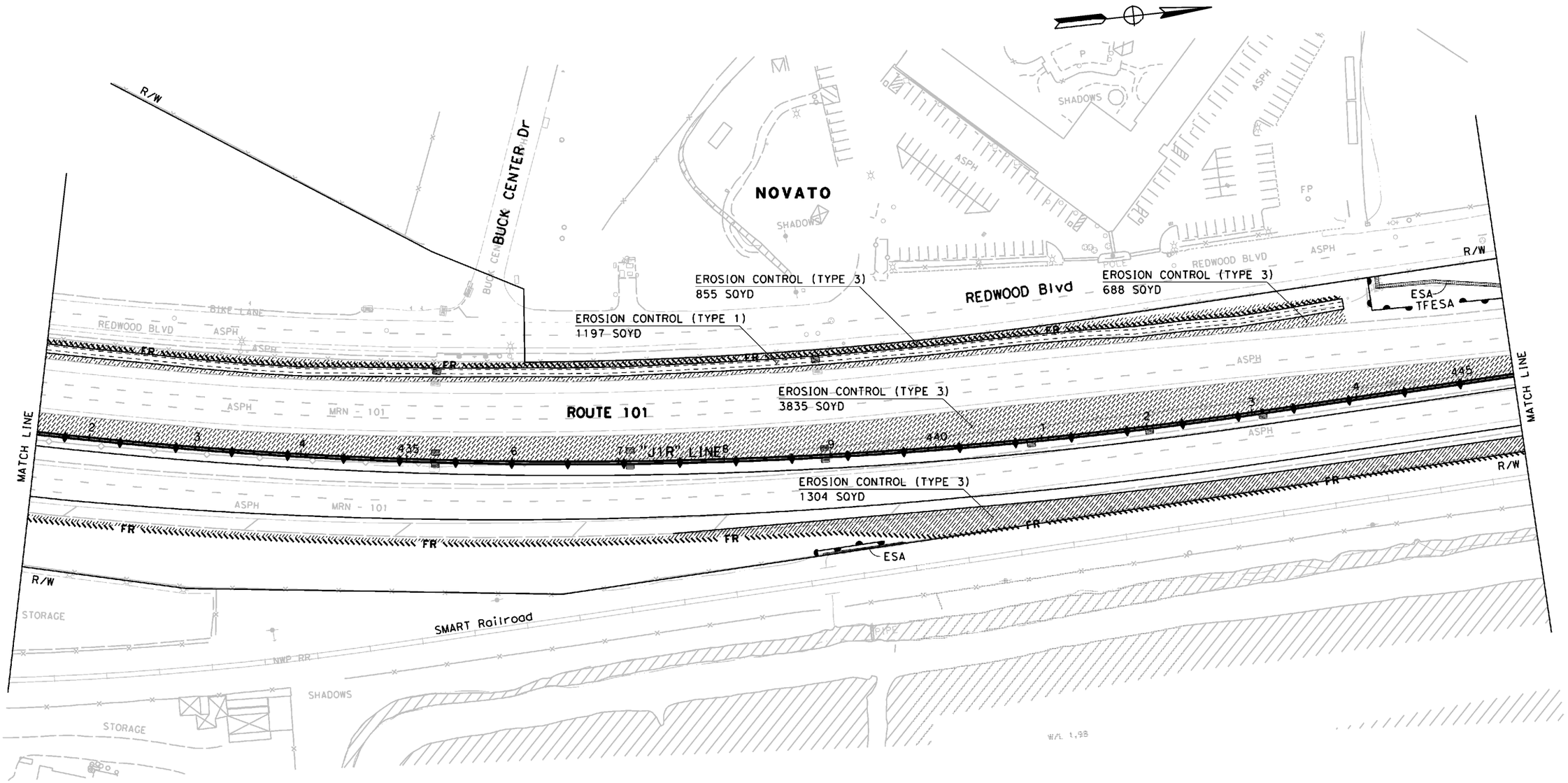
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



EROSION CONTROL PLAN

SCALE: 1" = 50'

FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EC-5

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET
REVISED BY: MV
DATE REVISED: 4/16/12

LAST REVISION 04-16-12
DATE PLOTTED =>5/3/2012
TIME PLOTTED =>14:52:15 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ge005.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

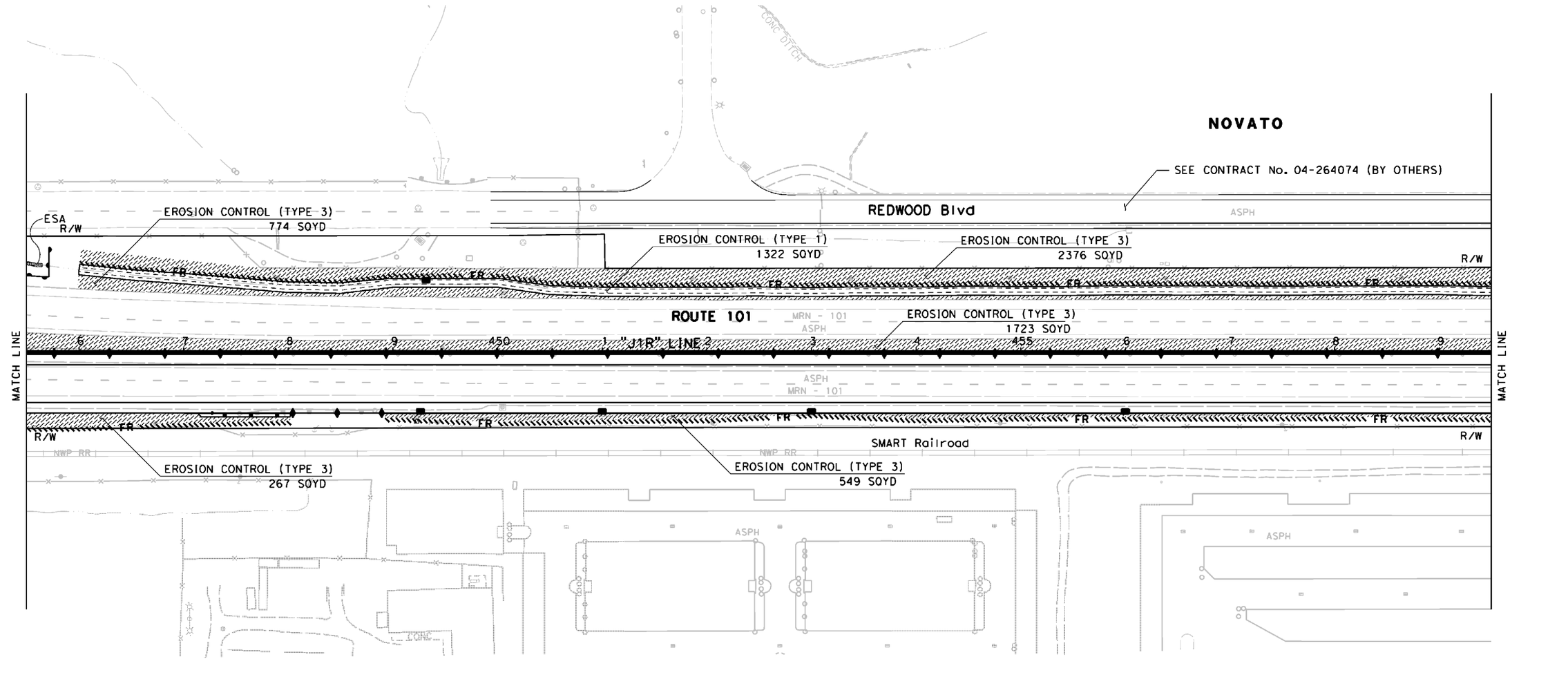
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-6

REVISED BY	DATE REVISED
MV	4/16/12

MARY VIDRA — CALCULATED-DESIGNED BY
RODOLFO ONCHI — CHECKED BY

NATALINA V. BERNARDI — CONSULTANT FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12
DATE PLOTTED =>5/3/2012
TIME PLOTTED =>14:52:44 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337ge006.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

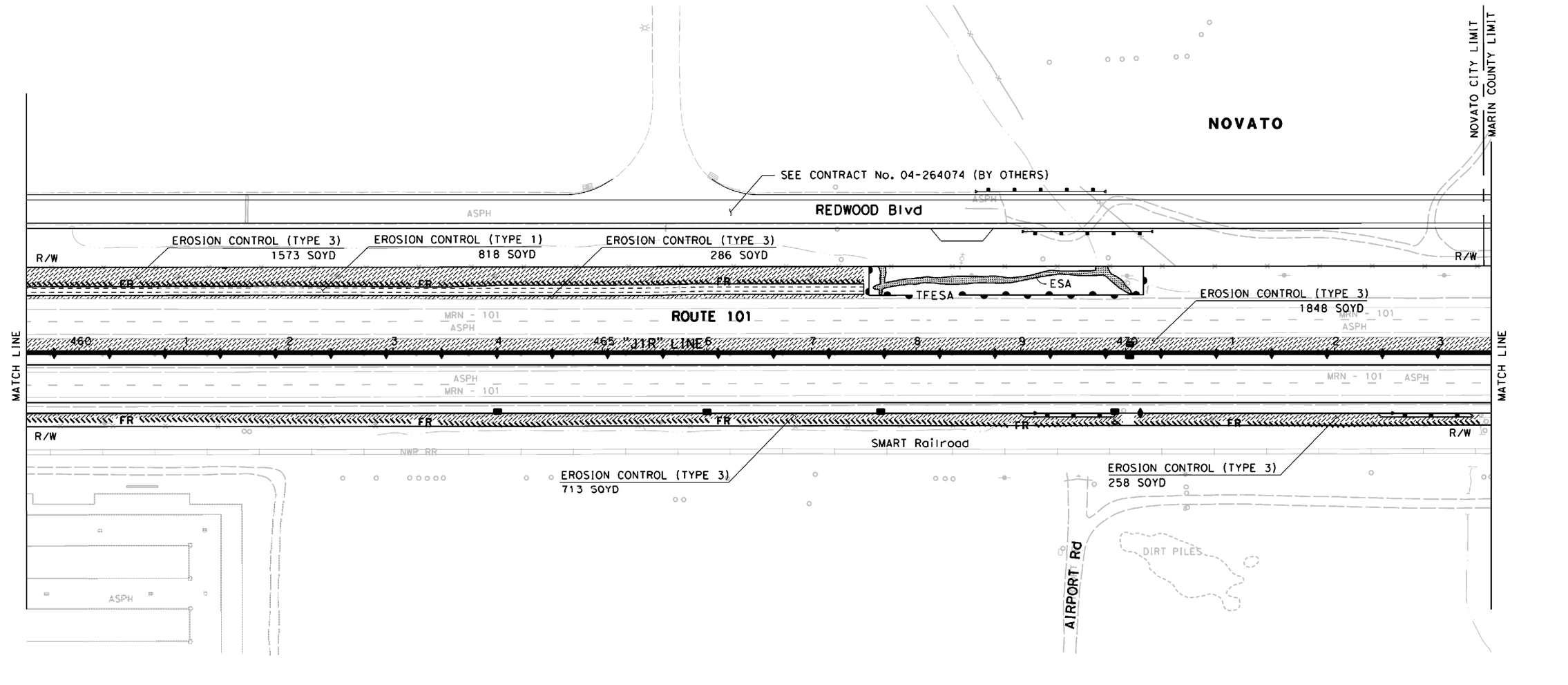
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-7

MARY VIDRA	REVISED BY	MV
GORDON SWEET	DATE REVISED	4/16/12
CALCULATED-DESIGNED BY		
CHECKED BY		
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI	

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 — DATE PLOTTED = 5/3/2012 — TIME PLOTTED = 14:53:05 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ge007.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:
FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

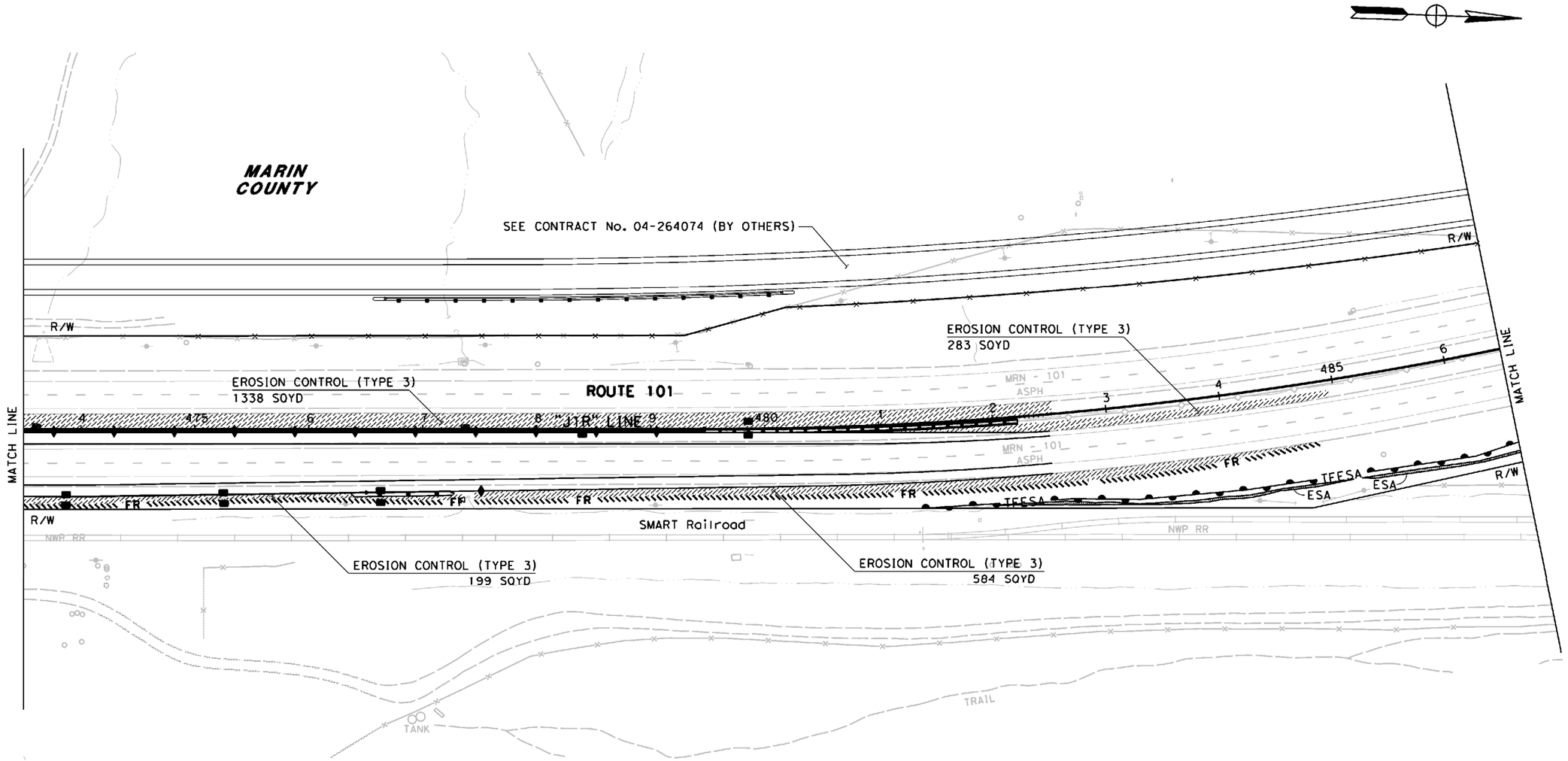
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-8

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET
REVISED BY: MV
DATE REVISED: 4/16/12

LAST REVISION: 04-16-12
DATE PLOTTED = 6/3/2012
TIME PLOTTED = 14:54:09 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ge008.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

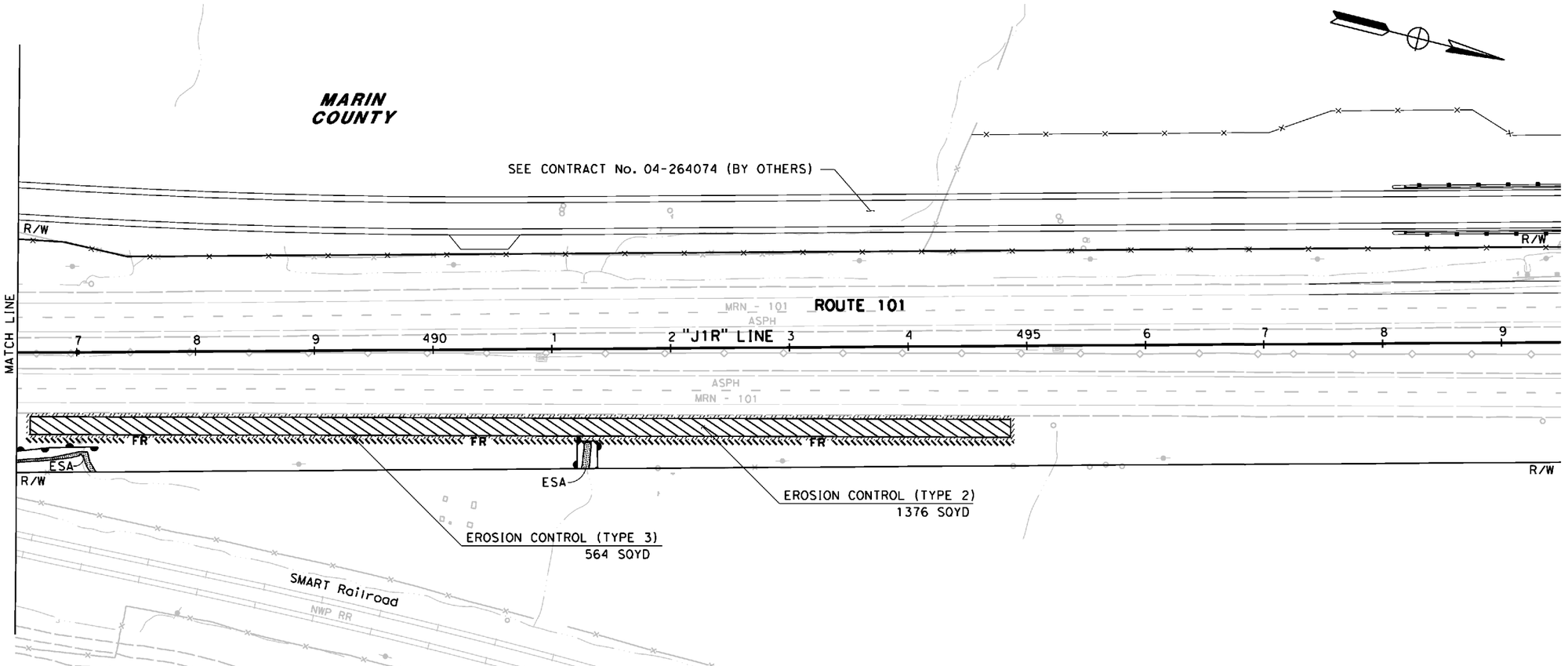
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES AND LEGEND, SEE SHEET EC-1

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE: 1" = 50'

EC-9

LAST REVISION 04-16-12 | DATE PLOTTED =5/3/2012 | TIME PLOTTED =>4:54:28 PM

REVISED BY: MV | DATE REVISED: 4/16/12

CALCULATED-DESIGNED BY: MARY VIDRA | CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ge009.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

NOTES:

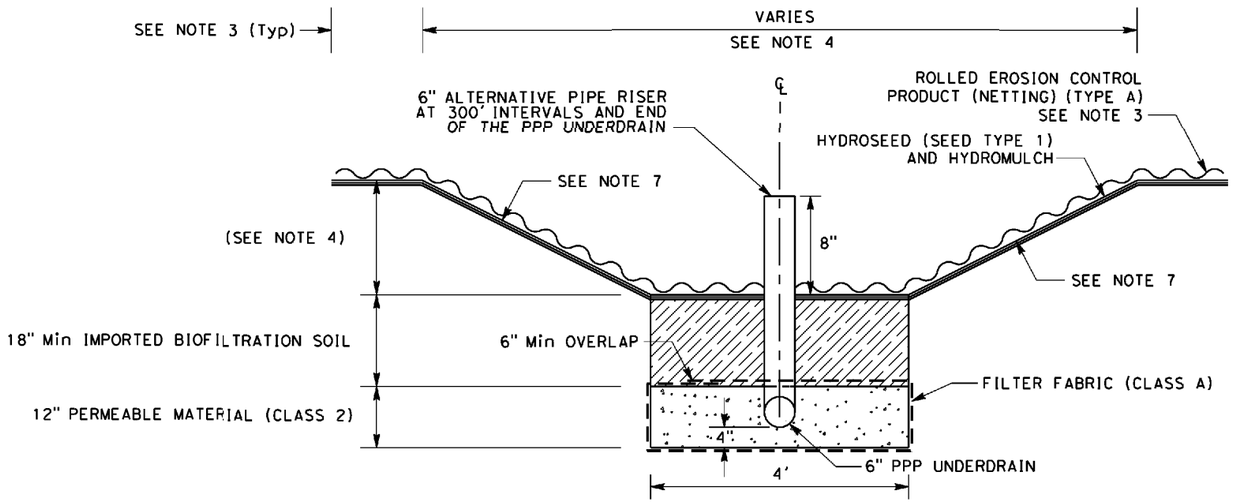
1. DIMENSIONS MAY VARY TO FIT ACTUAL FIELD CONDITIONS.
2. BEGINNING AND END OF LINEAR BIORETENTION AREA MAY VARY. EXACT DIMENSIONS SHALL BE DETERMINED BY THE ENGINEER.
3. WHERE ROLLED EROSION CONTROL PRODUCT (NETTING) IS PROPOSED, INSTALLATIONS SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS AND CALTRANS SPECIFICATIONS.
4. FOR LINEAR BIORETENTION AREA FLOW LINE ELEVATIONS AND PROFILES AND UNDERDRAIN PROFILES AND DETAILS, SEE DRAINAGE PLAN, PROFILES, AND DETAILS.

   SEE TABLE BELOW FOR DEPTH REQUIREMENTS FOR LINEAR BIORETENTION AREAS:

LOCATION	MAXIMUM	MINIMUM
ROUTE 101 MEDIAN Sta "J1R" 402+50 TO "J1R" 411+00	0.75'	0.75'
WEST OF SB ROUTE 101 Sta "J1R" 423+00 TO "J1R" 444+00	2.72'	0.75'
WEST OF SB ROUTE 101 Sta "J1R" 446+00 TO "J1R" 467+50	1.10'	0.75'

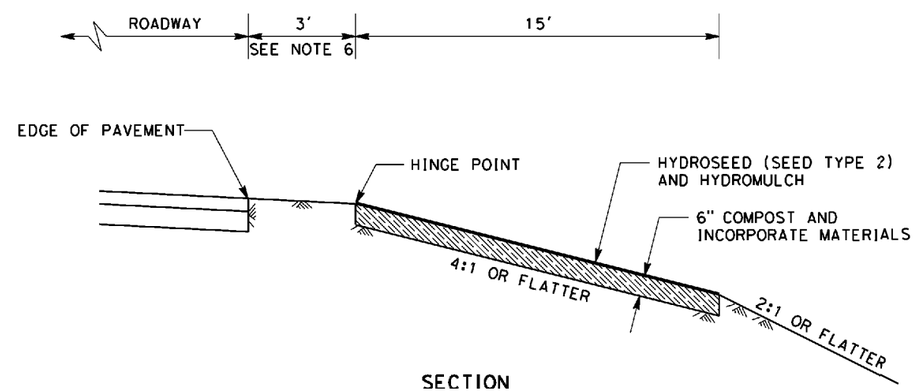
5. FOR PERFORATED PLASTIC PIPE UNDERDRAIN AND ALTERNATIVE PIPE RISER QUANTITIES, SEE DRAINAGE QUANTITIES SHEETS.
6. IF EXISTING PAVEMENT ADJACENT TO THE BIOFILTRATION STRIP WILL REMAIN UNMODIFIED, EROSION CONTROL (TYPE 3) SHALL BE PLACE BETWEEN THE EDGE OF PAVEMENT AND BIOFILTRATION STRIP. OTHERWISE, SHOULDER BACKING SHALL BE PLACE PER REVISED Std PLAN RSP P75.
7. SEE TABLE BELOW FOR SIDE SLOPE REQUIREMENTS FOR LINEAR BIORETENTION AREAS:

LOCATION	SIDE SLOPE REQUIREMENT
WEST OF SB ROUTE 101	WESTERN SIDE SLOPE (ADJACENT TO R/W): 2:1 EASTERN SIDE SLOPE (ADJACENT TO SB 101): 2:1 OR FLATTER
ROUTE 101 MEDIAN	4:1 FOR BOTH SIDE SLOPES



SECTION

LINEAR BIORETENTION AREA



SECTION
ADJACENT TO ROADWAY PAVEMENT

BIOFILTRATION STRIP

EROSION CONTROL DETAILS

NO SCALE

ECD-1

REVISED BY	DATE REVISED
MV	4/16/12

CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12
DATE PLOTTED =5/3/2012
TIME PLOTTED =4:54:48 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337gf001.dgn

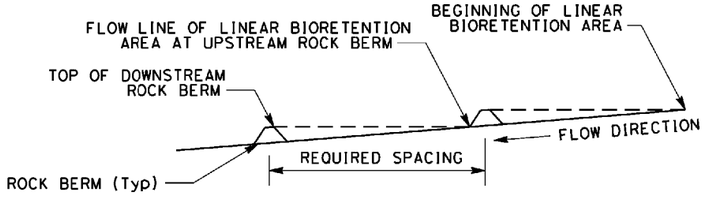
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

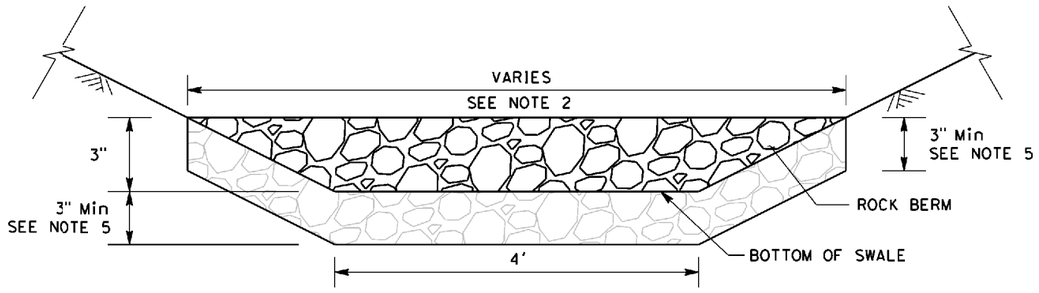
PROJECT NUMBER & PHASE 04120003371

NOTES:

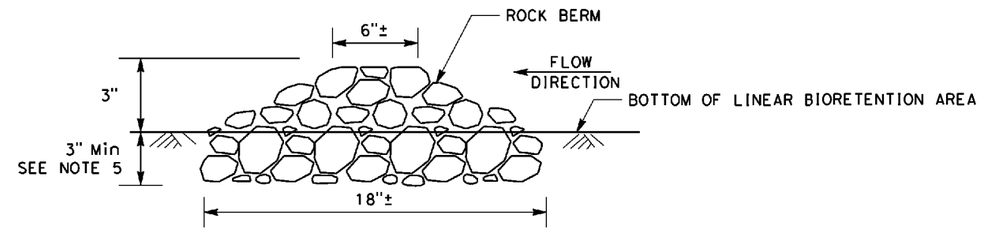
1. ROCK BERM SHALL CONSIST OF SMALL-ROCK SLOPE PROTECTION. SEE SPECIFICATIONS FOR MORE INFORMATION.
2. WIDTH OF ROCK BERM SHALL BE THE LENGTH REQUIRED TO ACHIEVE A MINIMUM HEIGHT OF 3 INCHES FROM THE BOTTOM OF THE LINEAR BIORETENTION AREA.
3. THE TOP OF DOWNSTREAM ROCK BERM SHALL MATCH THE FLOW LINE ELEVATION AT THE UPSTREAM ROCK BERM IN ORDER TO DETERMINE SPACING BETWEEN EACH ROCK BERM. SEE FIGURE 1.
4. DIMENSIONS MAY VARY TO FIT ACTUAL FIELD CONDITIONS.
5. ROCK BERM SHALL BE KEYED IN A MINIMUM OF 3 INCHES BELOW THE LINEAR BIORETENTION AREA SURFACE.
6. FOR LINEAR BIORETENTION AREA DETAILS, SEE SHEET ECD-1.



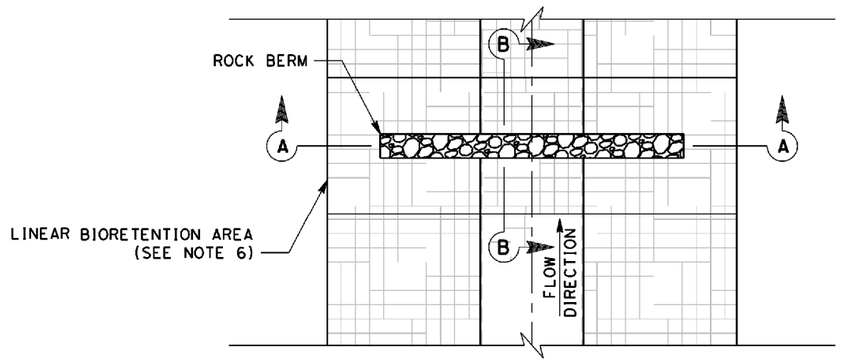
TYPICAL PROFILE
FIGURE 1



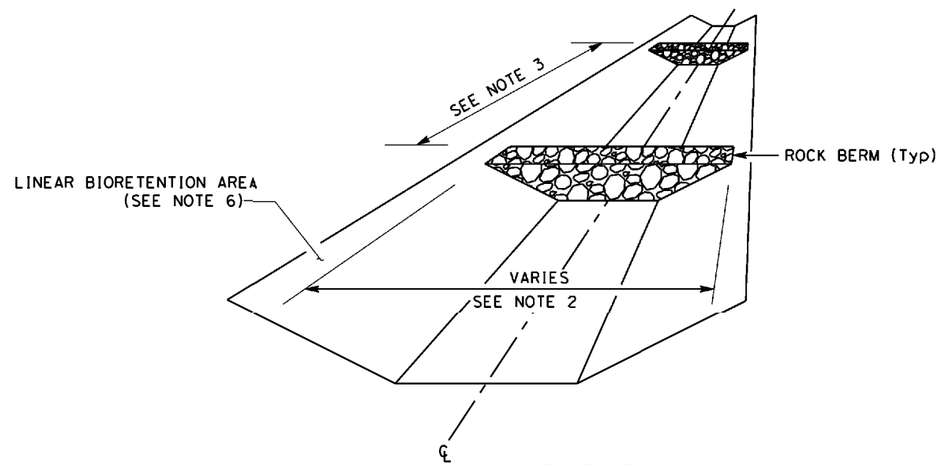
SECTION A-A



SECTION B-B



PLAN



PERSPECTIVE

ROCK BERM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

REVISED BY	DATE REVISED
MV	4/16/12

CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

EROSION CONTROL DETAILS

NO SCALE

ECD-2

LAST REVISION 04-16-12 | DATE PLOTTED =5/3/2012 | TIME PLOTTED =>4:55:09 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 04120003371gf002.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

SEED TYPE 1

BOTANICAL NAME (COMMON NAME)	PERCENT GERMINATION (MINIMUM)	POUNDS PURE LIVE SEED PER ACRE (SLOPE MEASUREMENT)
BROMUS CARINATUS, NATIVE * (CALIFORNIA BROME, NATIVE)	40	10
ELYMUS GLAUCUS, BERKELEY (BLUE WILD RYE)	40	7
HORDEUM BRACHYANTHERUM (MEADOW BARLEY)	40	5
LEYMUS TRITICODES VAR. RIO* (CREEPING WILDRYE, RIO)	53	5
FESTUCA IDAHOENSIS (BLUEBUNCH GRASS)	35	5
FESTUCA RUBRA VAR. MOLATE * (MOLATE RED FESCUE)	40	9
VULPIA MICROSTACHYS (THREE WEEK FESCUE)	45	5
TOTAL		46

* SEED PRODUCED IN CALIFORNIA ONLY.

SEED TYPE 2

BOTANICAL NAME (COMMON NAME)	PERCENT GERMINATION (MINIMUM)	POUNDS PURE LIVE SEED PER ACRE (SLOPE MEASUREMENT)
ARTEMISIA CALIFORNICA (CALIFORNIA SAGEBRUSH)	25	1
BROMUS CARINATUS, NATIVE * (CALIFORNIA BROME, NATIVE)	40	10
ELYMUS GLAUCUS, BERKELEY (BLUE WILD RYE)	40	7
ESCHSCHOLZIA CALIFORNICA (CALIFORNIA POPPY)	35	2
FESTUCA IDAHOENSIS (BLUEBUNCH GRASS)	35	5
FESTUCA RUBRA VAR. MOLATE * (MOLATE RED FESCUE)	40	9
HORDEUM BRACHYANTHERUM (MEADOW BARLEY)	40	5
LEYMUS TRITICODES VAR. RIO* (CREEPING WILDRYE, RIO)	53	5
NASSELLA PULCHRA (PURPLE NEEDLEGRASS)	35	11
VULPIA MICROSTACHYS (THREE WEEK FESCUE)	45	5
TOTAL		60

* SEED PRODUCED IN CALIFORNIA ONLY.

1. APPLY THE FOLLOWING MIXTURE WITH HYDROSEEDING EQUIPMENT AT THE RATES INDICATED WITHIN 60 MINUTES AFTER THE SEED HAS BEEN ADDED TO THE MIXTURE:

SEED TYPE 1

MATERIAL	POUNDS PER ACRE (SLOPE MEASUREMENT)
SEED	46
FIBER	285

SEED TYPE 2

MATERIAL	POUNDS PER ACRE (SLOPE MEASUREMENT)
SEED	60
FIBER	285

2. APPLY STRAW AT THE RATE OF 2 TONS PER ACRE BASED ON SLOPE MEASUREMENT. INCORPORATION OF STRAW WILL NOT BE REQUIRED. DISTIBUTE STRAW EVENLY WITHOUT CLUMPING OR PILING.

3. APPLY THE FOLLOWING MIXTURE WITH HYDROSEEDING EQUIPMENT AT THE CORRESPONDING RATES:

MATERIAL	POUNDS PER ACRE (SLOPE MEASUREMENT)
FIBER	285
TACKIFIER	200

EROSION CONTROL DETAILS

ECD-3

REVISED BY	DATE REVISED
MV	4/16/12

CALCULATED-DESIGNED BY: MARY VIDRA
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12
DATE PLOTTED = 25/3/2012
TIME PLOTTED = 3:45:29 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337gf003.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

DRAINAGE PLANS

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. EXISTING DRAINAGE LOCATIONS ARE APPROXIMATE ONLY. VERIFY LOCATION & ELEVATION BEFORE MODIFYING EXISTING DRAINAGE FACILITIES.
3. CONTRACTOR TO VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIALS.
4. FOR ADDITIONAL DETAILS OF LBA, SEE ECD-4.
5. FOR CONCRETE LINED DITCH, RSP, DA, RCB DETAILS, SEE DRAINAGE DETAILS.

ABBREVIATIONS:

APR	ALTERNATIVE PIPE RISER
DA	DEPRESSION APRON
GLD	GRATED LINE DRAIN
LBA	LINEAR BIORETENTION AREA
Rem	REMOVE
SGD	STANDARD GUTTER DEPRESSION
TR	TERMINAL RISER
w/	WITH

LEGEND:

- (No.) DRAINAGE SYSTEM
- DIRECTION OF FLOW
- (x) DRAINAGE UNIT
- ROCK SLOPE PROTECTION
- PROPOSED DRAINAGE INLET
- PROPOSED STORM DRAIN LINE
- REMOVE EXISTING CULVERT
- EXISTING DRAINAGE INLET
- EXISTING STORM DRAIN LINE
- GRADE TO DRAIN

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

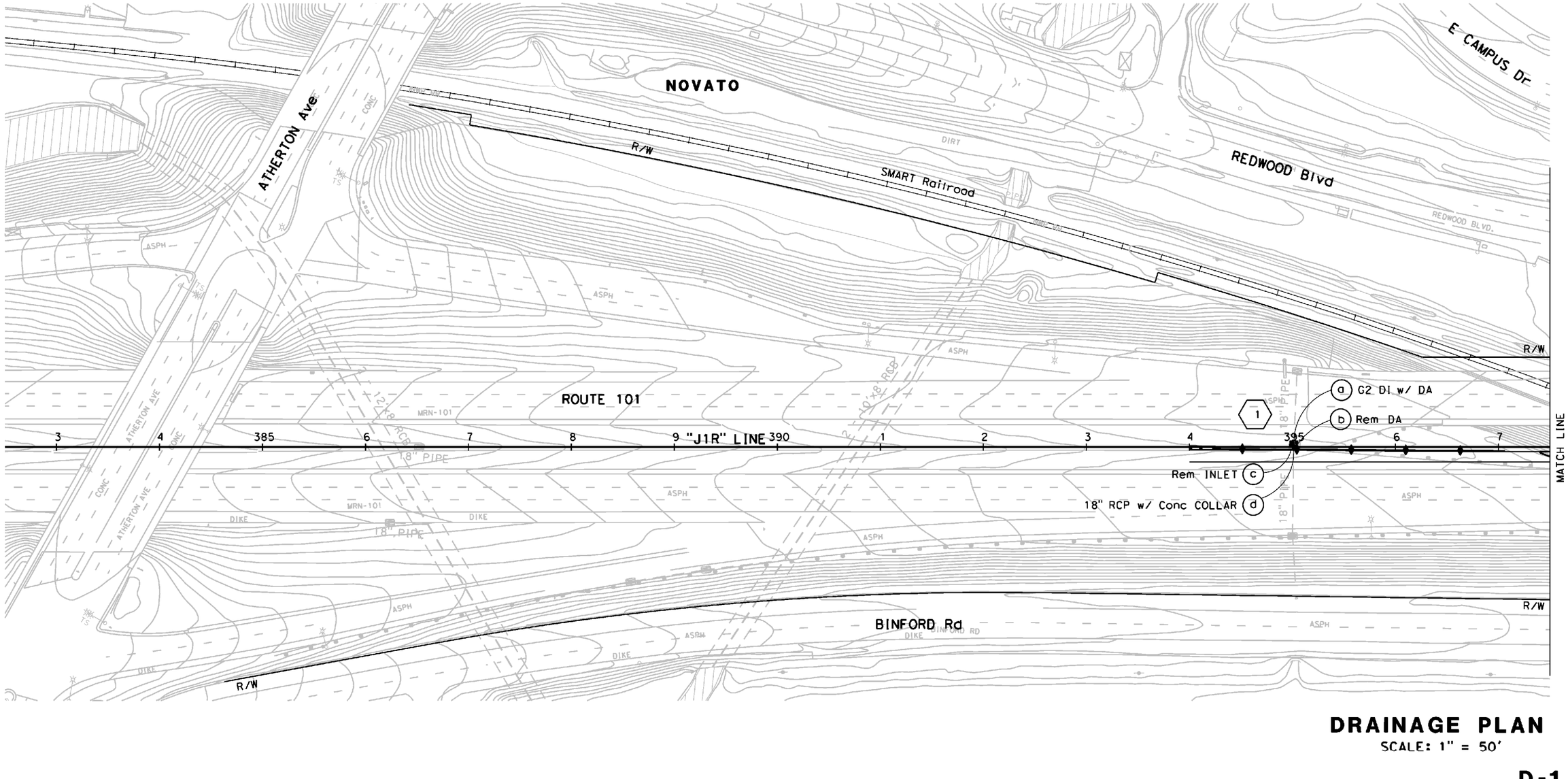
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



DRAINAGE PLAN

SCALE: 1" = 50'

D-1

APPROVED FOR DRAINAGE WORK ONLY

DN	4/16/12
REVISED BY	DATE REVISED
DAT NGUYEN	GORDON SWEET
CALCULATED-DESIGNED BY	CHECKED BY
CONSULTANT FUNCTIONAL SUPERVISOR	
NATALINA V. BERNARDI	

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 — DATE PLOTTED =>6/3/2012 TIME PLOTTED =>7:04:51 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 04120000337ia001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

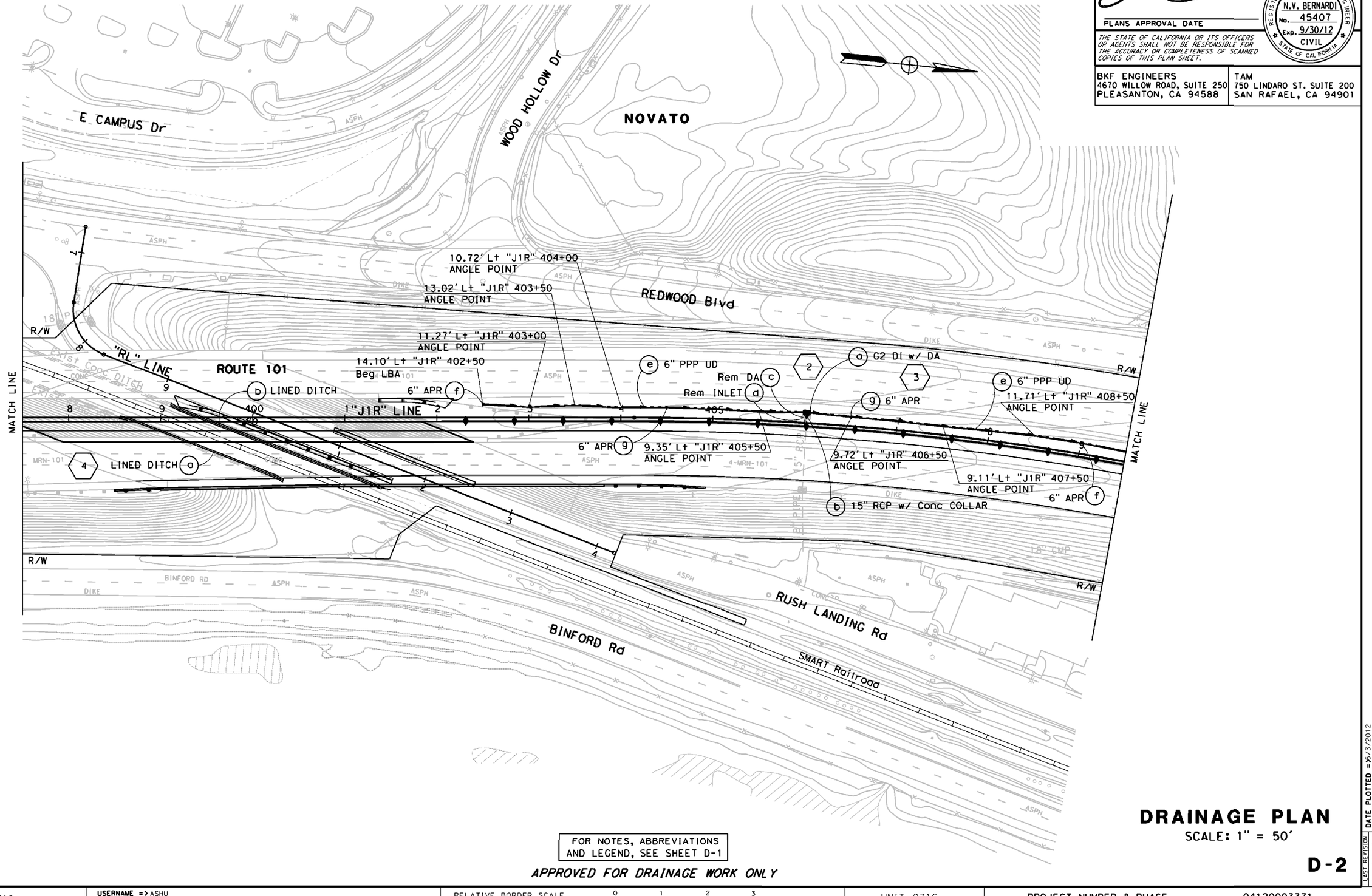
PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE: 1" = 50'

D-2

REVISED BY	DN		
DATE REVISED	4/16/12		
DAT NGUYEN	GORDON SWEET	CALCULATED-DESIGNED BY	CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 | DATE PLOTTED = 25/3/2012 | TIME PLOTTED = 17:05:22 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 04120003371a002.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

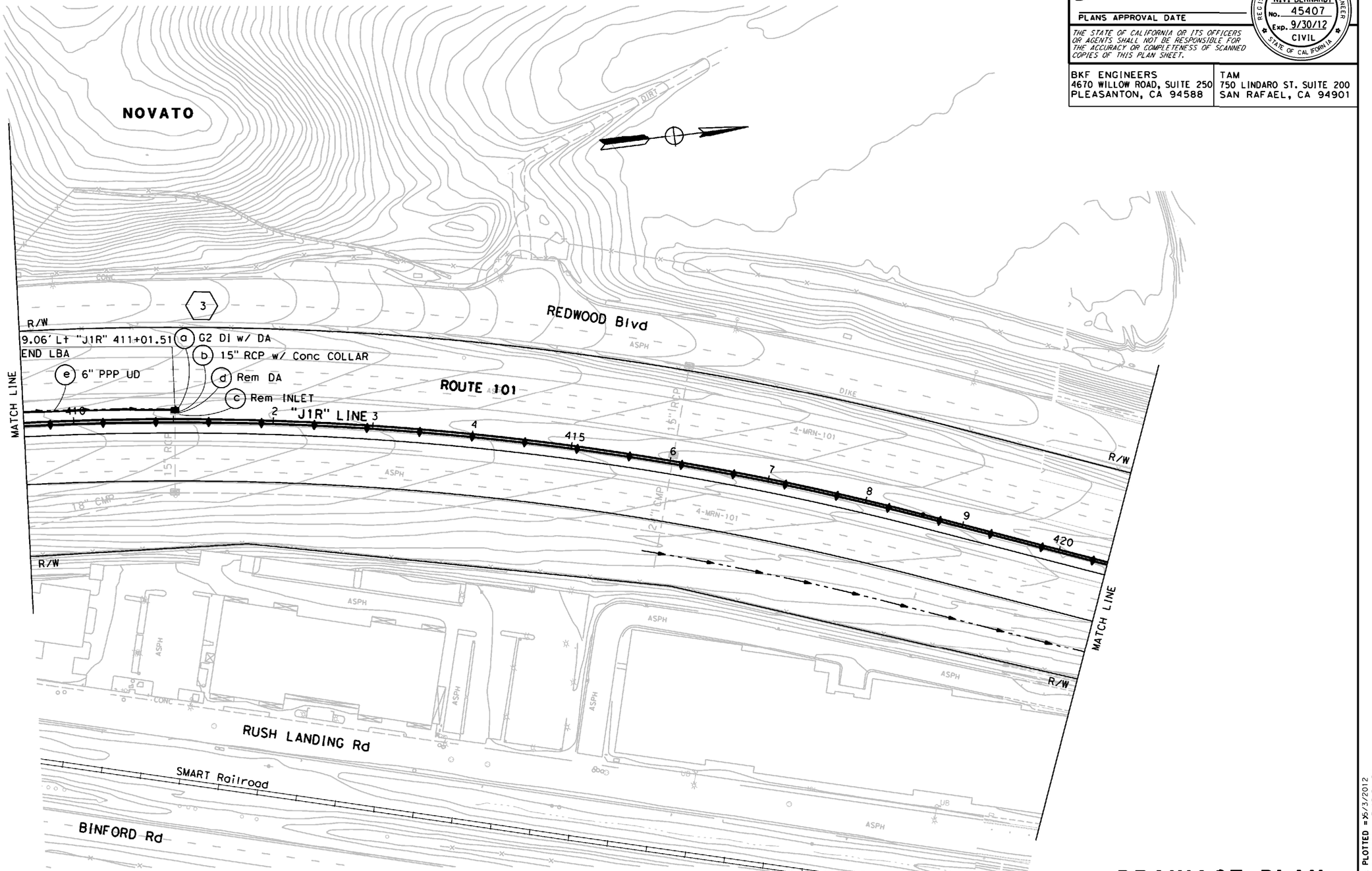
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE: 1" = 50'

D-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: DAT NGUYEN

CHECKED BY: GORDON SWEET

REVISED BY: DN — DATE REVISED: 4/16/12

LAST REVISION: 04-16-12 — DATE PLOTTED =>5/3/2012 — TIME PLOTTED =>7:05:51 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 04120003371a003.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

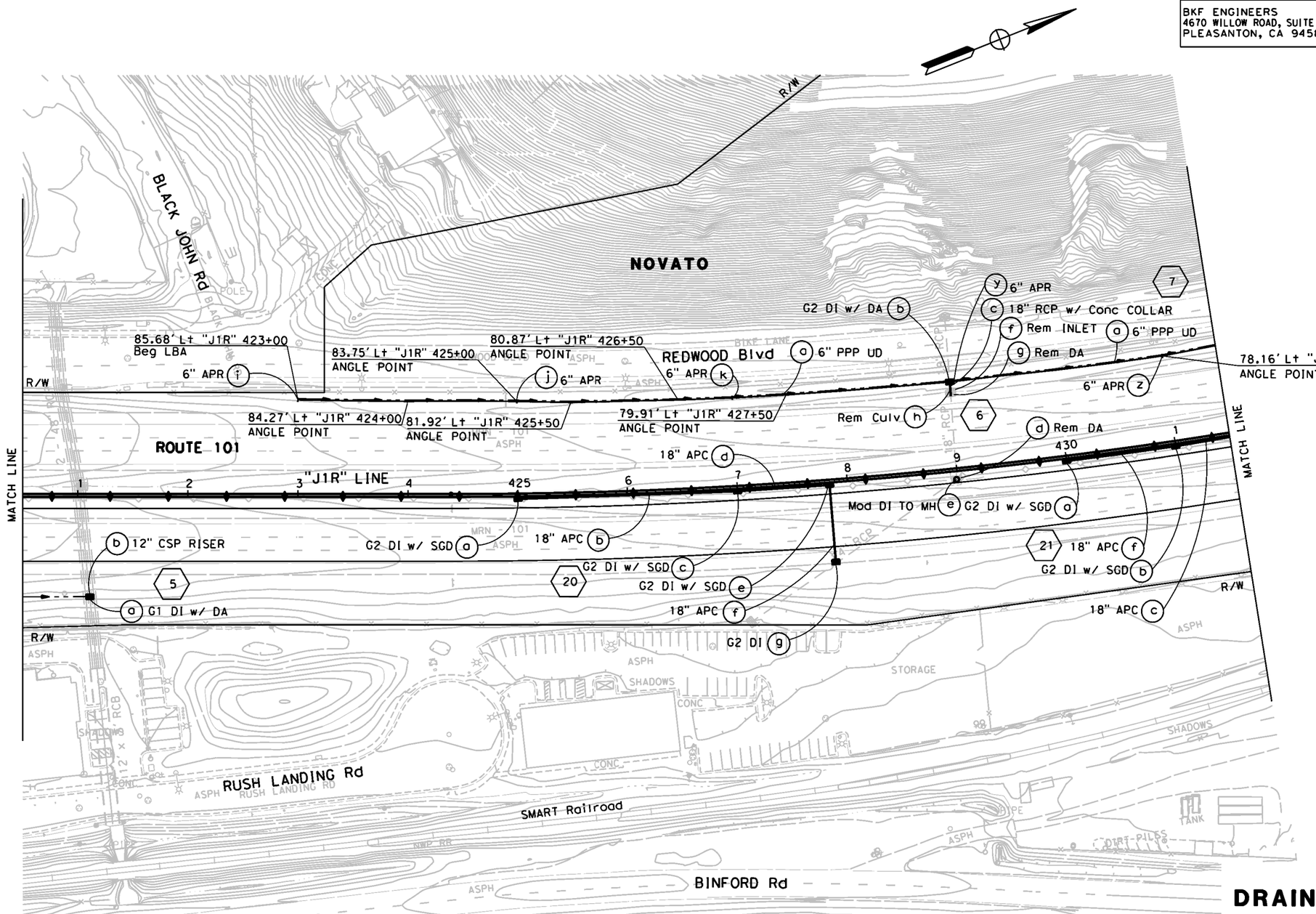
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE: 1" = 50'

D-4

CALCULATED-DESIGNED BY	DAT NGUYEN	REVISED BY	DN
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 | DATE PLOTTED = 5/4/2012 | TIME PLOTTED = 11:59:37 AM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ia004.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

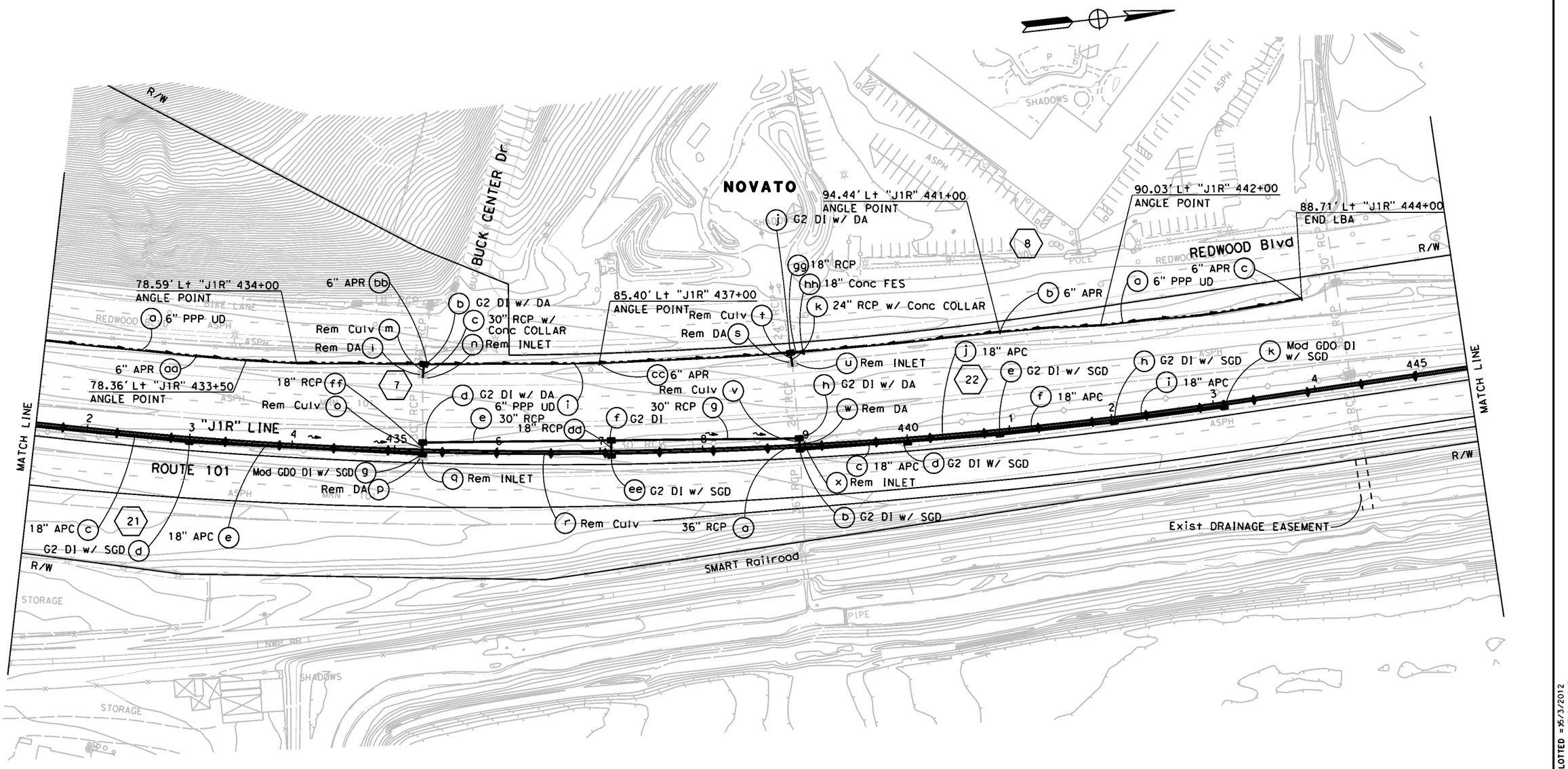
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



DRAINAGE PLAN

SCALE: 1" = 50'

D-5

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

REVISED BY	DN
DATE REVISED	4/16/12
DAT NGUYEN	
GORDON SWEET	
CALCULATED-DESIGNED BY	
CHECKED BY	
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	Caltrans

LAST REVISION 04-16-12 — DATE PLOTTED =>5/3/2012, TIME PLOTTED =>7:50:02 PM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337ia005.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

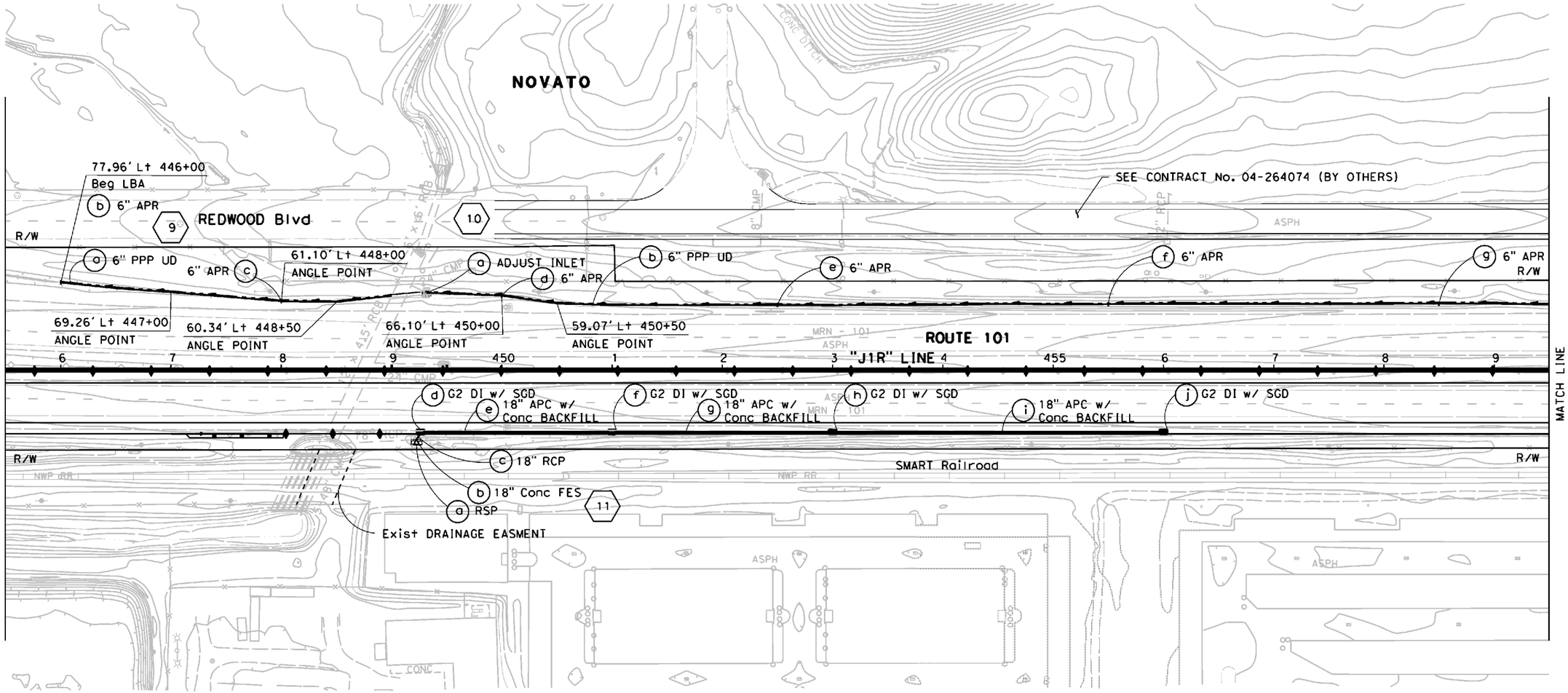
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



DRAINAGE PLAN

SCALE: 1" = 50'

D-6

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

CALCULATED-DESIGNED BY: DAT NGUYEN
CHECKED BY: GORDON SWEET
DN 4/16/12
REVISED BY / DATE REVISED

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

LAST REVISION 04-16-12
DATE PLOTTED => 16/2012
TIME PLOTTED => 17:07:07 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ia006.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

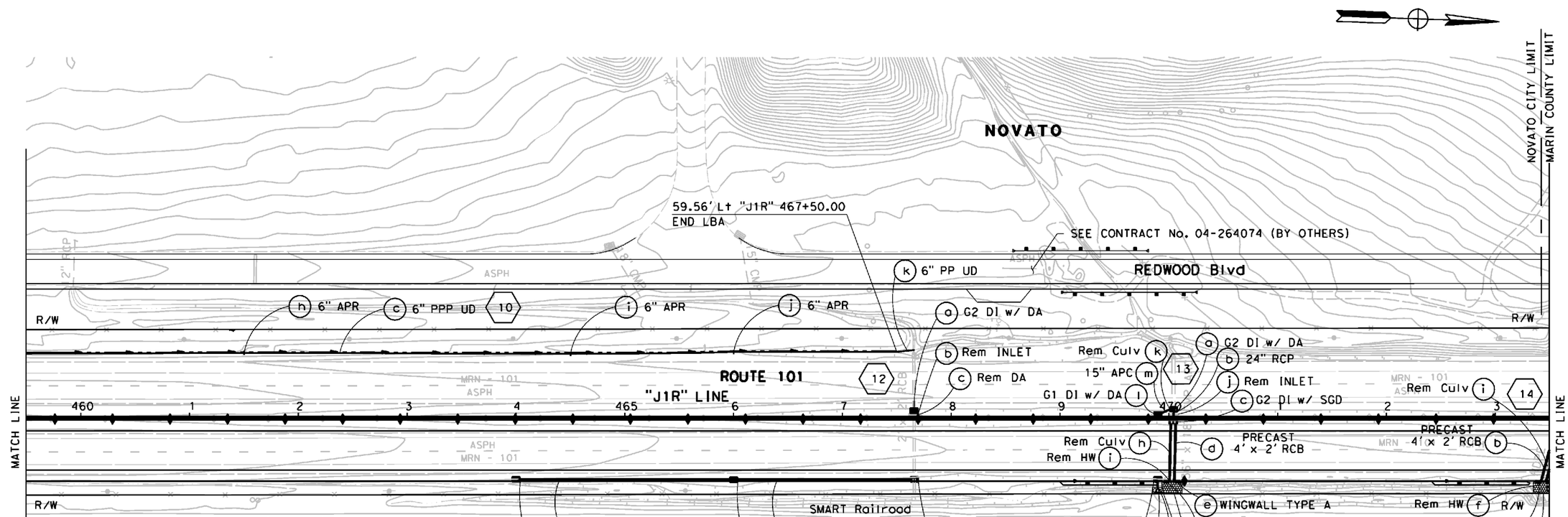
PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



DRAINAGE PLAN

SCALE: 1" = 50'

D-7

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: DAT NGUYEN
CHECKED BY: GORDON SWEET

REVISED BY	DATE REVISED
DN	4/16/12

LAST REVISION 04-16-12
DATE PLOTTED => 5/3/2012
TIME PLOTTED => 7:07:35 PM

BORDER LAST REVISED 7/2/2010
USERNAME => ASHU
DGN FILE => 0412000337ia007.dgn
RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3
UNIT 0716
PROJECT NUMBER & PHASE 04120003371

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

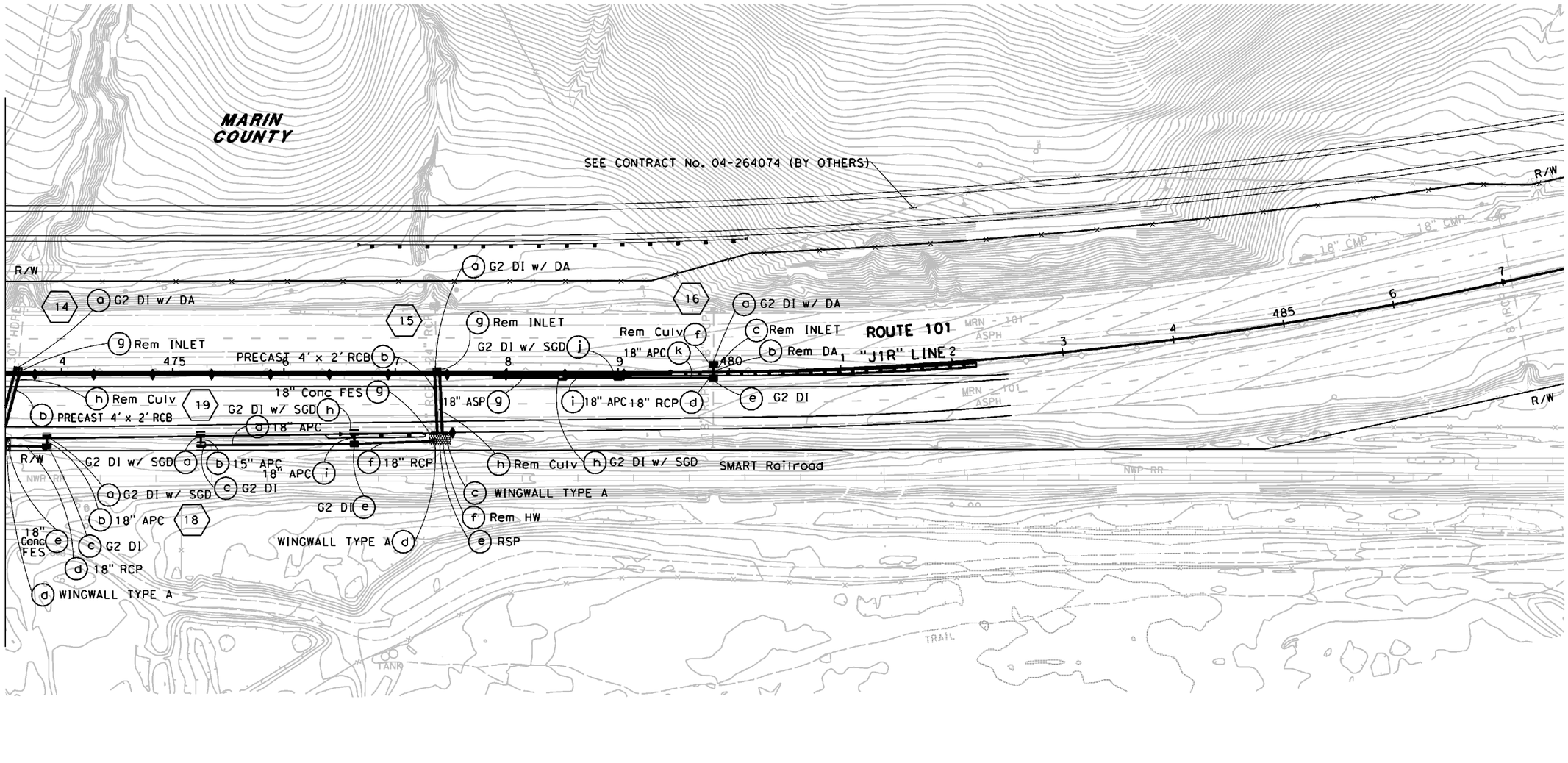
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE: 1" = 50'

D-8

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: DAT NGUYEN
CHECKED BY: GORDON SWEET

REVISED BY: DN
DATE REVISED: 4/16/12

LAST REVISION: 04-16-12
DATE PLOTTED => 25/5/2012
TIME PLOTTED => 7:08:02 PM

BORDER LAST REVISED 7/2/2010

USERNAME => ASHU
DGN FILE => 0412000337ia008.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0716

PROJECT NUMBER & PHASE 04120003371

TEMPORARY DRAINAGE

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. SEE DRAINAGE PLANS FOR ITEMS NOT SHOWN.
3. SEE DRAINAGE QUANTITIES FOR TEMPORARY DRAINAGE QUANTITIES.
4. PLUG EXISTING CULVERT AT CONSTRUCTED DRAINAGE INLET AND DIVERT FLOW TO ADJACENT DRAINAGE INLET WITHIN THE MEDIAN UNTIL NEEDED.
5. CONSTRUCT TEMPORARY DRAINAGE TRANSITION BEYOND CONSTRUCTION AREA. COVER END OF CONSTRUCTED 4' X 2' RCB AND REMAINING CULVERT WITH 1/2" THICK PLYWOOD OR OTHER SOLID MATERIAL APPROVED BY THE ENGINEER. OPENINGS FOR 2-15" Temp Culv SHALL BE CONSTRUCTED THROUGH THE PLYWOOD TO PROVIDE FLOW FROM RCB TO PIPE CULVERT. ANY VOIDS AT TEMPORARY PIPE OPENINGS SHALL BE FILLED WITH MORTAR OR OTHER APPROVED PLUGGING MATERIAL. BACKFILL WITH EMBANKMENT MATERIAL AND 12" RAPID SETTING CONCRETE BACKFILL TO EXISTING GRADE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

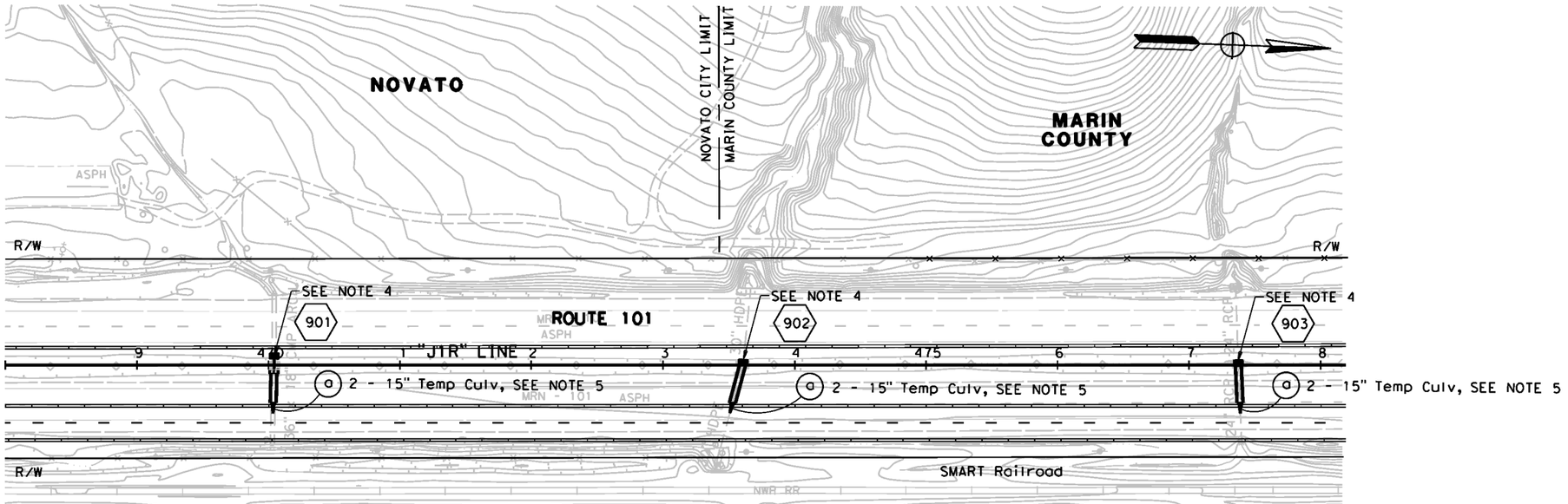
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



STAGE CONSTRUCTION DETAILS
TEMPORARY DRAINAGE
STAGE 1B

SCALE: 1" = 50'

APPROVED FOR TEMPORARY DRAINAGE WORK ONLY

SCD-1

	DN	4/16/12
	REVISED BY	DATE REVISED
	DAT NGUYEN	GORDON SWEET
	CALCULATED-DESIGNED BY	CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 | DATE PLOTTED =>6/8/2012 | TIME PLOTTED =>8:28:15 AM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337mb001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. SEE DRAINAGE PLANS FOR ITEMS NOT SHOWN.
3. SEE DRAINAGE QUANTITIES FOR TEMPORARY DRAINAGE QUANTITIES.
4. PLUG AT CONSTRUCTED DRAINAGE INLET AS SHOWN ON SCD-1 AND DIVERT FLOW TO ADJACENT DRAINAGE INLET WITHIN THE MEDIAN UNTIL NEEDED.
5. CONSTRUCT COFFERDAM TO PREVENT TIDAL WATER FROM ENTERING CONSTRUCTION AREA. CONTRACTOR TO PUMP, COLLECT INTO TANK, AND DISPOSE OF RESIDUAL WATER WITHIN TEMPORARY SHORING AREA.
6. CONSTRUCTION AND MAINTENANCE OF COFFERDAM IS INCLUDED IN PAYMENT FOR THE DRAINAGE SYSTEM INVOLVED.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

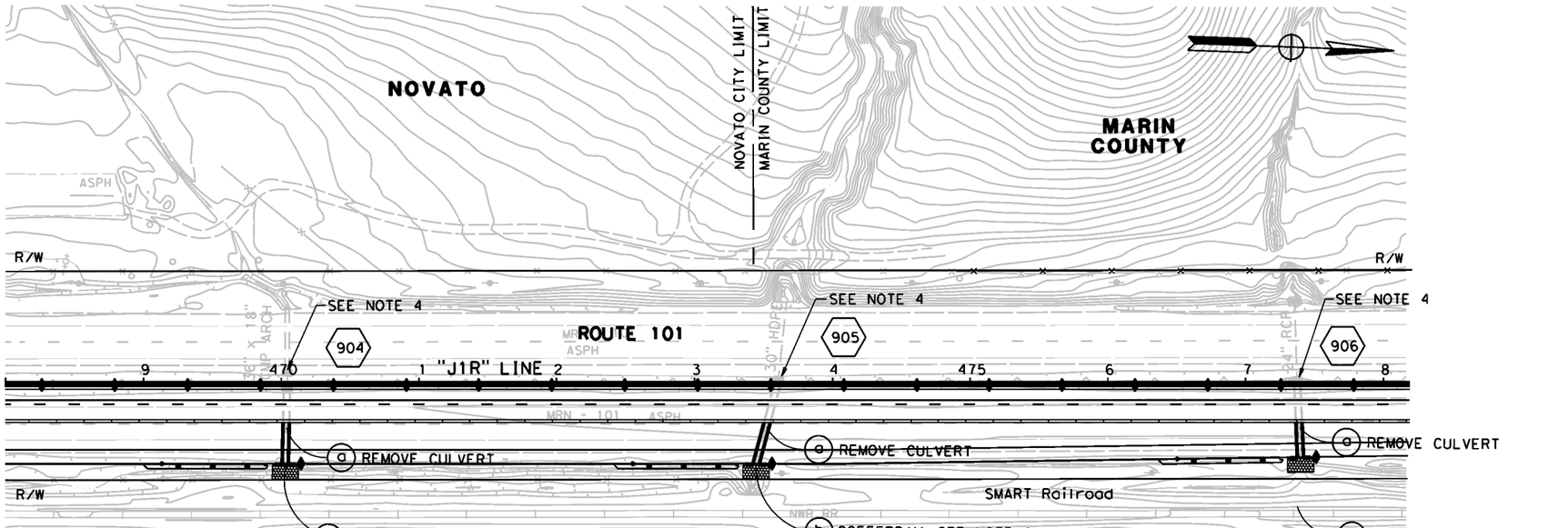
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



STAGE CONSTRUCTION DETAILS
TEMPORARY DRAINAGE
STAGE 2

SCALE: 1" = 50'

SCD-2

APPROVED FOR TEMPORARY DRAINAGE WORK ONLY

REVISED BY	DN			
DATE REVISED	4/16/12			
DAT NGUYEN	GORDON SWEET	CALCULATED-DESIGNED BY	CHECKED BY	

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04-16-12 | DATE PLOTTED =>6/8/2012 | TIME PLOTTED =>10:01:14 AM

BORDER LAST REVISED 7/2/2010 | USERNAME => ASHU | DGN FILE => 0412000337mb002.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

TEMPORARY WATER POLLUTION CONTROL PLANS

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. FOR MORE INFORMATION ON STAGE CONSTRUCTION, SEE STAGE CONSTRUCTION PAN SHEETS.

LEGEND:

- AREA TO BE CONSTRUCTED WITHIN CURRENT STAGE
- AREA CONSTRUCTED IN PREVIOUS STAGE(S)
- TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- CWM — TEMPORARY CONCRETE WASHOUT FACILITY (PORTABLE)
- TYPE # — TEMPORARY INLET PROTECTION
- FR — TEMPORARY FIBER ROLL

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

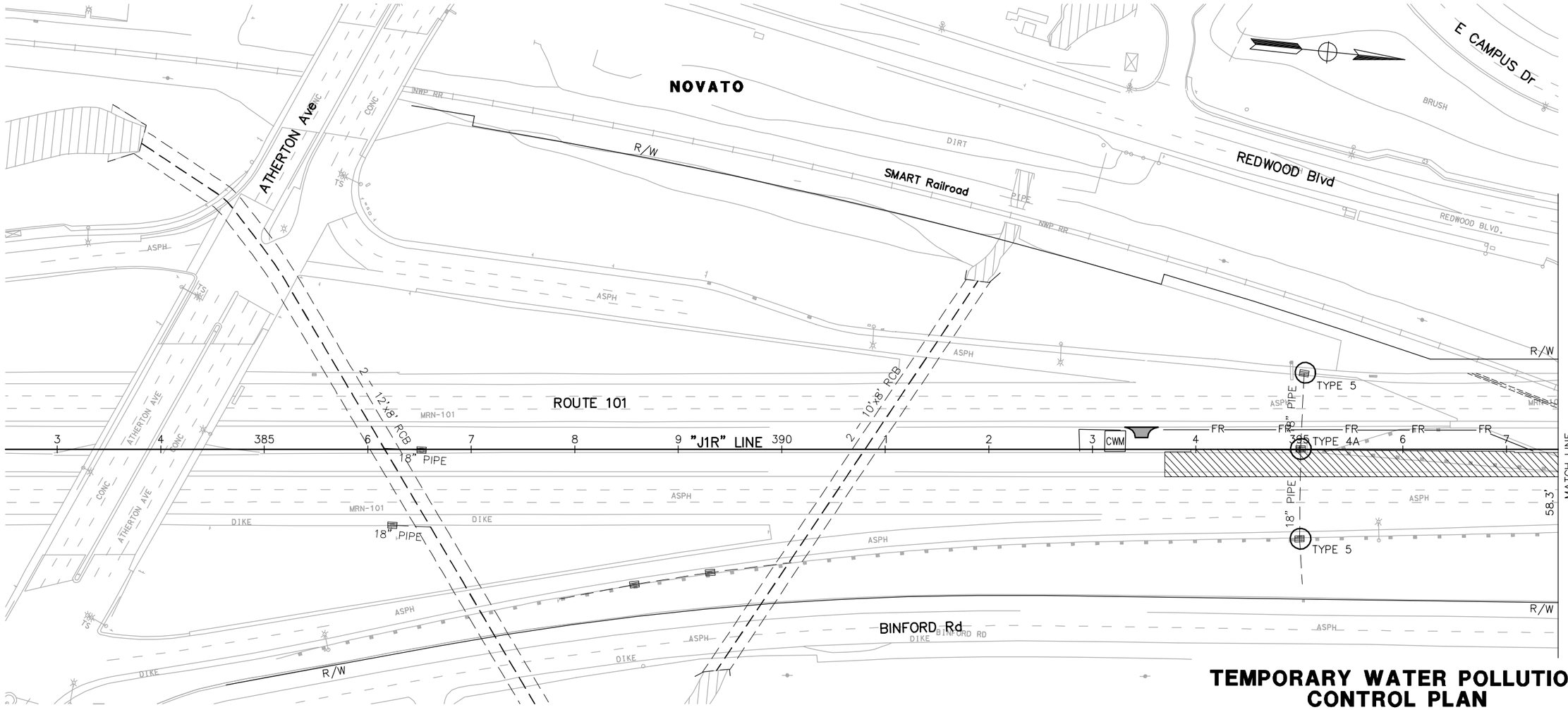
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN
STAGE 1A
SCALE: 1" = 50'

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-1

		SM	4/16/12
		REVISED BY	DATE REVISED
SHERWIN MANALO	GORDON SWEET		
CALCULATED–DESIGNED BY	CHECKED BY		

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:31 pm

\\BKF-FLV64\Dept$\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-01 1A.dwg 15 Apr 2012 1:31:38pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE

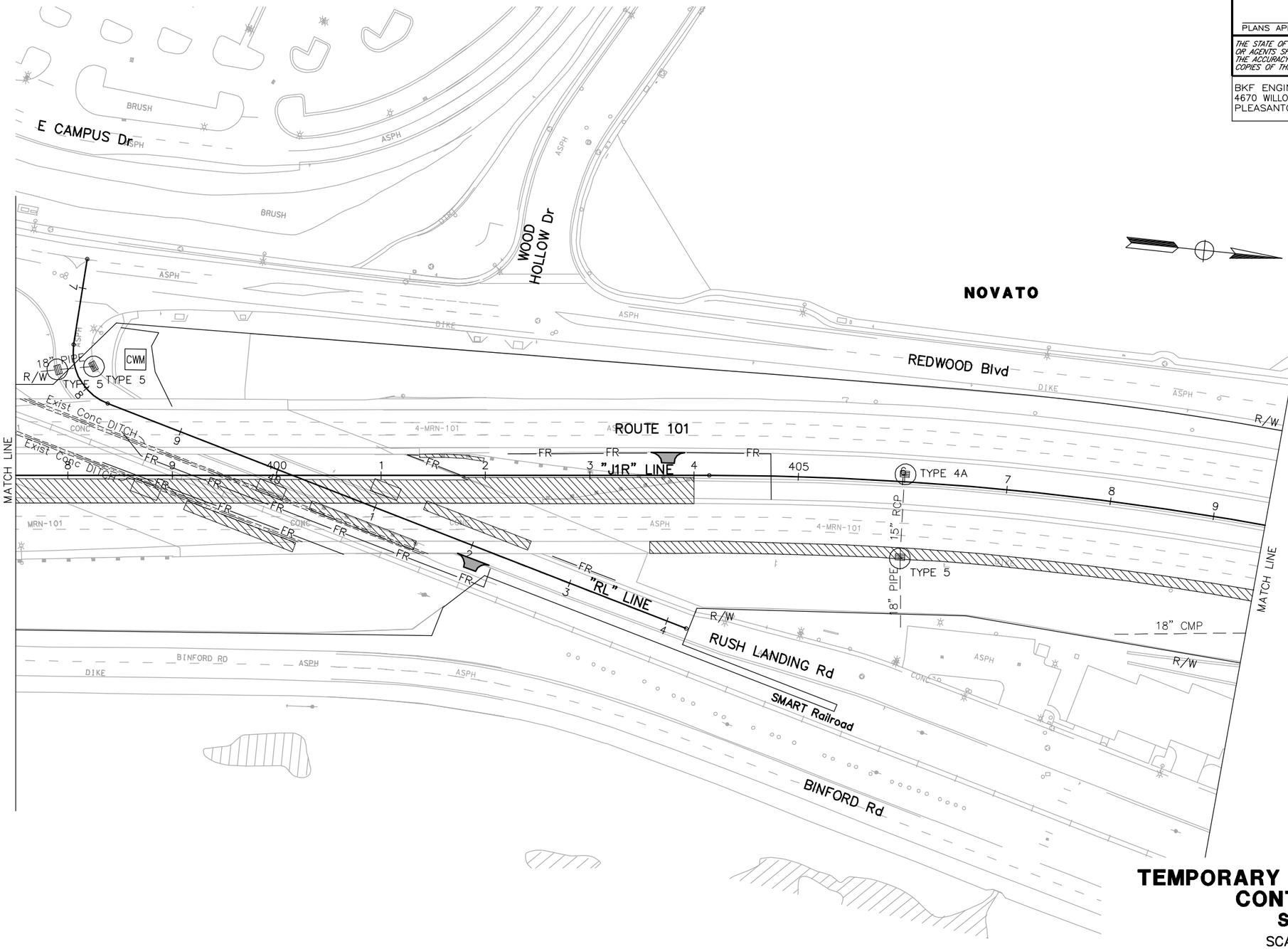
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-2

SM	4/16/12	CALCULATED–DESIGNED BY	
REVISED BY	DATE REVISED	CHECKED BY	
SHERWIN MANALO		CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI
GORDON SWEET		STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:37 pm

\\BKF-PLV\Jobs\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-02 1A.dwg 15 Apr 2012 1:37:47pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

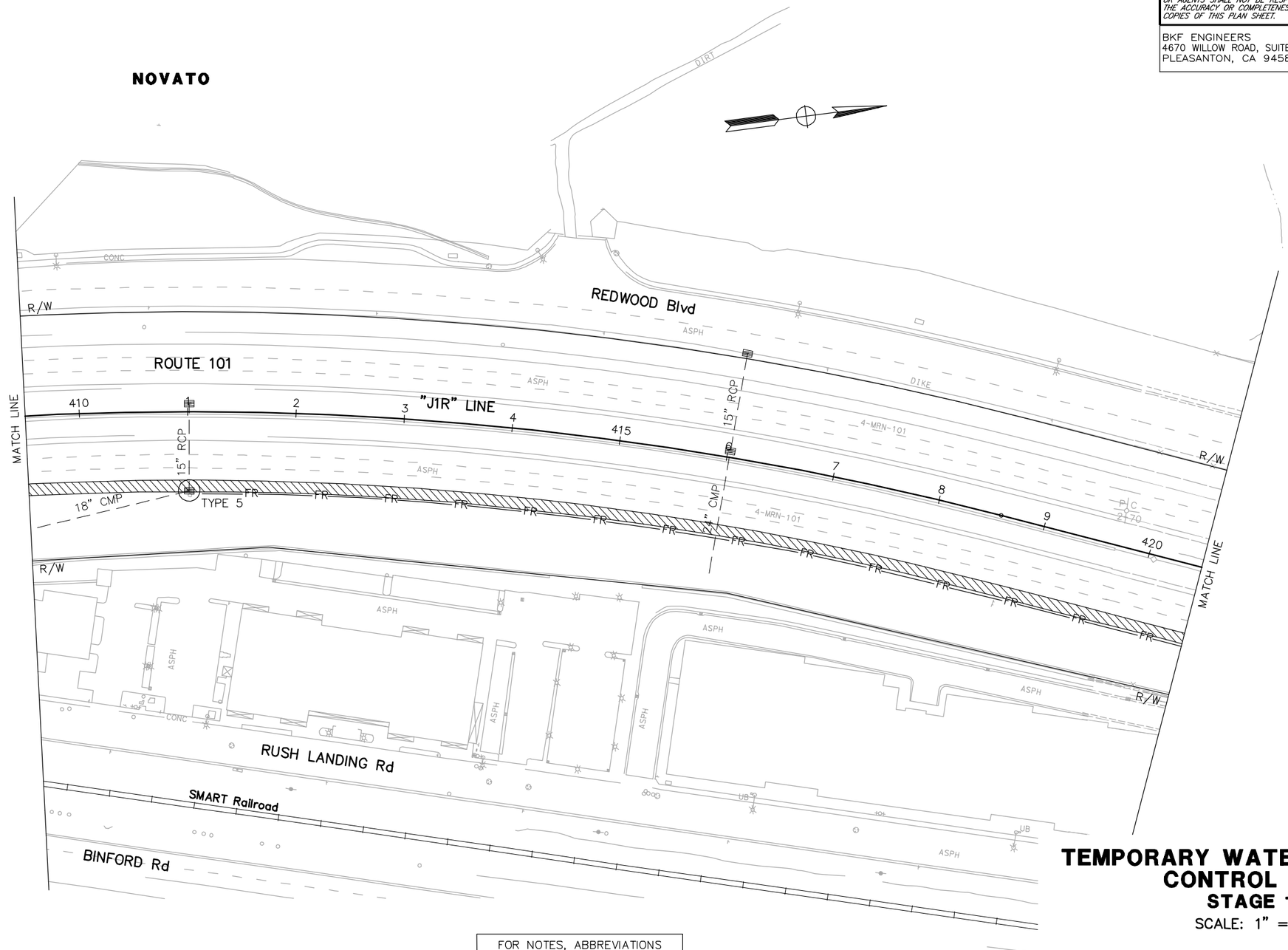
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

WPC-3

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:35 pm

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: SHERWIN MANALO

CHECKED BY: GORDON SWEET

REVISED BY	DATE REVISED
SM	4/16/12

\\BKF-PLV64\Dept\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-03 1A.dwg 15 Apr 2012 1:35:09pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

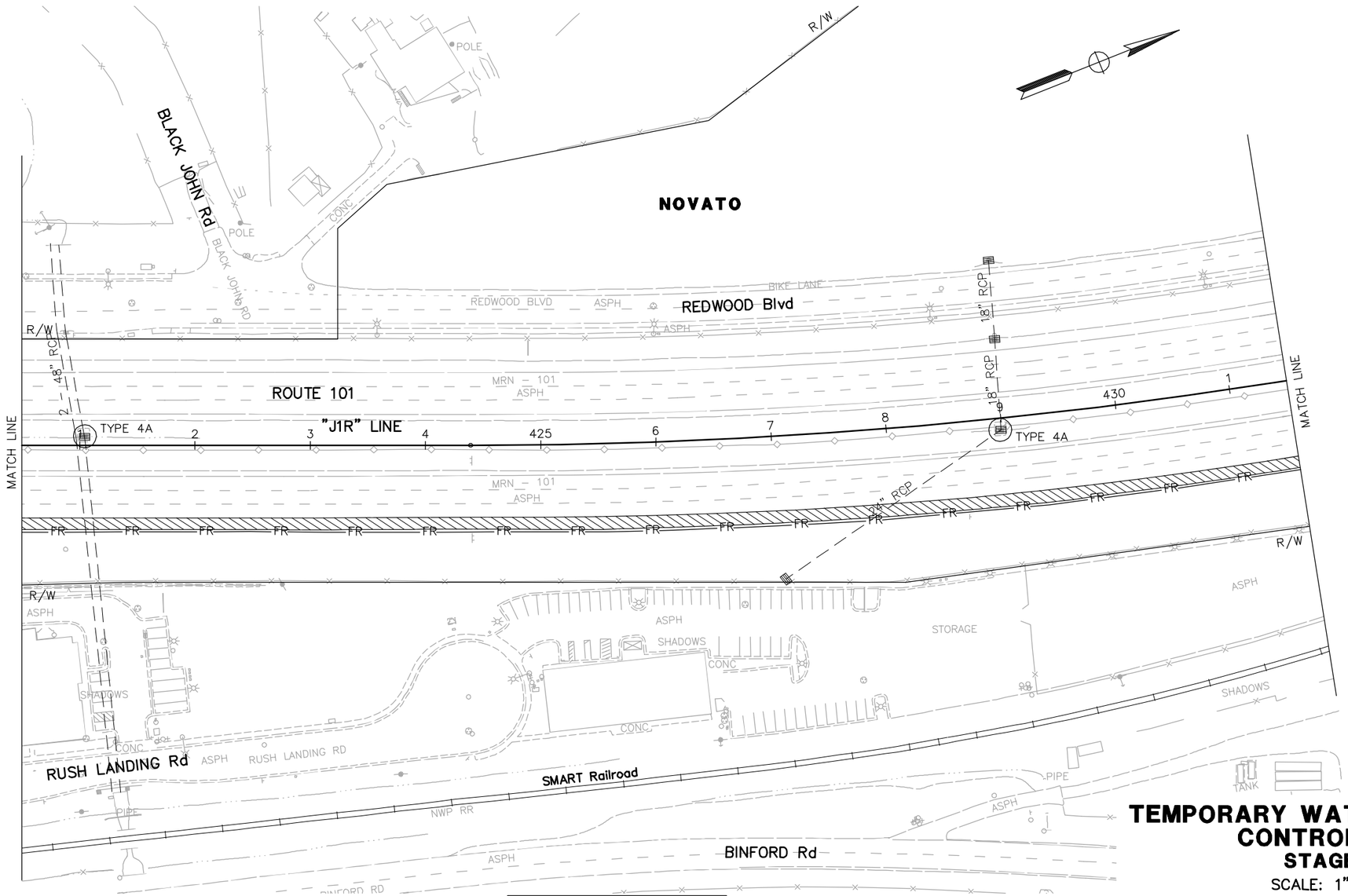
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

WPC-4

CALCULATED–DESIGNED BY	SHERWIN MANALO	REVISED BY	SM
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04–16–12 — DATE PLOTTED => Apr 15 2012 — TIME PLOTTED => 1:36 pm

\\BKF-PLV\d1\Eng06\067003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-04 1A.dwg 15 Apr 2012 1:36:29pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER DATE

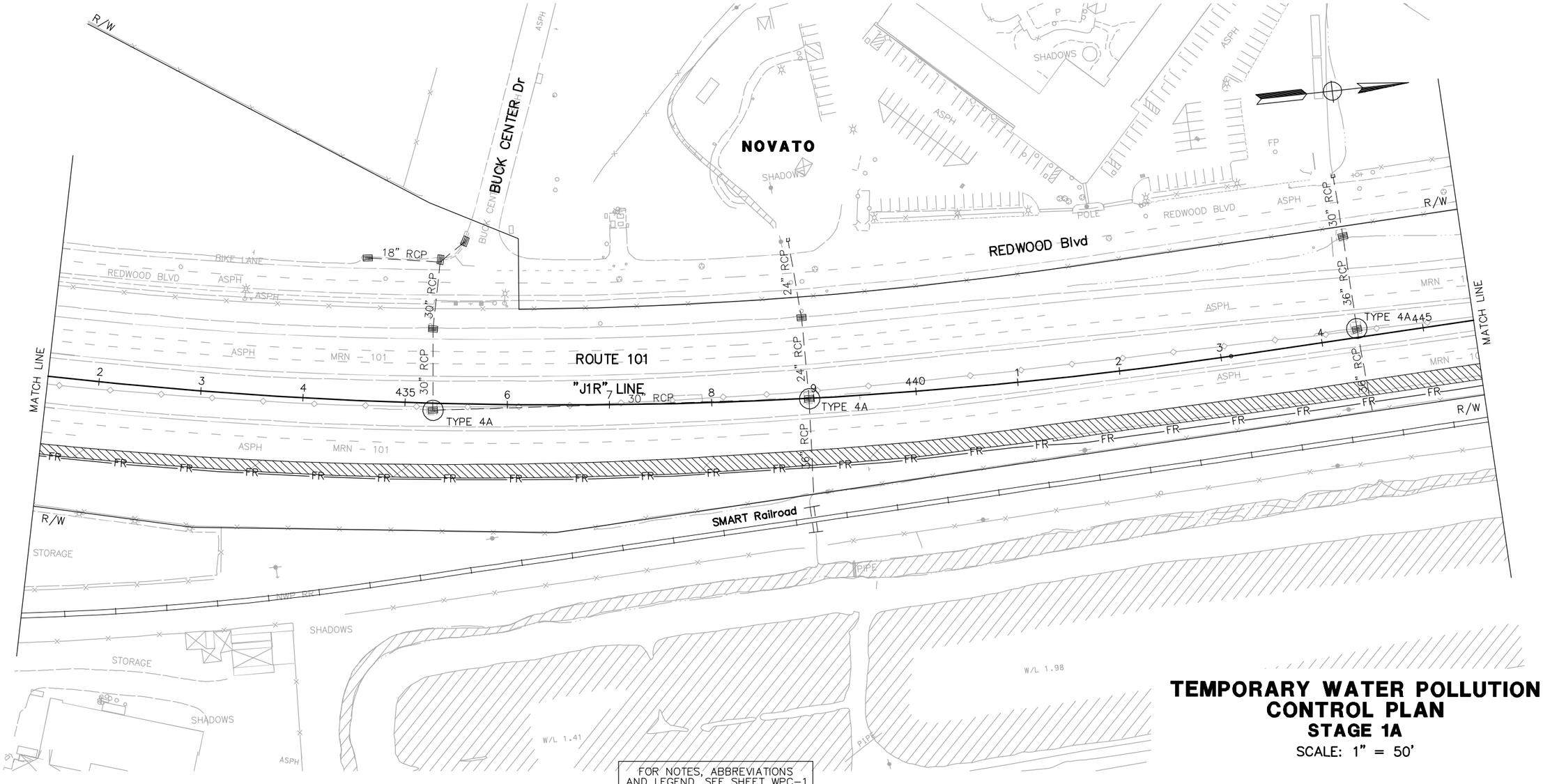
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

WPC-5

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:39 pm

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED–DESIGNED BY: SHERWIN MANALO

CHECKED BY: GORDON SWEET

	REVISED BY	DATE REVISED
	SM	4/16/12

\\BKF-PLV\e4\Drg#\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-05 1A.dwg 15 Apr 2012 1:38:41pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

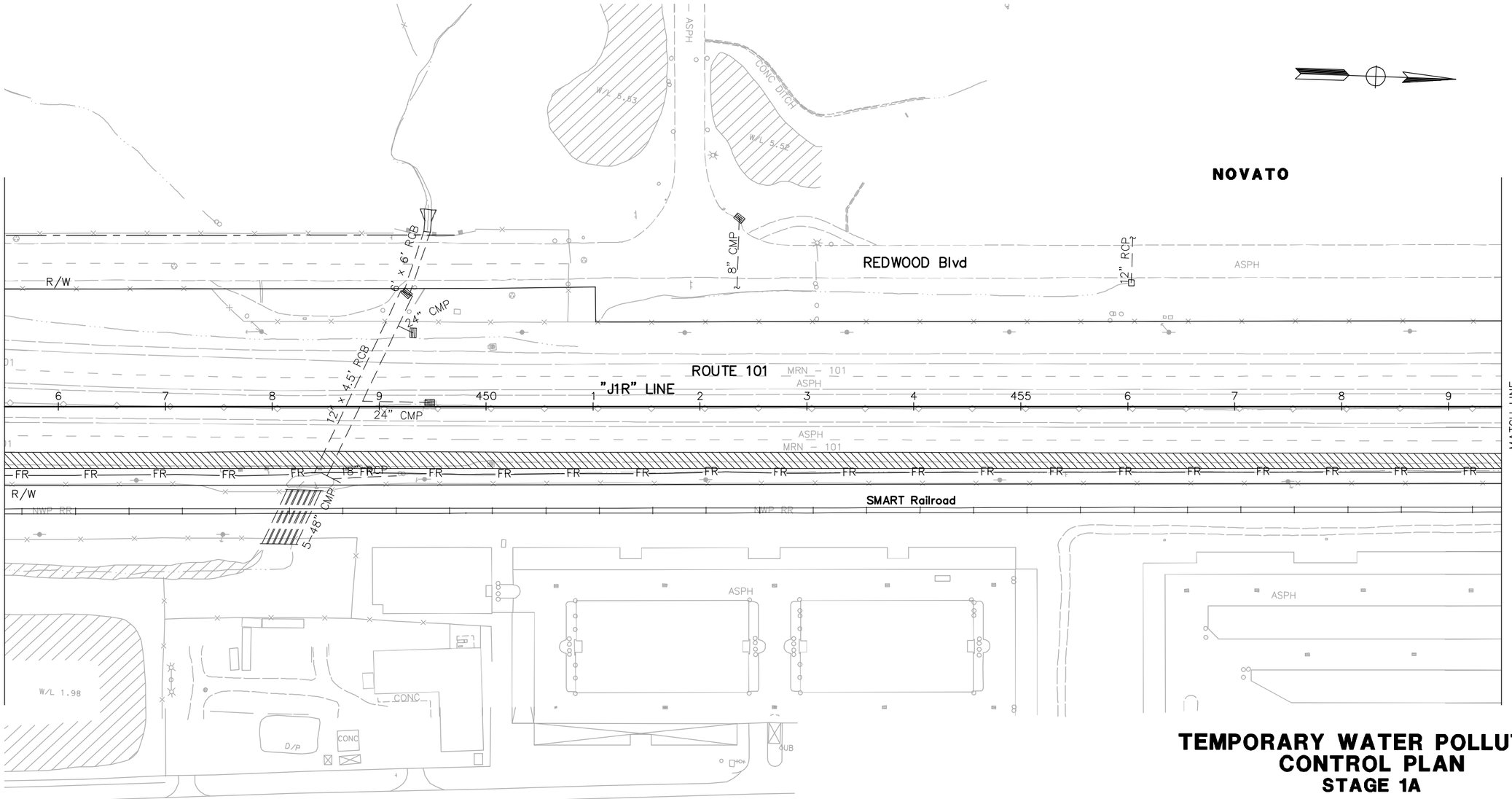
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

WPC-6

		SM	4/16/12
		REVISED BY	DATE REVISED
SHERWIN MANALO		GORDON SWEET	
CALCULATED–DESIGNED BY		CHECKED BY	

CONSULTANT FUNCTIONAL SUPERVISOR
NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:40 pm

\\BKF-FILYard\Engr\097003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-06 1A.dwg 15 Apr 2012 1:40:59pm MARA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

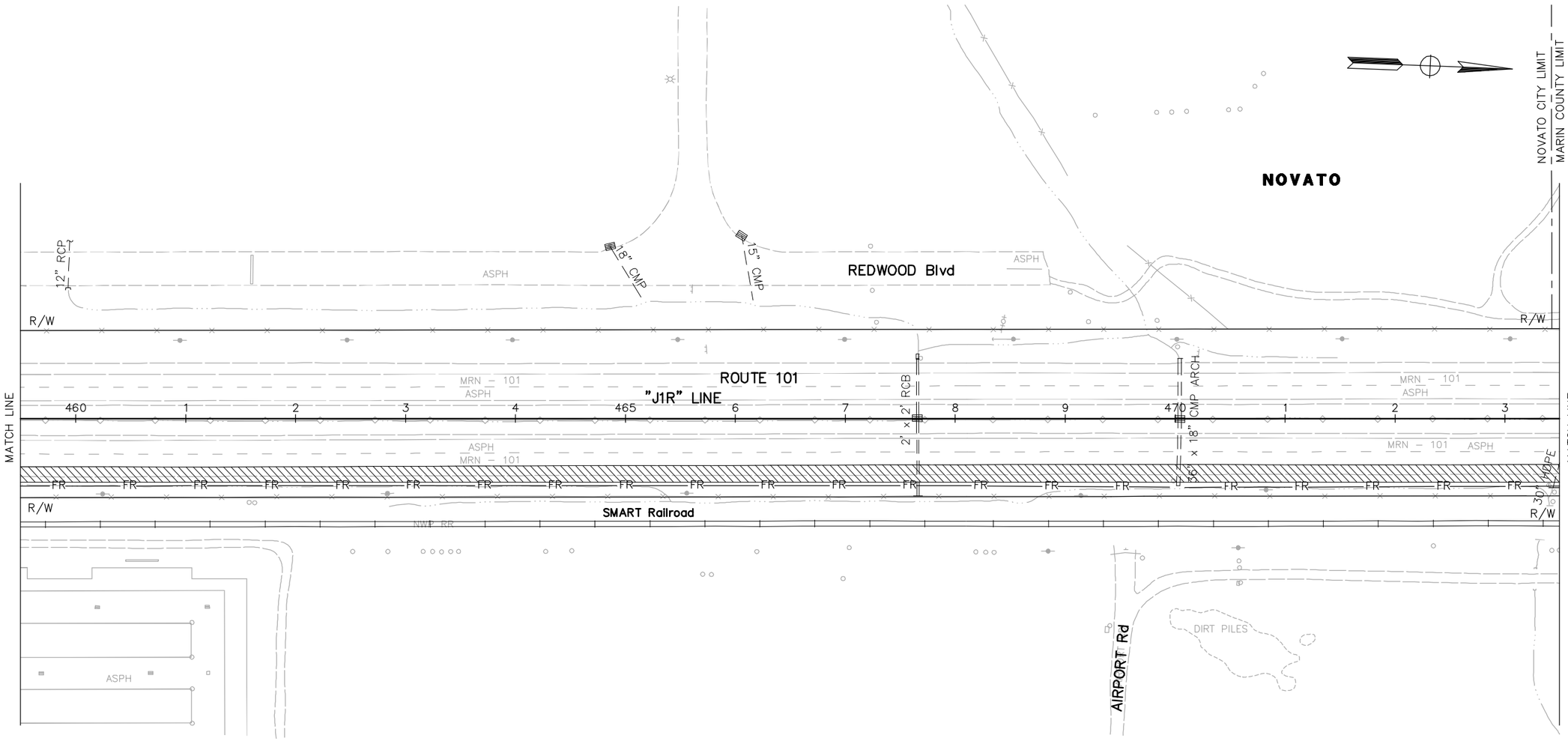
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-7

CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI	
STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	CALCULATED–DESIGNED BY	SHERWIN MANALO
Caltrans	CHECKED BY	GORDON SWEET
	REVISED BY	SM
	DATE REVISED	4/16/12

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:42 pm

\\BKF-PLV\e1\Engdat\67003-20\DWG\SHEETS\WPC\WPC Layout – NOT PART OF SET\WPC-07 1A.dwg 15 Apr 2012 1:42:08pm MANA

BORDER LAST REVISED 7/2/2010	USERNAME =>$USER DGN FILE => $REQUEST	RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3	UNIT 0716	PROJECT NUMBER & PHASE	04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

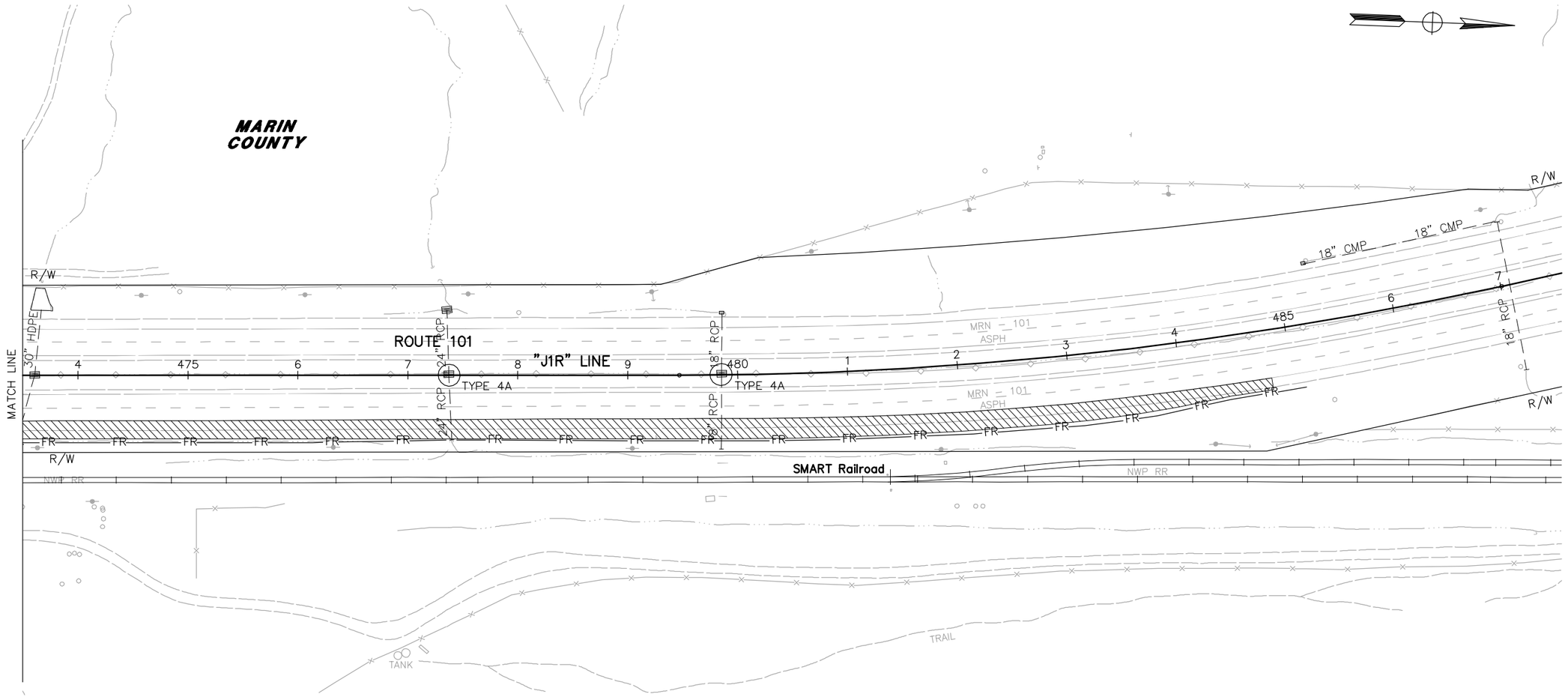
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1A

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-8

CALCULATED–DESIGNED BY	SHERWIN MANALO	REVISED BY	SM
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04–16–12 — DATE PLOTTED => Apr 15 2012 — TIME PLOTTED => 1:46 pm

\\BKF-PLV\e1\Dgn04\087003-20\DWG\SHEETS\WPC's Layout - NOT PART OF SET\WPC-08 1A.dwg 15 Apr 2012 1:46:18pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

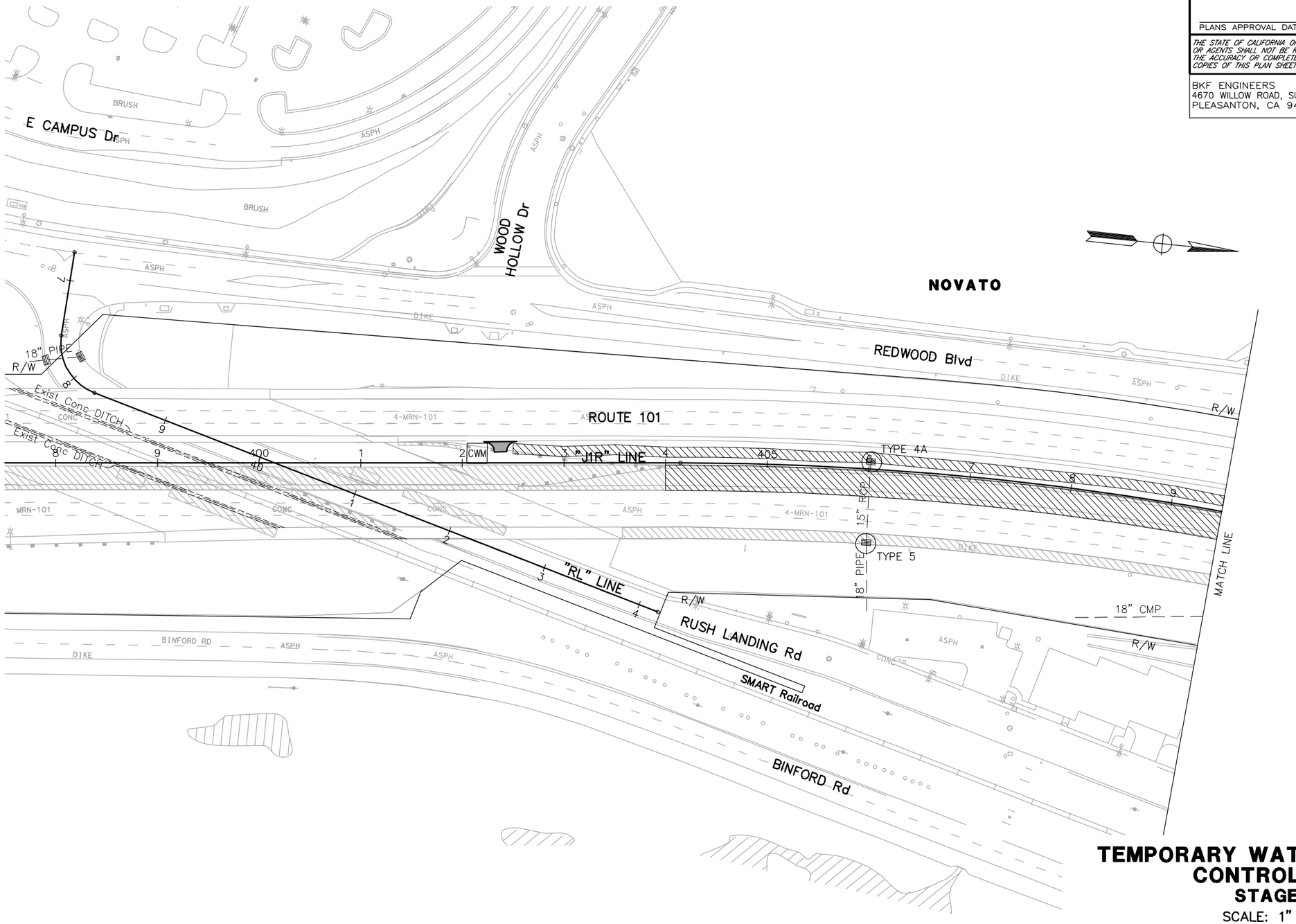
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-9

CALCULATED–DESIGNED BY	SHERWIN MANALO	REVISED BY	SM
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:11 pm

\\BKF-PLV\Arf\proj\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-09 1B.dwg 15 Apr 2012 2:11:55pm MANA

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

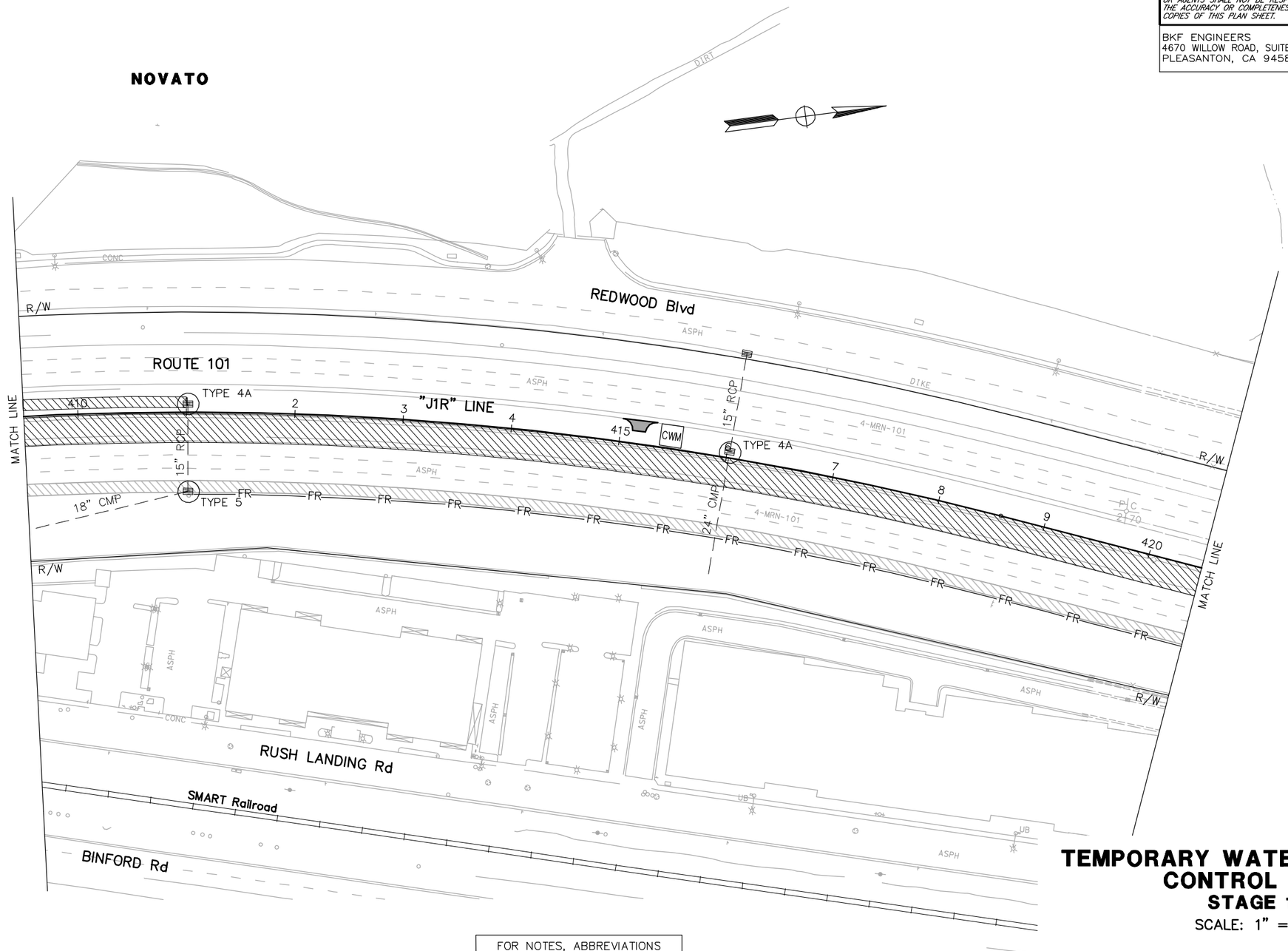
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

WPC-10

SM	4/16/12		
REVISED BY	DATE REVISED		
SHERWIN MANALO	GORDON SWEET		
CALCULATED–DESIGNED BY	CHECKED BY		

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:49 pm

\\BKF-PLV64\Dept\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-10 1B.dwg 15 Apr 2012 1:49:08pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER DATE

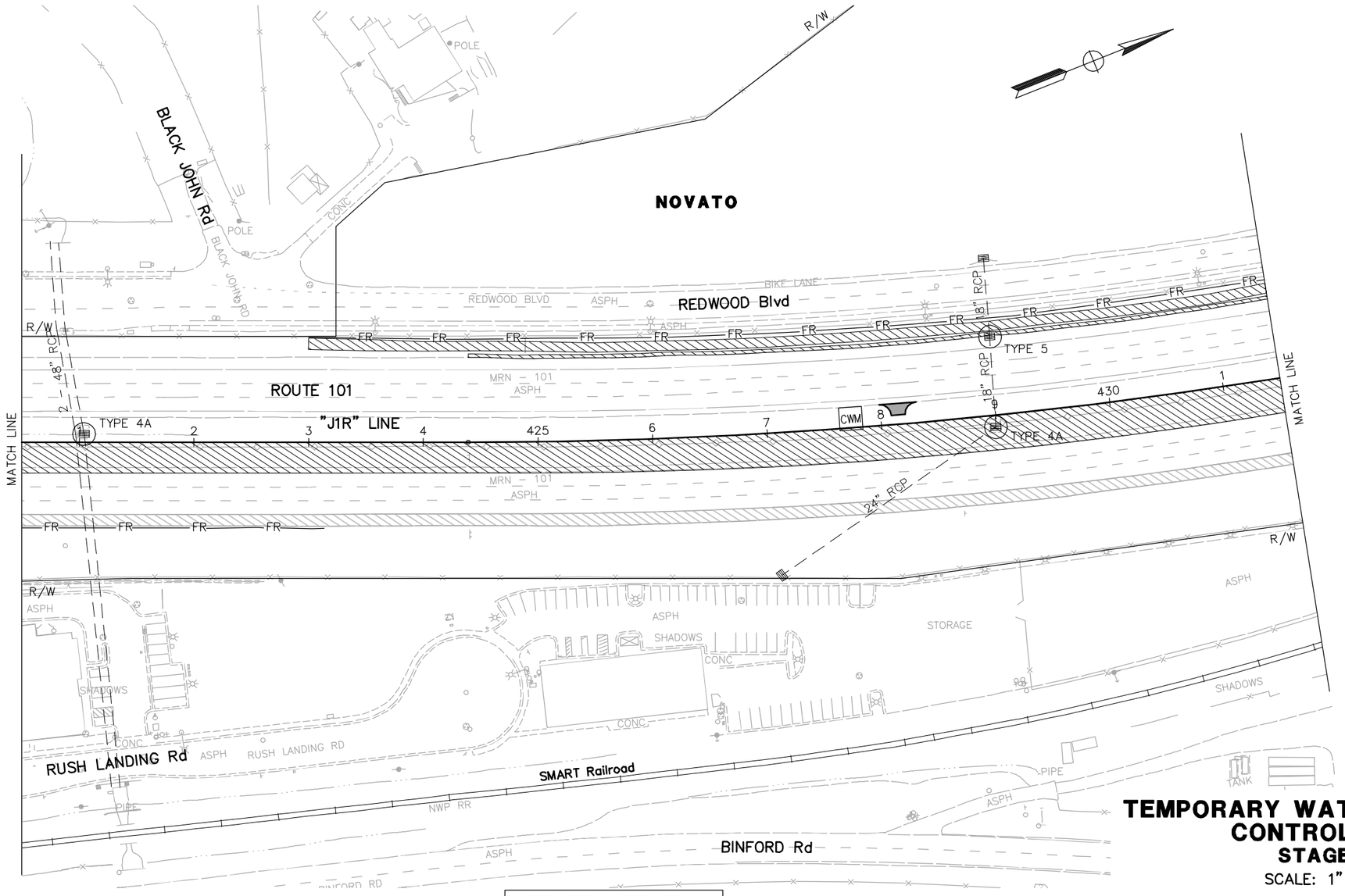
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

WPC-11

REVISED BY	DATE REVISED
SM	4/16/12

CALCULATED–DESIGNED BY: SHERWIN MANALO
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 1:54 pm

\\BKF-PLVA1\Engdata\67003-20\DWG\SHEETS\WPC\Layout - NOT PART OF SET\WPC-11 1B.dwg 15 Apr 2012 1:54:52pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

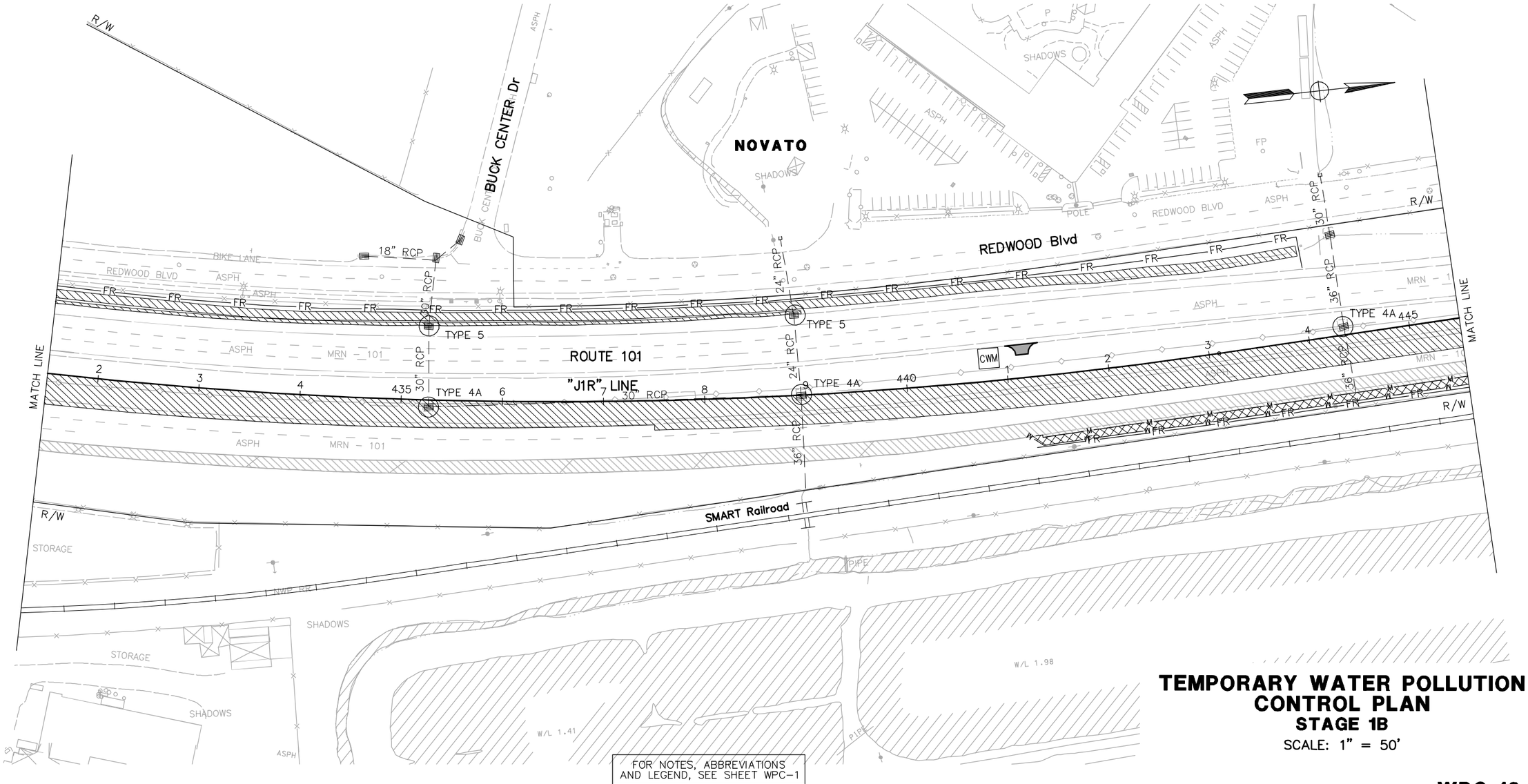
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-12

SM	4/16/12		
REVISED BY	DATE REVISED		
SHERWIN MANALO	GORDON SWEET		
CALCULATED– DESIGNED BY	CHECKED BY		

CONSULTANT FUNCTIONAL SUPERVISOR
NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04–16–12
DATE PLOTTED => Apr 15 2012
TIME PLOTTED => 1:38 pm

\\BKF-FLV64\Dgn$\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-12 1B.dwg 15 Apr 2012 1:58:45pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER DATE

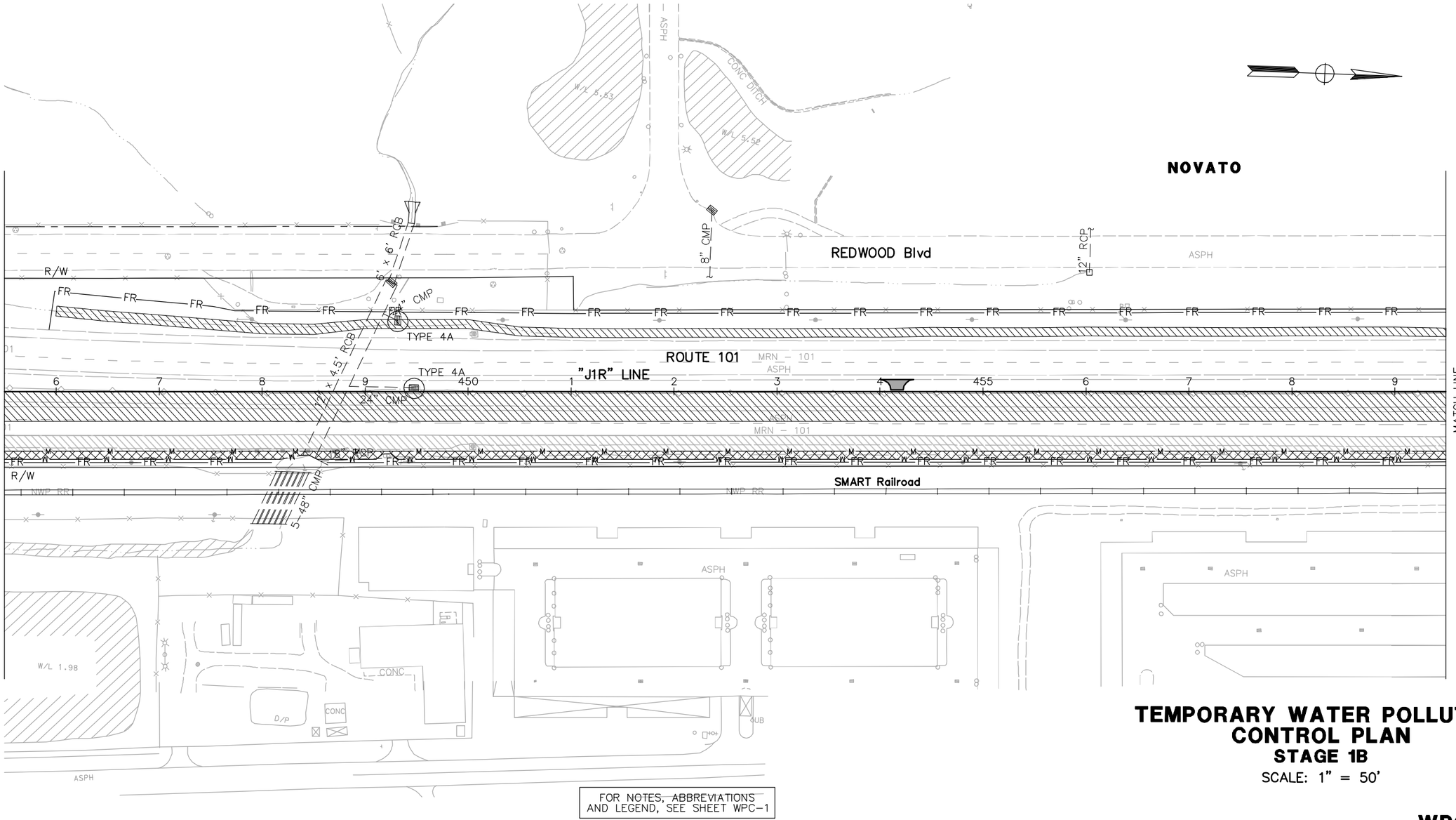
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

WPC-13

REVISED BY	DATE REVISED
SM	4/16/12

CALCULATED–DESIGNED BY: SHERWIN MANALO
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION: DATE PLOTTED => Apr 15 2012; TIME PLOTTED => 2:00 pm

\\BKF-PLT\HP4\Proj08\087003-22\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-13 1B.dwg 15 Apr 2012 2:00:45pm NANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

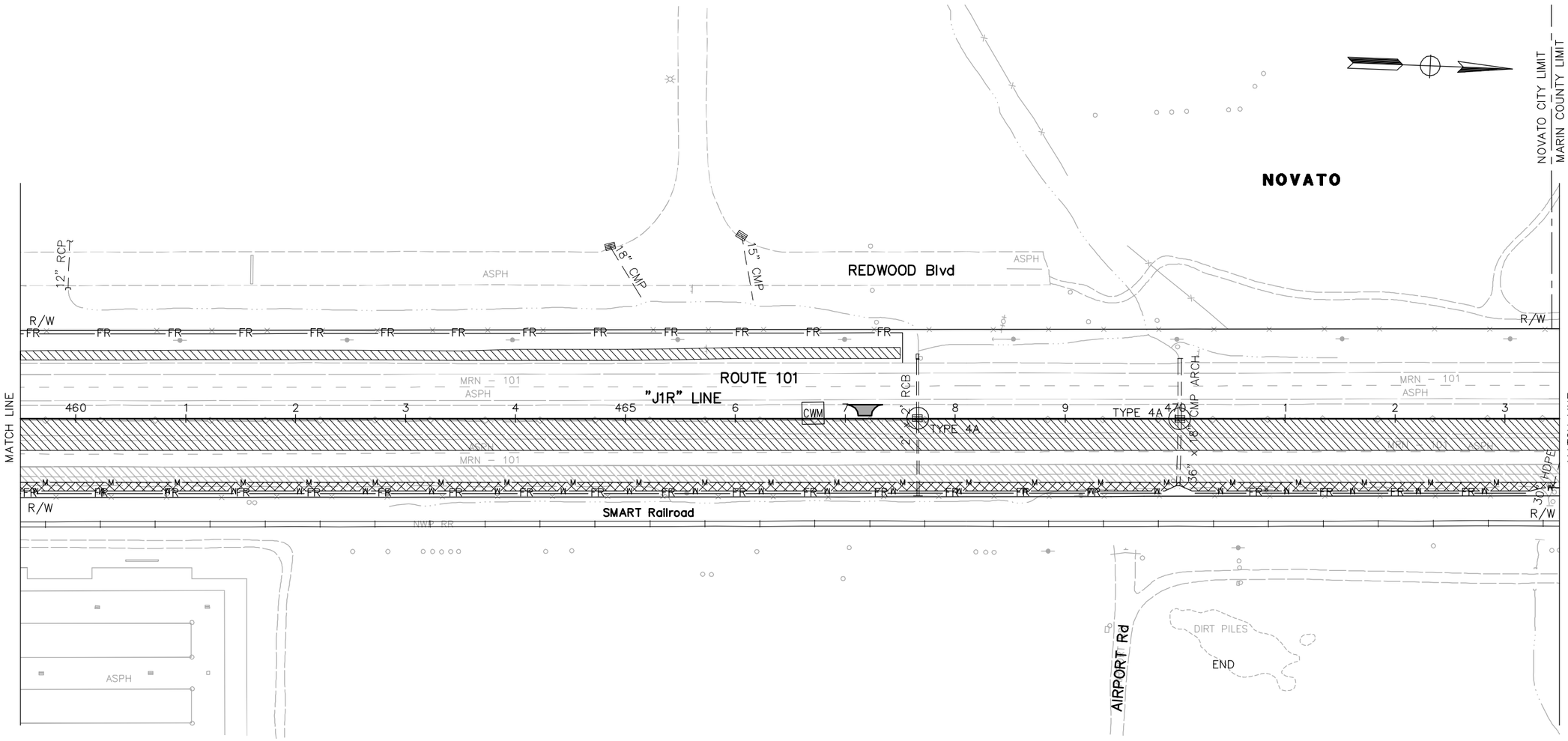
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 1B

SCALE: 1" = 50'

WPC-14

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

CALCULATED–DESIGNED BY	SHERWIN MANALO	REVISED BY	SM	
CHECKED BY	GORDON SWEET	DATE REVISED	4/16/12	

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:02 pm

\\BKF-PLV\e1\Engdat\87003-20\DWG\SHEETS\WPC\WPC Layout – NOT PART OF SET\WPC-14 1B.dwg 15 Apr 2012 2:02:45pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER DATE

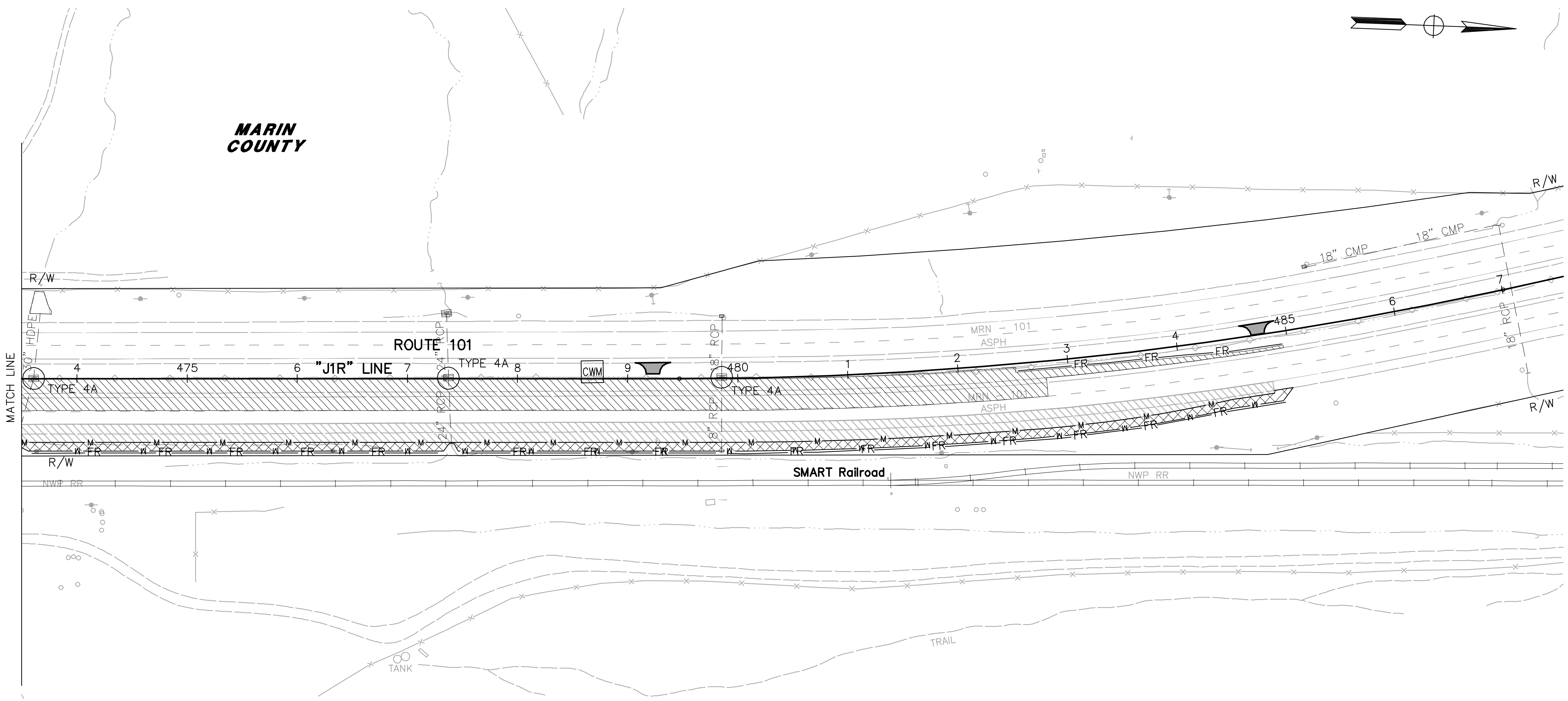
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN
STAGE 1B
SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-15

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI
CALCULATED-DESIGNED BY: SHERWIN MANALO
CHECKED BY: GORDON SWEET
REVISED BY: SM
DATE REVISED: 4/16/12

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

DATE PLOTTED => Apr 15 2012
TIME PLOTTED => 2:04 pm
LAST REVISION 04-16-12

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

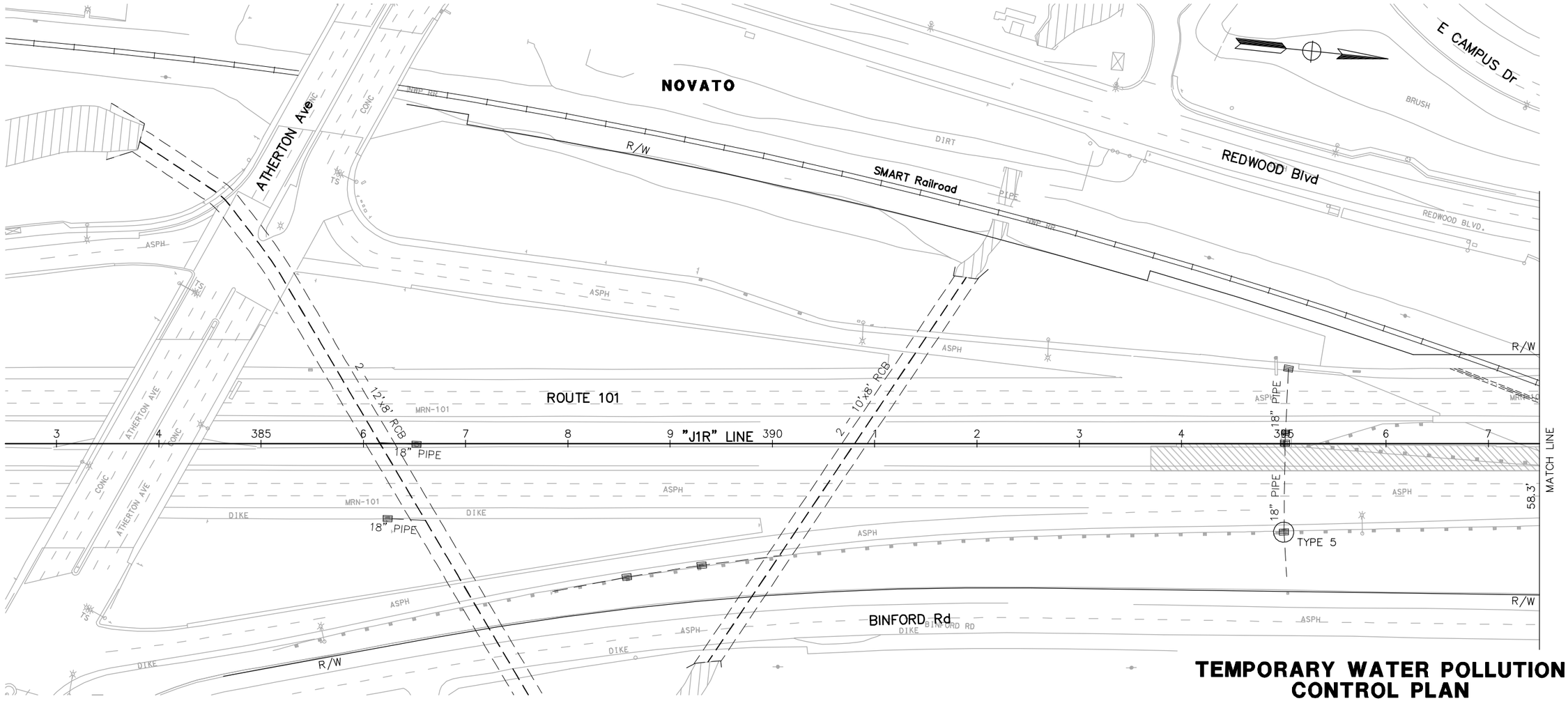
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-16

		SM	4/16/12
		REVISED BY	DATE REVISED
CALCULATED–DESIGNED BY	SHERWIN MANALO		
CHECKED BY	GORDON SWEET		
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI		
STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	Caltrans		

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:07 pm

\\BKF-FLVn41\Dgn$\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-16 2.dwg 15 Apr 2012 2:07:20pm MARA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

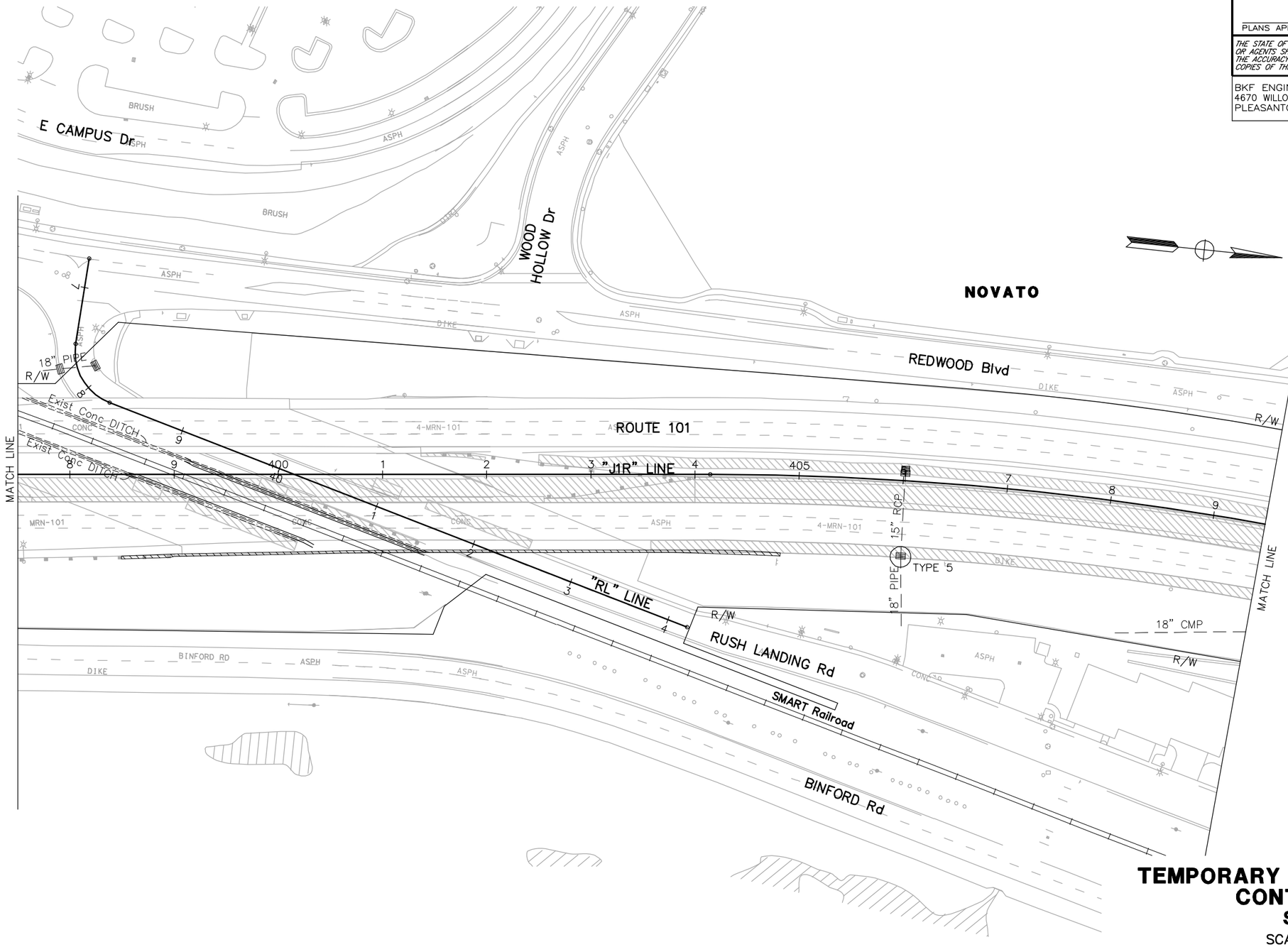
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-17

REVISED BY	DATE REVISED
SM	4/16/12

CALCULATED–DESIGNED BY: SHERWIN MANALO
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:09 pm

\\BKF-PLV\Arf\proj\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-17 2.dwg 13 Apr 2012 2:09:58pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

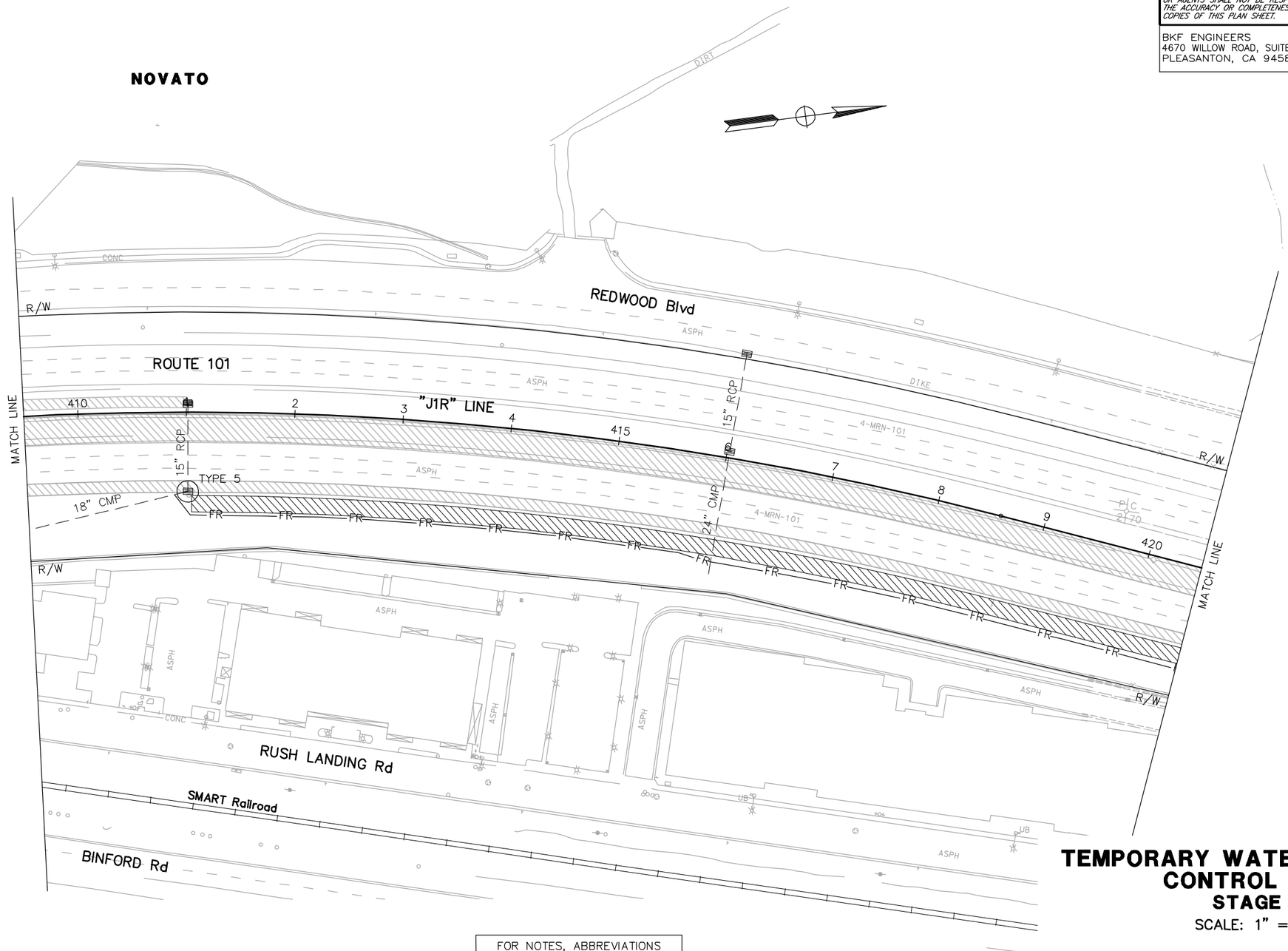
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC-1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

WPC-18

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:13 pm

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

CALCULATED-DESIGNED BY: SHERWIN MANALO

CHECKED BY: GORDON SWEET

REVISED BY	DATE REVISED
SM	4/16/12

\\BKF-FLV64\Data$\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-18 2.dwg 15 Apr 2012 2:13:57pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

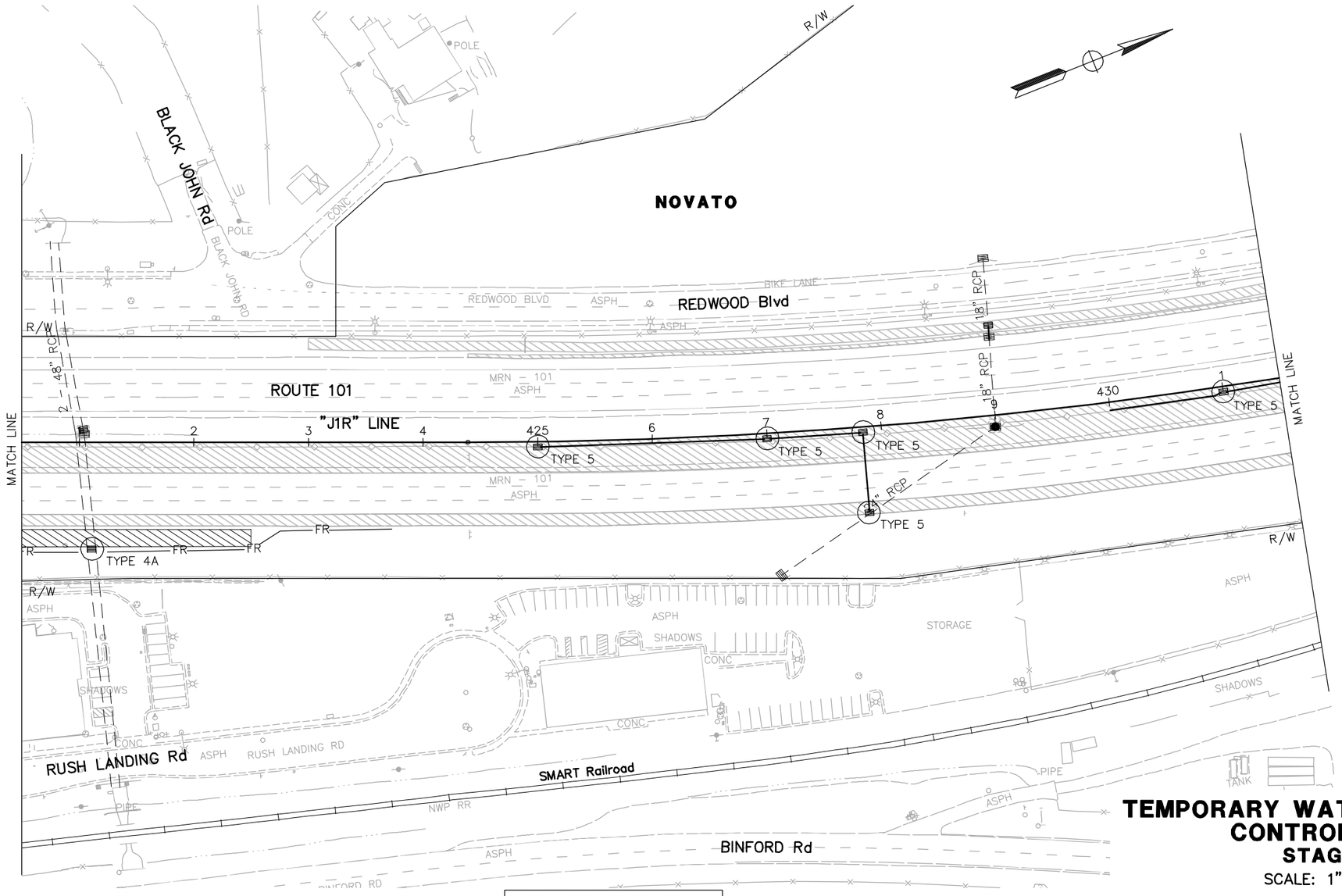
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

WPC-19

	SM	4/16/12
	REVISED BY	DATE REVISED
SHERWIN MANALO	GORDON SWEET	
CALCULATED–DESIGNED BY	CHECKED BY	

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:16 pm

\\BKF-PLVol1\Engdb\67003-20\DWG\SHEETS\WPC\ Layout - NOT PART OF SET\WPC-19 2.dwg 15 Apr 2012 2:16:11pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

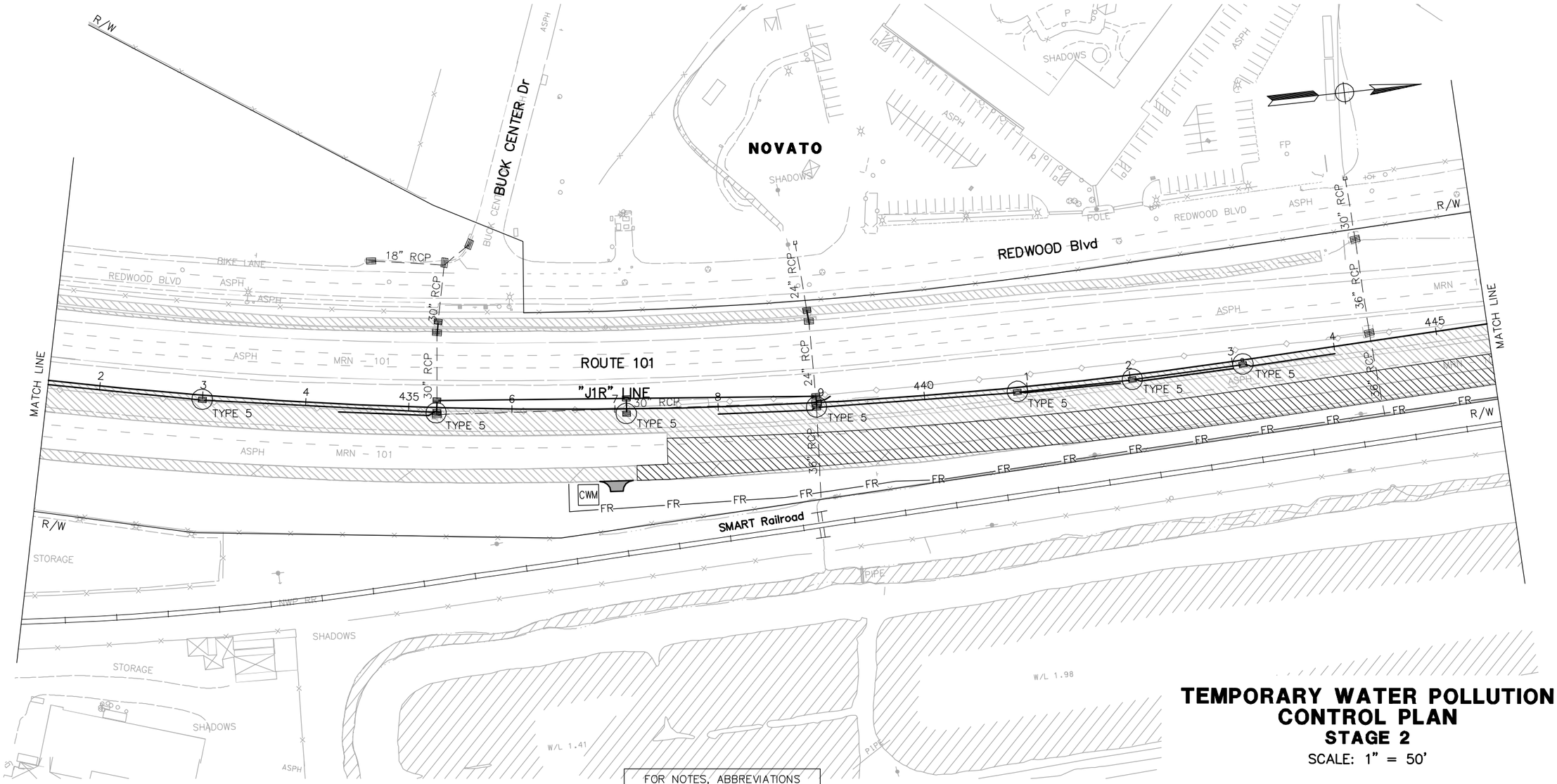
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

TEMPORARY WATER POLLUTION CONTROL PLAN
STAGE 2
SCALE: 1" = 50'

WPC-20

SM	4/16/12		
REVISED BY	DATE REVISED		
SHERWIN MANALO	GORDON SWEET		
CALCULATED– DESIGNED BY	CHECKED BY		

CONSULTANT FUNCTIONAL SUPERVISOR
NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:18 pm

\\BKF-FLV64\Dept\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-20 2.dwg 15 Apr 2012 2:18:11pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

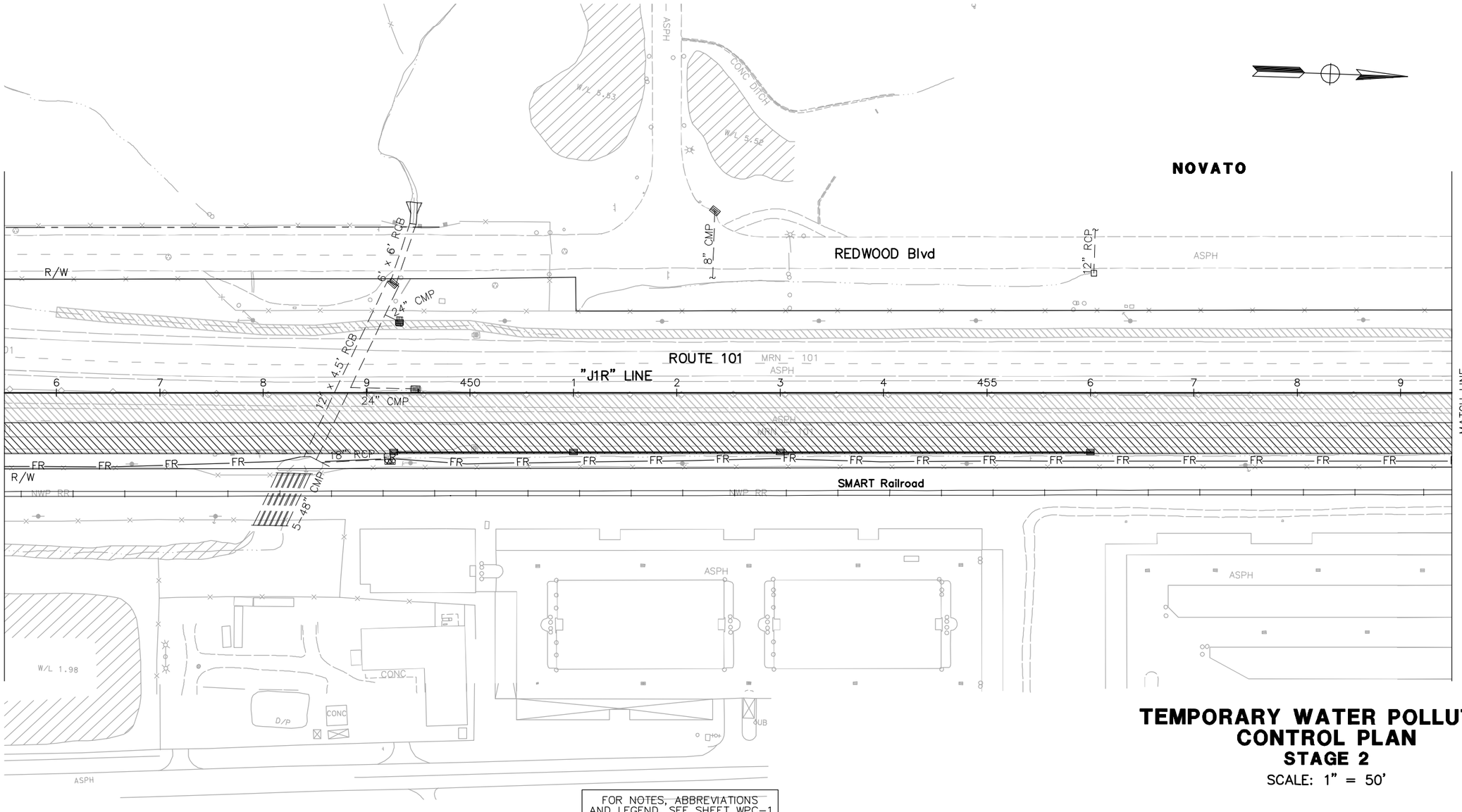
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-21

		SM	4/16/12
		REVISED BY	DATE REVISED
	SHERWIN MANALO	GORDON SWEET	
	CALCULATED–DESIGNED BY	CHECKED BY	

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION — Caltrans

LAST REVISION 04–16–12 — DATE PLOTTED => Apr 15 2012 — TIME PLOTTED => 2:19 pm

\\BKF-PLV4\Arjob\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-21 2.dwg 15 Apr 2012 2:19:28pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER DATE

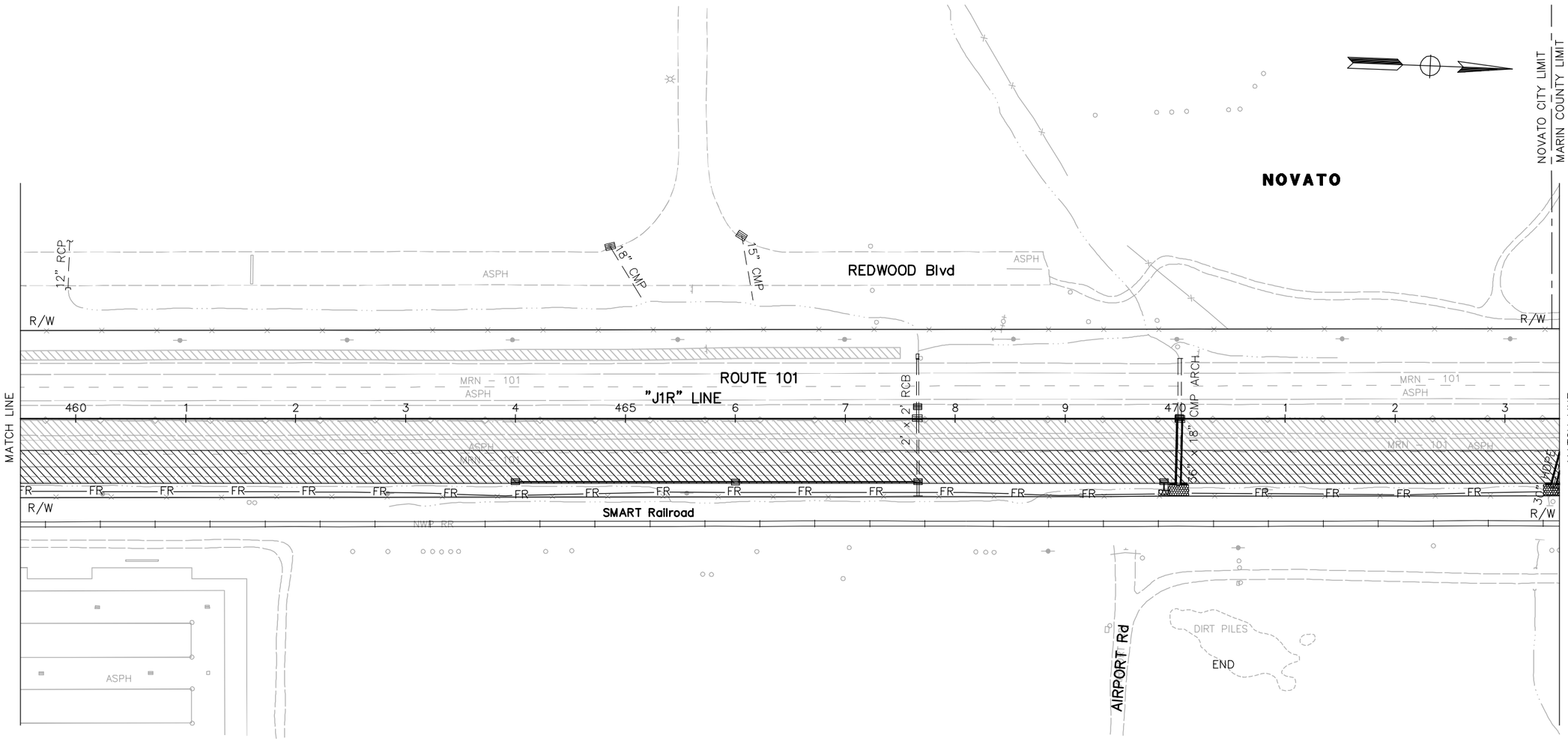
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

WPC-22

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI	CALCULATED–DESIGNED BY: SHERWIN MANALO	REVISED BY: SM	DATE REVISED: 4/16/12	
STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	CHECKED BY: GORDON SWEET			

LAST REVISION 04–16–12 — DATE PLOTTED => Apr 15 2012 — TIME PLOTTED => 2:25 pm

\\BKF-PLV\e4\Engdat\87003-20\DWG\SHEETS\WPC\WPC Layout – NOT PART OF SET\WPC-22 2.dwg 15 Apr 2012 2:25:11pm MANA

BORDER LAST REVISED 7/2/2010	USERNAME =>$USER DGN FILE => $REQUEST	RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3	UNIT 0716	PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

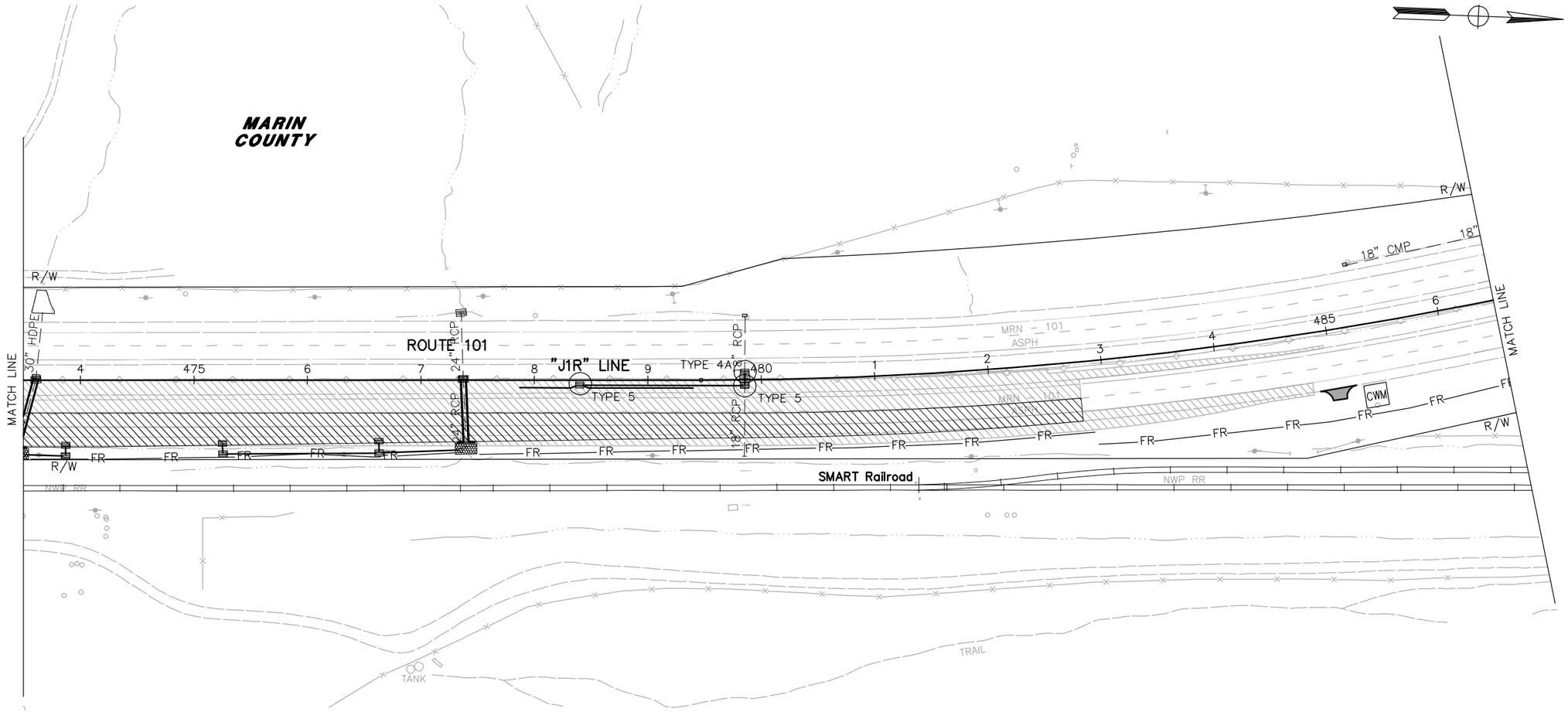
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET WPC–1

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-23

		SM	REVISED BY		
		4/16/12	DATE REVISED		
CALCULATED–DESIGNED BY	SHERWIN MANALO				
CHECKED BY	GORDON SWEET				

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION: DATE PLOTTED => Apr 15 2012; TIME PLOTTED => 2:26 pm

\\BKF-PLV4\Engdb\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-23 2.dwg 15 Apr 2012 2:26:58pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

NOTE:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER _____ DATE _____

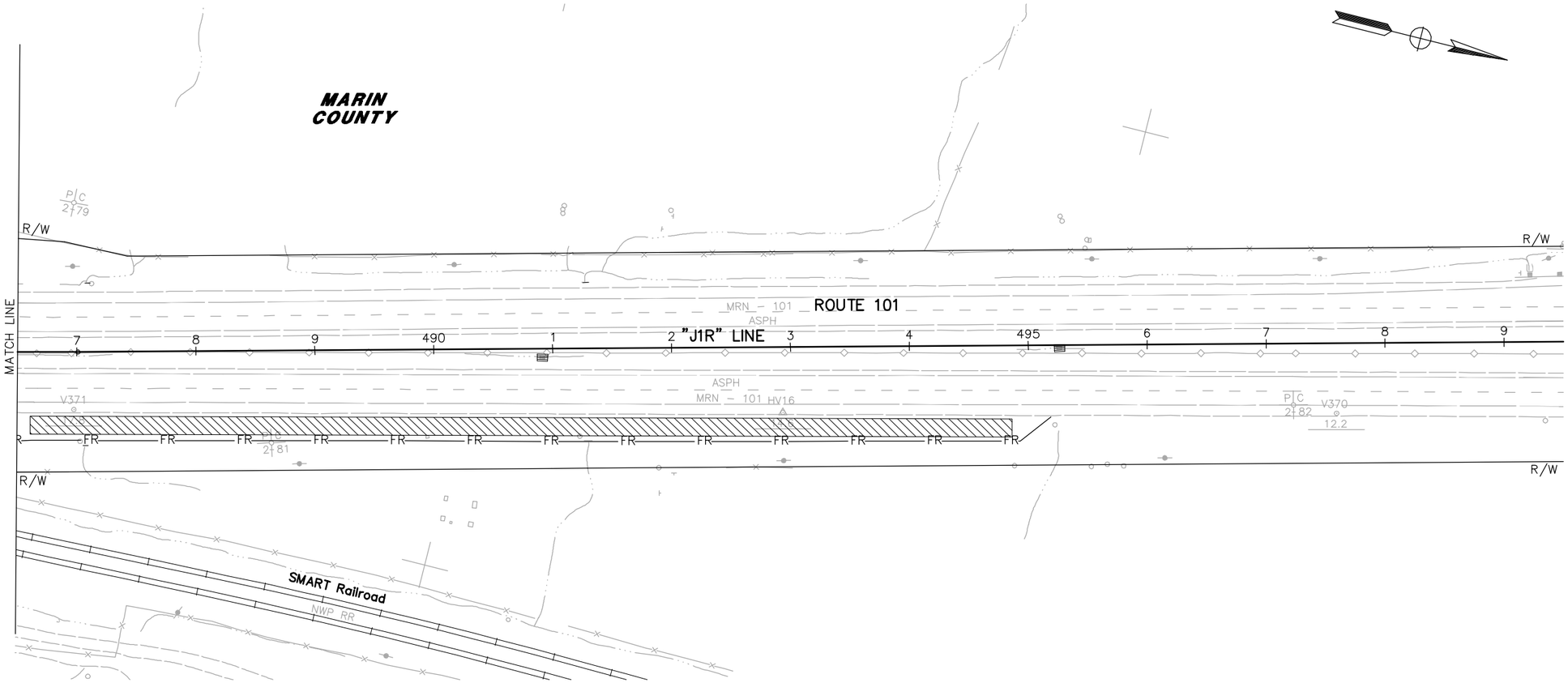
PLANS APPROVAL DATE _____

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



TEMPORARY WATER POLLUTION CONTROL PLAN

STAGE 2

SCALE: 1" = 50'

WPC-24

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

		SM	4/16/12	
		REVISED BY	DATE REVISED	
CALCULATED–DESIGNED BY	SHERWIN MANALO			
CHECKED BY	GORDON SWEET			
CONSULTANT FUNCTIONAL SUPERVISOR	NATALINA V. BERNARDI			
STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	Caltrans			

LAST REVISION 04–16–12 | DATE PLOTTED => Apr 15 2012 | TIME PLOTTED => 2:29 pm

\\BKF-FILVR1\Projects\087003-20\DWG\SHEETS\WPC\WPC Layout - NOT PART OF SET\WPC-24 2.dwg 15 Apr 2012 2:29:02pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

DRAINAGE REPORT

DRAINAGE REPORT

Marin-Sonoma Narrows

04-MRN- 101 R22.0/24.4
Marin-Sonoma Narrows – MSN A3 – NB HOV Lane Widening Project
Project ID 04120003371

In Marin County
In and near Novato
From 0.2 Mile North of Atherton Avenue Overcrossing
To 1.4 Mile South of Redwood Landfill Overcrossing

Prepared for

THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION, DISTRICT 04

June 14, 2012

Design Engineer:
BKF ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94588

Job # 20087003-20

Table of Contents

1. **INTRODUCTION**
   - 1.1 Purpose and Scope 1
   - 1.2 Description & Setting 2
   - 1.3 National Flood Insurance Maps 2
   - 1.4 Methodology 3
   - 1.5 Bridge Hydraulics 3

2 **PROJECT OVERVIEW**
   - 2.1 Potential Project Impacts
     - 2.1.1 Flood Plain Encroachments 3
     - 2.1.2 Residences and Other Buildings 3
     - 2.1.3 Crops 3
   - 2.2 Existing Drainage System
     - 2.2.1 Cross Culverts – HEC-RAS Analyses 4
     - 2.2.2 Crossing Culverts 5
     - 2.2.3 Roadside Ditches 5
     - 2.2.4 Existing Stormwater Storage 5
     - 2.2.5 Existing Stormwater Treatment 5
   - 2.3 Proposed Improvements
     - 2.3.1 Crossing and Longitudinal Culverts 6
     - 2.3.2 Roadside Ditches 6
     - 2.3.3 Gutter Spread 6
     - 2.3.4 Stormwater Treatment 6
     - 2.3.5 Peak Flow Attenuation 7
   - 2.4 Unusual and Special Conditions
     - 2.4.1 Existing Facility Conditions 7
     - 2.4.2 Alternative Pipes 7
     - 2.4.3 Corrosion and Abrasion 7
     - 2.4.4 Erosion 8
     - 2.4.5 National Pollutant Discharge Elimination Permit (NPDES) 8

3 **STORMWATER ROUTING PLAN**
   - 3.1 Proposed Stormwater Routing Scheme 8

4 **DESIGN CRITERIA** 8

5 **DIVERSIONS** 8

6 **REFERENCES** 9

FIGURES:

Figure 1	Project Location Map
Figure 2	Project Vicinity Map
Figures 3A-3E	Proposed Drainage Areas
Figures 4A-4E	Storm Drain Node Identifiers
Figure 5	Existing Off-Site Drainage Areas
Figure 6	HEC-RAS Cross Section Location Map

TABLES:

Table 1A	Rational Method Parameters, Area and Slope
Table 1B	Rational Method Parameters, Runoff Coefficient
Table 1C	Rational Method Parameters, Intensity and Flow
Table 2	Creek Hydraulics at Station 449+00, Existing
Table 3A	Route 101 Culvert Hydrology
Table 3B	Route 101 Culvert Hydraulics
Table 4	Inlet on Gutter Drainage Area, 25-Year Flow
Table 5	Gutter Spread, Inlet Interception Calculations
Table 6	Inlet Sag Calculations
Table 7	Drainage Ditches Normal Depth Calculations
Table 8	Rock Slope Protection HEC-14 Method
Table 9	Hydraulic Conditions within Bioretention Areas, 25-Year Flow

APPENDIX A

Drainage Critertia
WinIDF 1.0 Output Table
Exhibit 1 - Firmette of FEMA Map Number 06041 C0175D
Exhibit 2 - Firmette of FEMA Map Number 06041 C0277D

1 INTRODUCTION

1.1 Purpose and Scope

The California Department of Transportation (Caltrans), in cooperation with Federal Highway Administration (FHWA), the Transportation Authority of Marin (TAM), and Sonoma County Transportation Authority (SCTA) propose to make improvements on United States Highway (US) 101 through the Marin/Sonoma Narrows (MSN) between State Route (SR) 37 in the City of Novato to just north of the Corona Road Overcrossing (Bridge No. 20-0160) in the City of Petaluma for a total of 16.1 miles. The project limits are divided into three segments; generally speaking, the locations include Segment A (Novato), Segment B (Novato to Petaluma), and Segment C (Petaluma).

The three project segments are further divided into sub segments (such as A1 and B1, etc.). The project segments are to be completed in two primary construction phases. Phase 1 is fully funded and includes segments A1, B1, B2/B4, B3 and C1. Phase 2 will include remaining work within or between these segments, including this project known as Marin Sonoma Narrows – Phase 2, referred to as "MSN A3" or "Project" in this report. The phase 2 projects, including this Project, were originally programmed in the RTIP and securing funding for the remaining MSN corridor work is a high priority for Caltrans and TAM. In this particular instance, TAM is seeking to apply for, and pursue, Corridor Mobility Improvement Account (CMIA) "savings," anticipated at the end of the 2012 Fiscal Year. As such, and similar to the B4 segment in Summer 2011, TAM's goal is to fund and accelerate design and PS&E documents for construction for MSN A3, to compete as a "shovel-ready" project, eligible to procure and utilize the potentially available CMIA savings.

Segment A3 will include transportation improvements along northbound US 101 only, beginning in the City of Novato and ending in Marin County, between Post Mile (PM) 22.0 and PM 22.4 the approximate project limits of Segments A1 and B1.

Throughout this stretch of US 101, the Project proposes to widen northbound US 101 within the existing median and outside shoulder in order to provide a 12-foot HOV lane and 10-foot inside and outside shoulders, thereby extending the MSN A1 HOV system to the north by approximately two miles. In addition to pavement widening, the HOV extension also proposes to widen the existing North Novato Overhead (Bridge No. 27-0094R) which is located within the southern portion of the project limits. Proposed improvements include striping, bridge and pavement widening, pavement replacement, pavement overlay, drainage inlets and culverts installation and/or replacement, and reconstruction of the beam barrier. The proposed improvements for the Project do not preclude any future MSN Phase 2 projects.

The Project location map is shown on Figure 1 and the Project vicinity map is shown on Figure 2.

The purpose of this drainage report is to present the following for the Project:

- Existing drainage conditions
- Capacities of the storm water facilities
- Recommended conveyance facilities
- Recommended treatment facilities

1.2 Description and Setting

The Project is located at the northeastern portion of Marin. The Project will require modifications to existing cross culverts and construction of supplemental longitudinal drainage facilities. The Project will not affect or redirect runoff.

Proposed Project improvements include adding an HOV lane and providing drainage improvements within northbound lanes that are consistent with ultimate project improvements.

1.3 National Flood Insurance Maps

The Project area is shown on the following Federal Emergency Management Agent (FEMA) Flood Insurance Rate Maps (FIRMs):

> Marin County, California (unincorporated areas), Panel 175. The map is Community Panel number 06041C0175D last revised May 4, 2009.
> Marin County, California (City of Novato), Panel 277. The map is Community Panel number 06041C0277D last revised May 4, 2009.

Portions of the Project are within Flood Hazard Zone VE. Zone VE is defined as a coastal flood zone with velocity hazard (wave action) and a defined base flood elevation (BFE) (in this case elevation 8). Project FIRMettes are attached as Exhibits 1-2 in Appendix A. All of the area within Zone VE is drainage facilities between the edge of pavement and the right-of-way. The lowest paved grade is elevation 8.78 and is above the BFE.

1.4 Methodology

The MSN Project improvements are evaluated using Caltrans Standard Methodology as modified and supplemented using drainage criteria presented in Appendix A. Peak flow rates through the Project area are computed using the Rational Method. The depth and velocity of flow through pipe systems is analyzed using the STORMCAD computer program, which evaluates for both surcharge and non-surcharge flow conditions. There is a box culvert at station 449+00 that is analyzed using the HEC-RAS computer program. Project drainage improvements are sized to convey the 25-year storm event.

1.5 Bridge Hydraulics

Creek crossings through the Project are within circular and box culverts. Existing large facilities include a 12-foot by 4.5-foot box culvert at Station 449+00. The box culvert is a continuation of a County 6- by 6-foot box culvert that conveys flows under Redwood Boulevard. There is an 12-foot by 5 foot RCB at Station 421+00.

2 PROJECT OVERVIEW

2.1 Potential Project Impacts

2.1.1 Flood Plain Encroachments

The Project will place fill within portions of the FEMA zone VE. The fill will not impact conveyance of flows and does not encroach on flow paths within the Flood Plain.

2.1.2 Residences and Other Buildings

No buildings are affected by the Project.

2.1.3 Crops

No crops are affected by the Project.

2.2 Existing Drainage System

Runoff through the Project area flows from the western hills toward the east, outfalling directly to the Black John Slough ultimately discharging to the Petaluma River. The Petaluma River drains to the North San Pablo Bay, which is an extension of San Francisco Bay.

The Project drainage areas consist primarily of grassed open fields, with a portion of the drainage area as grazing lands, with minor amounts of paved roadways and vegetated roadway side-slopes. There are commercial development within the lower portions of the

drainage area including office buildings, research center and hotels. Offsite slopes west of the Project are steep, with typical slopes between 2:1 and 10:1. The area downstream of the Project is tidal slough.

Ditches located adjacent to the outside shoulder convey flows to the tidal sloughs. The flow line of a portion of the ditches is in Caltrans right-of –way with remaining portions of ditches within Sonoma Marin Area Rail Transit (SMART) right-of-way convey flows to Black Jack Slough.

Drainage areas for the Project cross culverts are shown on Figures 3A through 3E. Characteristics of the drainage areas upstream of the project such as overland sheet flow, rill flow and concentrated flow are presented in Tables 1A. Runoff coefficients for the 25 and 100-year storm evens are presented in Tables 1B. Flows for the 25 and 100-year storm events are presented in Tables 1C. There is some storm drain piping within several of the drainage areas. Much of the piping directs flows lateral to the flow direction and does not appear to substantially reduce the time of concentration. For the drainage area to Station 439+00, there is a large urbanized area and the time of shallow concentrated flow is based on a velocity of 5 feet per second for stabilized slopes.

During typical storm events, runoff from the hillsides west of the Project will flow through one of 14 existing drainage facilities that convey flow under Northbound Route101. Locations of the existing Route 101 crossings culverts are shown on Figures 4A through 4E. Route 101 is raised above the overland flow path and currently acts as a barrier to overland flow. Currently, during the 100-year storm event, runoff from the northern portion of the Project will flow longitudinal along the Route 101 southbound shoulder and overtop at a low point around Station 469+00 along the southbound lanes and northbound lanes. Runoff from existing drainage areas upstream of Route 101 are shown on Figures 5A through 5B.

2.2.1 Cross Culverts – HEC-RAS Analyses

One drainage ditch that conveys flow through the Project area is evaluated using the U.S. Army Corps of Engineers HEC-RAS River Analysis System computer model. The following describes the system evaluated using the HEC-RAS model.

- Station 449+00 (Labeled as Basalt Creek on USGS maps) - A 6 by 6-foot box culvert conveys runoff under Redwood Boulevard, immediately upstream of the project. Runoff is conveyed under Route 101 within a 12 by 4.5-foot cross culvert. Immediately downstream of the project, flow is through a set of five parallel 48-inch CMP culverts. The RCB culvert conveys the 25-year event with at least one foot freeboard to edge of travelway. During the 100-year storm event, the peak water level will be elevation 11.9 at the 6 by 6-foot box culvert headwall. This is 0.1 feet below top of headwall elevation and is contained within the channel banks.

The HEC-RAS modeling results for the creek listed above are presented in Table 2. The cross section location of the above creek is presented in Figures 6. Creek analyses start at the railroad tracks downstream of the Project. For the purpose of these analyses, the starting water level at the downstream limit of the study is based on FEMA documents of the 100-year water level.

2.2.2 Crossing Culverts

Runoff from the Project area flows easterly toward the Black John Slough. Cross culverts convey flow from upstream drainage areas under Route 101. The locations of the existing culverts modeled are shown on Figures 4A through 4E. In most cases, the 25-year event peak flow rate to the existing culverts can be conveyed by the existing culverts. Three cross culverts at Stations 470+00, 473+43 and 477+37 are undersized and cannot convey the 25-year storm event. Runoff in excess of the culvert capacity will either be stored within low-lying areas upstream of the culvert or will bypass the culvert as overland flow to the next downstream facility.

For the purpose of evaluating culvert capacity, culverts are considered adequate if the 25-year design flow rate can be conveyed with a water level that is at least three-tenths of a foot below the existing edge of travelway. The three-tenths of a foot allowance is for future southbound roadway improvements and will be needed to extend the edge of travelway to the west.

There are no longitudinal culverts in the Project area.

2.2.3 Roadside Ditches

Surface flows from the hillsides west of Route 101 to the crown of southbound Route 101 are collected in roadside ditches adjacent to Route 101 and convey runoff to the cross culverts. As noted previously, there are locations where the existing cross culvert cannot convey the peak flow rate during a 25-year event. In some locations, the excess flow is conveyed in the roadside ditch to the next downstream cross culvert.

2.2.4 Existing Stormwater Storage

There is no intentional existing storage within the Project area.

2.2.5 Existing Stormwater Treatment

There are no designated existing stormwater treatment facilities in the Project site area.

2.3 Proposed Improvements

Drainage improvements are proposed to accommodate roadway widening improvements.

2.3.1 Crossing and Longitudinal Culverts

Existing flow patterns to existing cross culverts will be maintained. No extension of existing or proposed crossing culverts under roadways is required in this Project's improvements. However, the undersized culverts will be upsized beneath Northbound 101 beginning at a G2 inlet within the median. Upsizing the three undersized culverts will also solve the 100-year storm overtopping issue at Station 449+00 as previously discussed in this report. Future Southbound 101 improvements will be responsible for extending the upsized culverts underneath Southbound lanes.

Longitudinal culverts are proposed along the eastern edge of pavement and median to capture runoff associated with superelevation of the roadway and to capture runoff to ditches within the SMART right-of-way. Project longitudinal culverts will make direct connections to existing storm drain lines via new catch basins. Modeling results of the existing and proposed upsized cross culverts are presented in Tables 3A and 3B.

2.3.2 Roadside Ditches

Grading of the roadside ditches in portions of the median and along segments of Southboud 101 for stormwater treatment are proposed. The proposed linear bioretention areas for stormwater treatment will double as conveyance ditches. The ditches will have a 4-foot bottom width and a minimum depth of 0.75-feet. Normal depth calculations for proposed conveyance ditches are presented in Table 7.

2.3.3 Gutter Spread

An existing dike is located on Northbound 101 between Stations 404+00 to 411+00. Several other dikes are proposed on Northbound 101 with a low point on the shoulder edge of pavement at Station 475+25. A median barrier is proposed along the entire length of the project with a low point along Northbound 101 median at Station 442+02. Catch basins and slotted pipe drains will be installed to maintain a flow spread width no greater than the 10-foot shoulder. Drainage areas and 25-year peak flows to the gutters are presented in Table 4. Gutter spread and inlet capacities are presented in Table 5. The two inlets in a sag condition is presented in Table 6.

2.3.4 Stormwater Treatment

Stormwater will be treated by a combination of biostrips and linear bioretention areas that will double as conveyance swales. These BMP facilities will treat by filtration of stormwater though biofiltration soil consisting of a blend of compost and sand per the

Regional Water Quality Control Board (RWQCB). Stormwater treatment is evaluated separately in the Storm Water Data Report.

Stormwater treatment will occur within bioretention facilities. Rock berms are proposed within the treatment areas to spread flows and promote infiltration thoughout the length of the facility. Rock berms are proposed with spacing such that the top of the downstream berm is the same elevations as the toe of the next upstream rock berm. Flow depth through the bioretention areas is presented in Table 9. The depth of flow across the top of rock berm is shown as less than 0.25 feet. The flow velocity is less than 3 feet per second.

2.3.5 Peak Flow Attenuation

Peak Flow attenuation is not required for this Project due to the project location in a coastal flood region subject to velocity hazard (wave action). Projects culvert outfall to the FEMA Flood Hazard Zone VE. Zone VE is defined as a coastal flood zone with velocity hazard (wave action) and a defined base flood elevation (in this case elevation 8). See project FIRMettes in Appendix B.

2.4 Unusual and Special Conditions

2.4.1 Existing Facility Conditions

A site visit was conducted April 9, 2012. Several project culverts and culverts downstream of the project in the tidal region were found to contain about two feet of compacted sediment. Cleaning of the existing culverts to remove sediment is proposed for the 36-inch RCP at Station 439+00 and the 12-foot by 4.5 foot RCB at Station 449+00. Additionally, the five 48-inch CMP lines beneath the SMART tracks may require cleaning. Caltrans has easement access to the 48-inch CMP lines.

Project culvert hydraulics calculations are based on the culverts full cross sectional area available for flow.

2.4.2 Alternative Pipes

Alternative Pipe analysis are presented in the Geotechnical Design and Materials Report (GDMR).

2.4.3 Corrosion and Abrasion

Evaluation of corrosion and abrasion are provided in the GDMR.

2.4.4 Erosion

Rock slope protection (RSP) is proposed at proposed culvert outfall locations to minimize sour at pipe outfalls. The proposed RSP outlet facilities are sized using the HEC-14 methodology. Outfall facilities sizes are presented in Table 8.

2.4.5 National Pollutant Discharge Elimination Permit (NPDES)

The Project is subject to the conditions of the Caltrans' NPDES Permit for Storm Water Management during General Construction Activities. This Permit requires that the Project Resident Engineer (RE) submit a Notice of Construction (NOC) to the Regional Water Quality Control Board at least 30 days prior to the start of construction. A California Department of Fish and Game Streambed Alteration Permit, a Regional Water Quality Control Board 401 Permit and a United States Army Corps of Engineers 404 Permit are required.

Project specifications will require that the Contractor prepare a Storm Water Pollution Prevention Plan (SWPPP). The Contractor will not be allowed to start work on the project until Caltrans has deemed that the SWPPP meets the conditions of their General Permit. During the construction period, the Contractor shall be responsible for the implementation of the SWPPP. Caltrans will monitor compliance with the SWPPP. Water Pollution Control Details and Specifications will be provided to the Contractor as a part of the PS&E to be used in the development of the SWPPP.

3 STORM WATER ROUTING PLAN

3.1 Proposed Storm Water Routing Scheme

Existing flow paths will be maintained. No diversions in the natural flow path are planned for the improvements in the Project area.

4 DESIGN CRITERIA

Design criteria are presented in Appendix A.

5 DIVERSION

No diversion of runoff is proposed.

6 REFERENCES

Publications on drainage design manuals, design charts and Caltrans "as-built" plans used in the design of the Project Drainage System include the following:

1. Highway Design Manual, Fifth Edition, (2006 with updates), State of California, Department of Transportation, Sacramento, California.

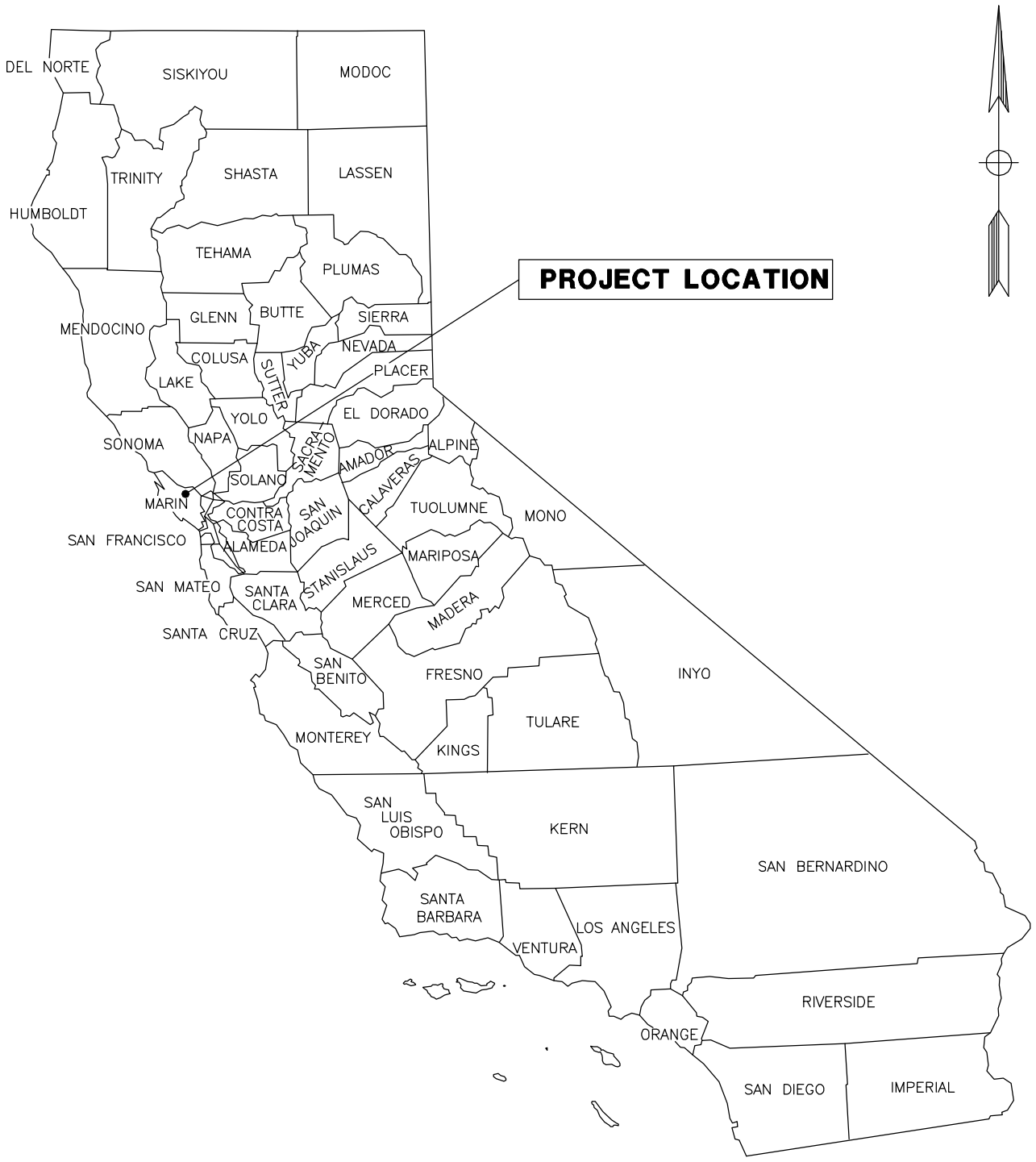
2. Standard Plans, (2010), State of California, Department of Transportation, Sacramento, California.

3. Standard Specifications, (2010), State of California, Department of Transportation, Sacramento, California.

4. Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, U.S Department of Transportation, Federal Highway Administration

5. Drainage Report for Marin Sonoma Narrows MSN B1, EA 04-264074

6. Drainage Report for Marin Sonoma Narrows MSN A1, EA 04-264061

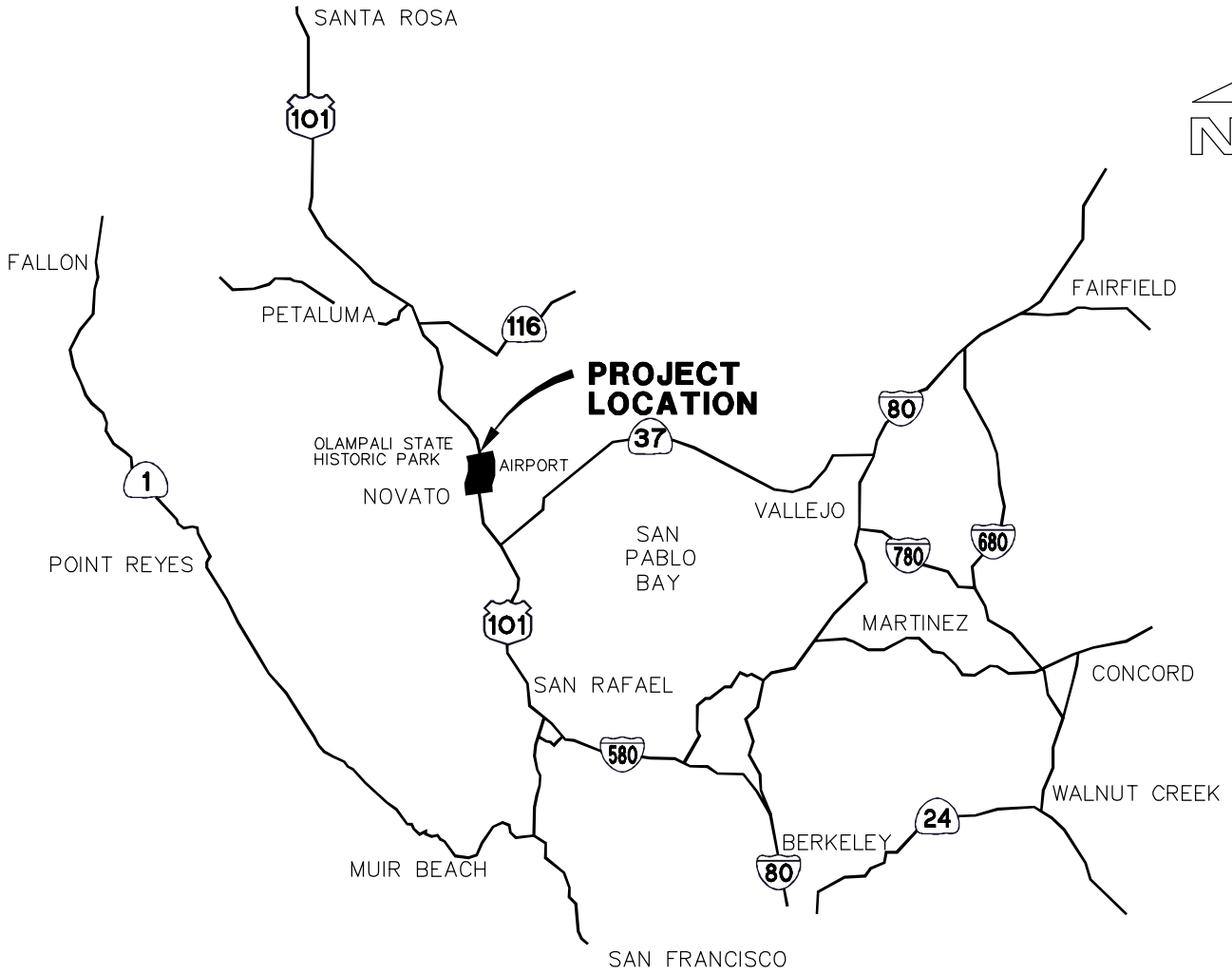


MARIN/SONOMA NARROWS - SEGMENT A3 HOV WIDENING PROJECT

IN MARIN COUNTY
FROM THE ATHERTON AVENUE OVERCROSSING
TO 1.4 MILES SOUTH OF THE REDWOOD LANDFILL OVERCROSSING
04–Mrn–101, PM R22.0/24.4

PROJECT LOCATION MAP

NOT TO SCALE



MARIN/SONOMA NARROWS - SEGMENT A3 HOV WIDENING PROJECT

IN MARIN COUNTY

FROM THE ATHERTON AVENUE OVERCROSSING

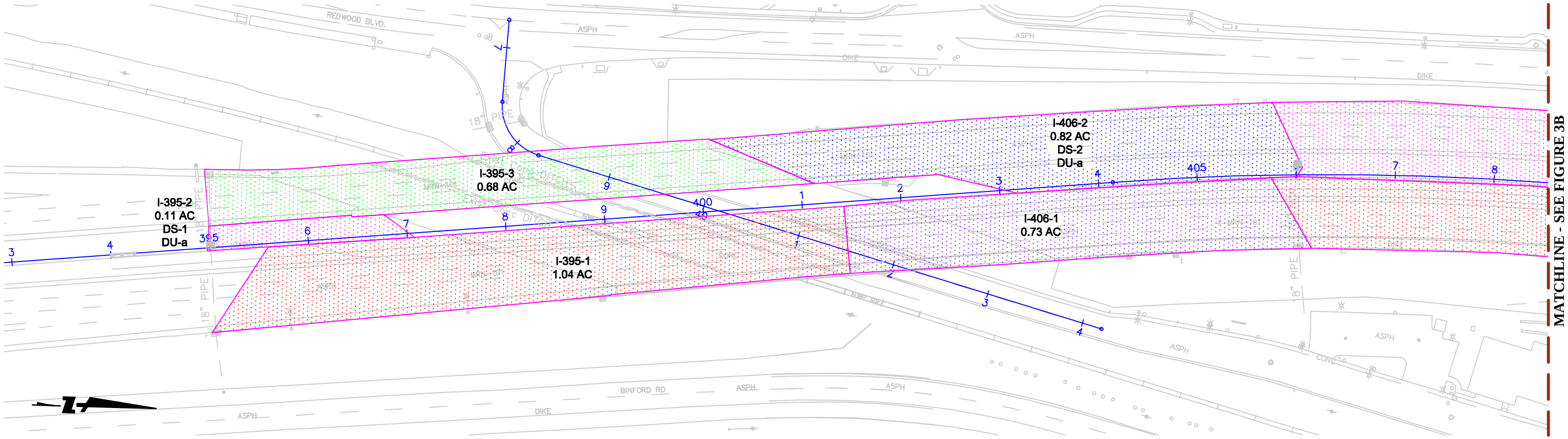
TO 1.4 MILES SOUTH OF THE REDWOOD LANDFILL OVERCROSSING

04–Mrn–101, PM R22.0/24.4

PROJECT VICINITY MAP

NOT TO SCALE

© BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

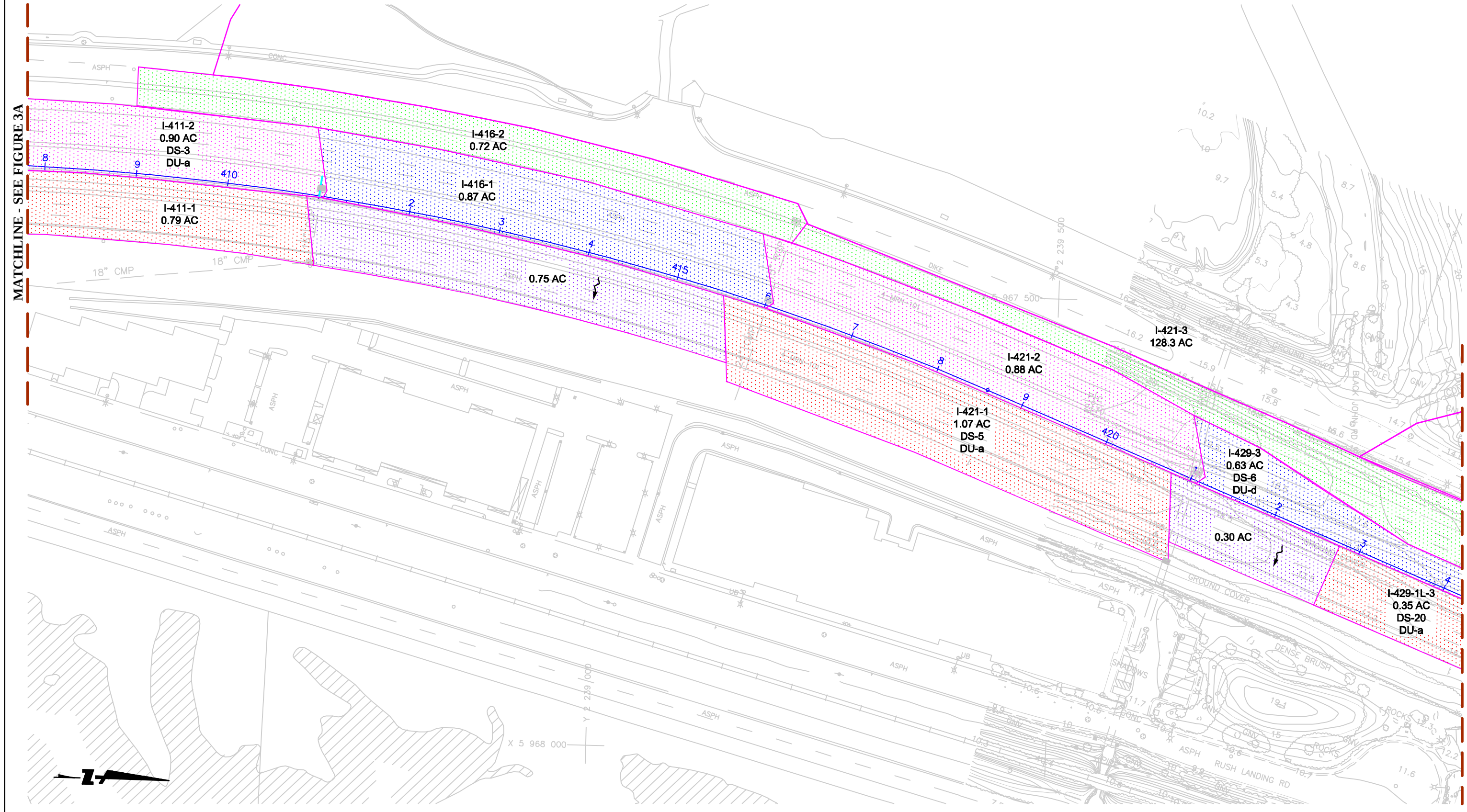
FIGURE 3A

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-re\vol4\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: \\Bkf-ro\vol4\Eng08\087003-20\DWG\FIGURES-101%MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

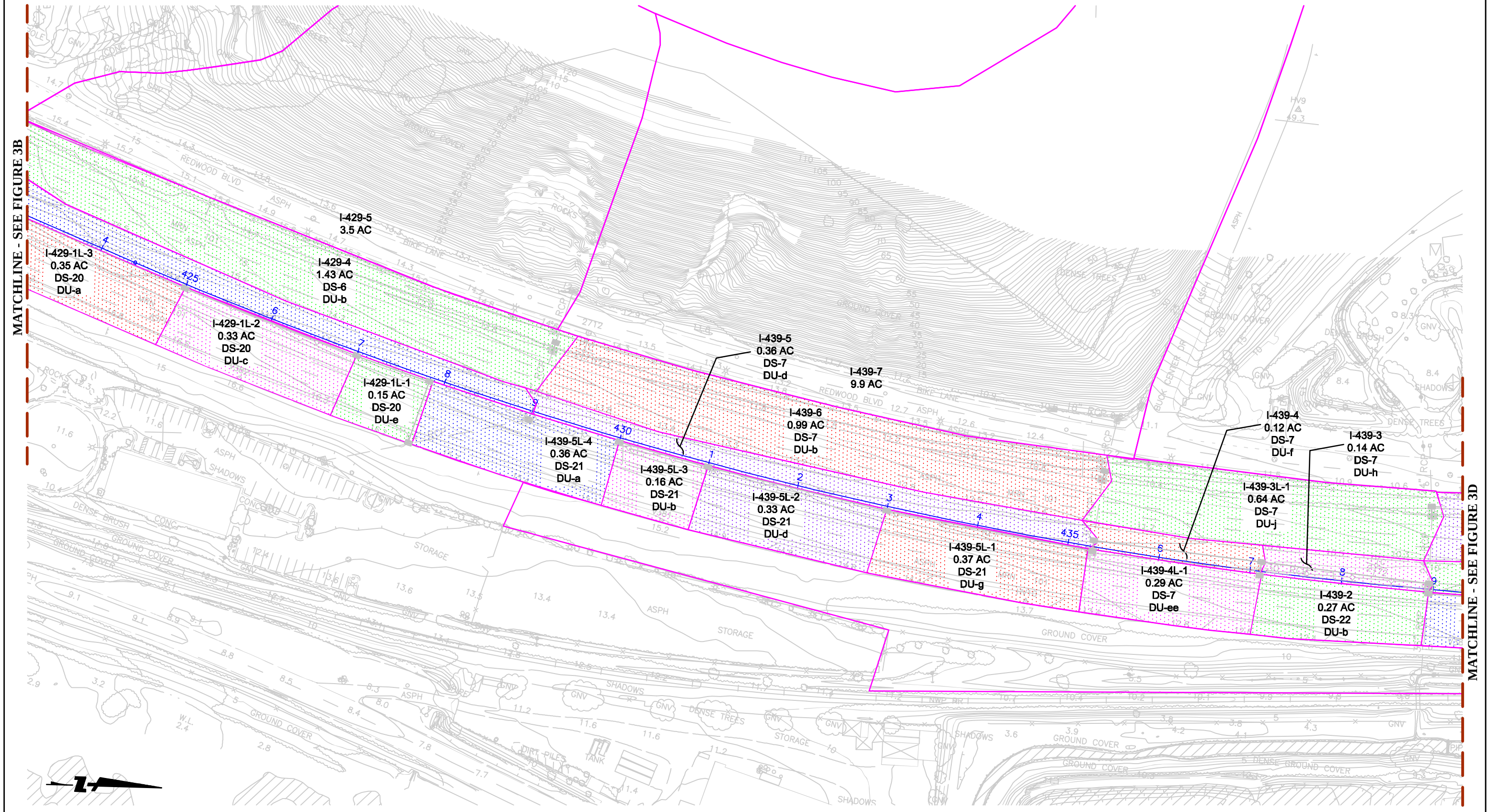
LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

FIGURE 3B
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Eng05\087003-20\DWG\FIGURES-101\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

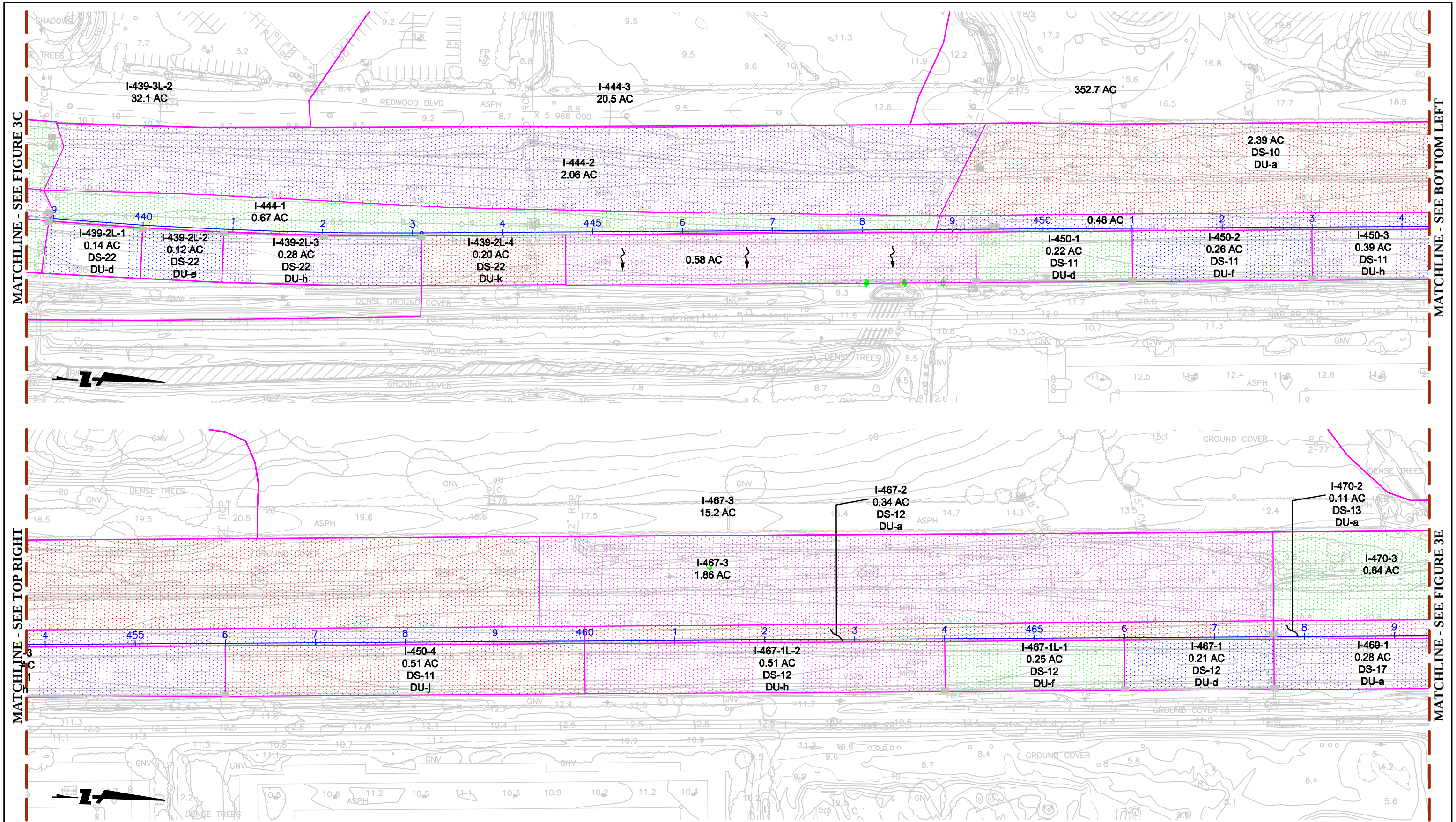
LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
~►	DRAINAGE FLOW DIRECTION

FIGURE 3C
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Eng08\087003-20\DWG\FIGURES-101%MSN-Figure-3.dwg
PLOT DATE: 08-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

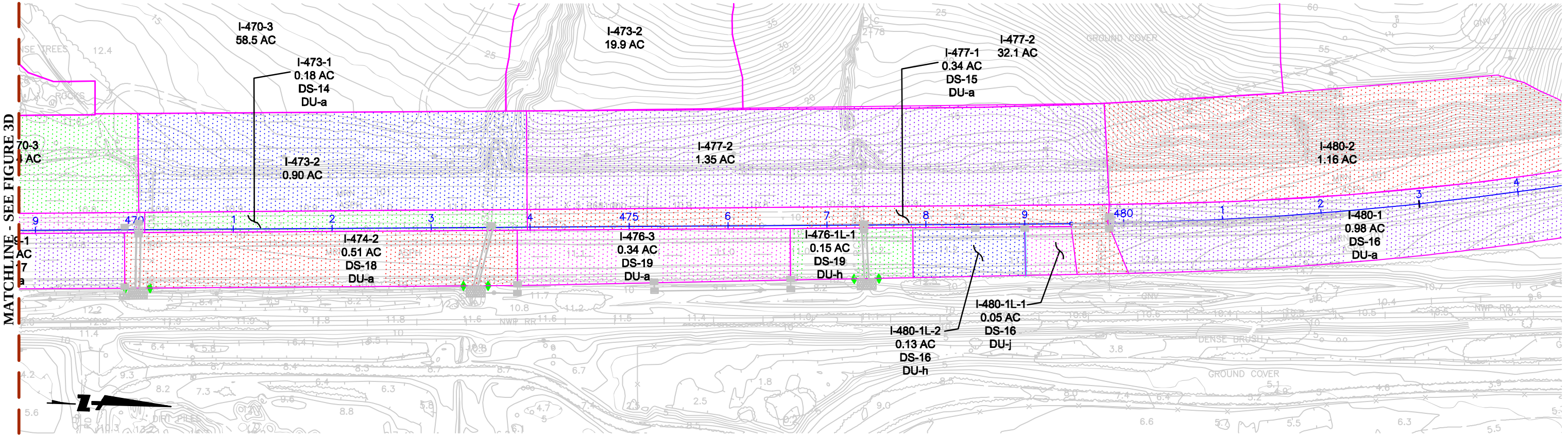
I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

FIGURE 3D

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

© BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
X.xx AC	DRAINAGE AREA (ACRES)
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER
⇝	DRAINAGE FLOW DIRECTION

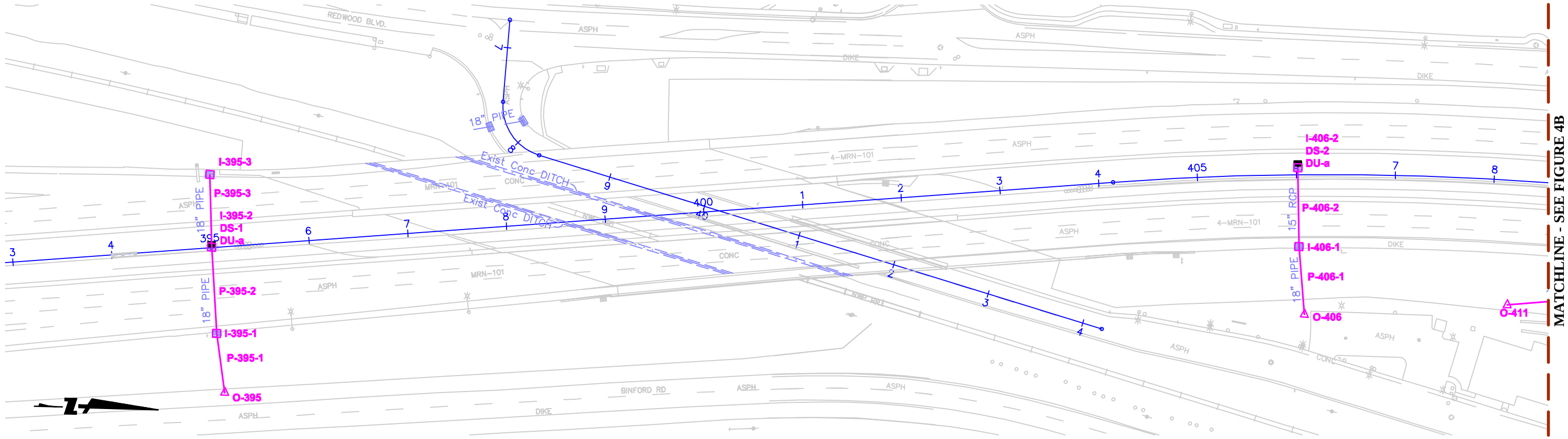
FIGURE 3E

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
PROPOSED DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-revol4\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-3.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

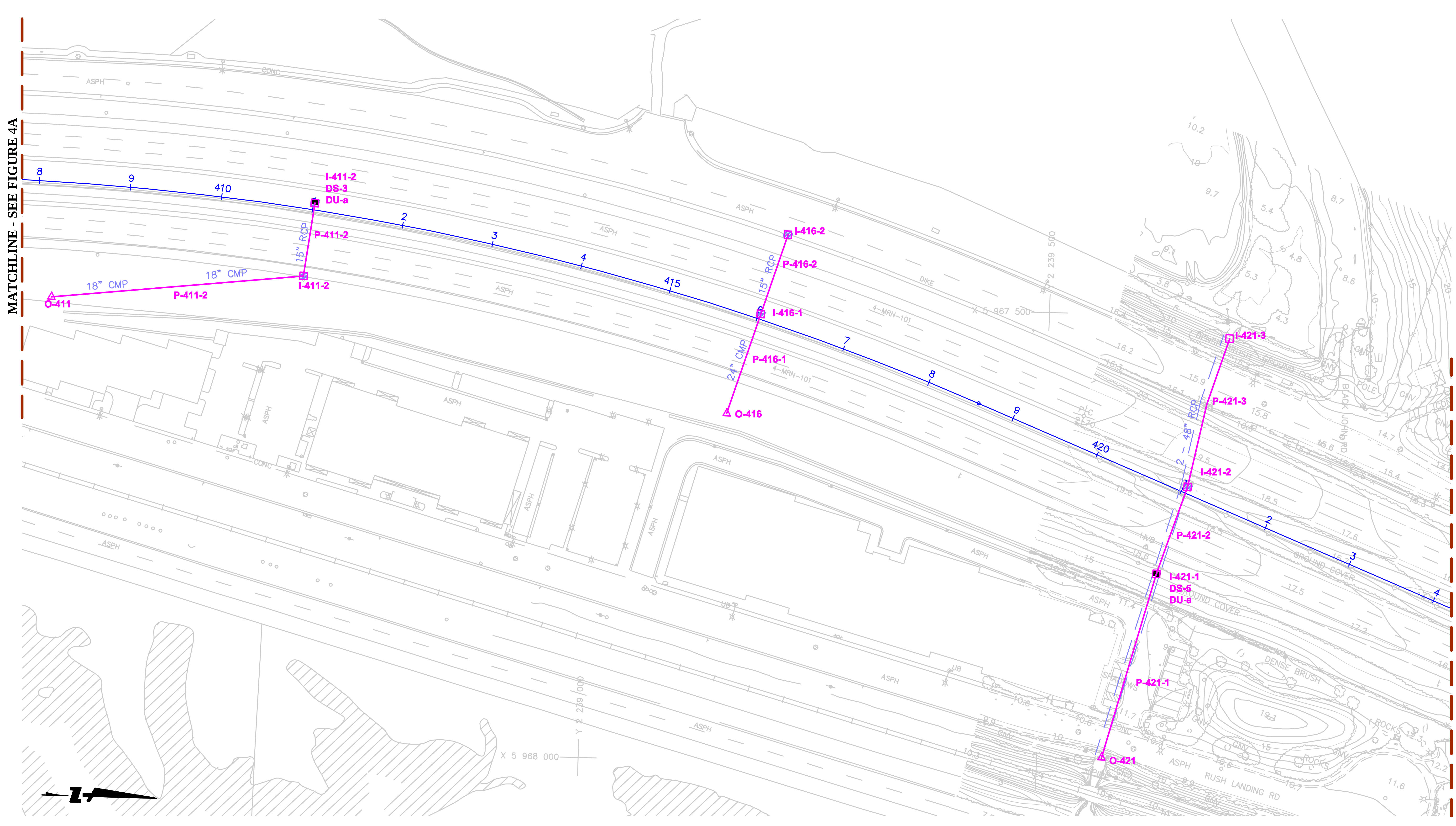
LEGEND:

I-200-X	STORMCAD SYSTEM – ELEMENT NUMBER
DS-X	DRAINAGE PLAN SYSTEM NUMBER
DU-x	DRAINAGE PLAN UNIT NUMBER

FIGURE 4A
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

©BKF Engineers



LEGEND:

I-200-X	STORMCAD SYSTEM – ELEMENT NUMBER
DS-X	DRAINAGE PLAN SYSTEM NUMBER
DU-x	DRAINAGE PLAN UNIT NUMBER

GRAPHIC SCALE

100 0 100 200

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

FIGURE 4B

ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12 PLOTTED BY: smit

© BKF Engineers

MATCHLINE - SEE FIGURE 4B

I-429-1L-3
DS-20
DU-a

P-429-1L-3
DS-20
DU-b

I-429-1L-2
DS-20
DU-c

P-429-1L-2
DS-20
DU-d

I-429-1L-1
DS-20
DU-e

P-429-1L-1
DS-20
DU-f

I-429-1
DS-20
DU-g

P-429-1

O-429

P-429-2

P-429-3

I-429-2
DS-6
DU-f

I-429-3
DS-6
DU-d

P-429-4

I-429-4
DS-6
DU-b

P-429-5

I-429-5

I-439-5L-4
DS-21
DU-f

P-439-5L-4
DS-21
DU-f

I-439-5L-3
DS-21
DU-b

P-439-5L-3
DS-21
DU-c

I-439-5L-2
DS-21
DU-d

P-439-5L-2
DS-21
DU-e

I-439-5L-1
DS-21
DU-g

P-439-6

I-439-7

P-439-7

I-439-6
DS-7
DU-b

I-439-5
DS-7
DU-d

P-439-5
DS-7
DU-e

I-439-4
DS-7
DU-f

P-439-4L-1
DS-7
DU-dd

I-439-4L-1
DS-7
DU-ee

P-439-3
DS-7
DU-g

I-439-3L-

P-439-3L-2

P-439-3L-1

I-43
DS-
DU-

I-439
DS-2
DU-c

P-439-2

I-439-1

P-439-1

O-439

18" RCP
24" RCP
30" RCP
36" RCP

MATCHLINE - SEE FIGURE 4D

DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
100 0 100 200

LEGEND:
I-200-X STORMCAD SYSTEM – ELEMENT NUMBER
DS-X DRAINAGE PLAN SYSTEM NUMBER
DU-x DRAINAGE PLAN UNIT NUMBER

FIGURE 4C
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

© BKF Engineers

MATCHLINE - SEE FIGURE 4C

I-439-3L-2
I-439-3L-1
DS-7
DU-j
I-439-3
DS-7
DU-h
I-439-2
DS-22
DU-c
P-439-2L-1
DS-22
DU-c
I-439-2L-1
DS-22
DU-d
P-439-2L-2
DS-22
DU-j
I-439-2L-2
DS-22
DU-e
P-439-2L-3
DS-22
DU-f
I-439-2L-3
DS-22
DU-h
P-439-2L-4
DS-22
DU-i
I-439-2L-4
DS-22
DU-k
I-444-3
P-444-3
I-444-2
P-444-2
I-444-1
P-444-1
O-444
SYSTEM MODELED IN HEC-RAC
6' x 6' RCB
24" CMP
8" CMP
4' x 4.5' RCB
24" CMP
I-450-1
DS-11
DU-d
18" RCP
P-450-1
DS-11
DU-c
O-450
DS-11
DU-b
5'-48" CMP
I-450-2
DS-11
DU-f
P-450-2
DS-11
DU-e
I-450-3
DS-11
DU-h
P-450-3
DS-11
DU-g

MATCHLINE - SEE BOTTOM LEFT

MATCHLINE - SEE TOP RIGHT

P-450-4
DS-11
DU-i
I-450-4
DS-11
DU-j
I-467-1L-2
DS-12
DU-h
P-467-1L-2
DS-12
DU-g
I-467-1L-1
DS-12
DU-f
P-467-1L-1
DS-12
DU-e
I-467-3
P-467-3
I-467-2
DS-12
DU-g
2' x 2' RCB
I-467-1
DS-12
DU-d
P-467-2
P-467-1
O-467

MATCHLINE - SEE FIGURE 4E

LEGEND:

I–200–X	STORMCAD SYSTEM – ELEMENT NUMBER
DS–X	DRAINAGE PLAN SYSTEM NUMBER
DU–x	DRAINAGE PLAN UNIT NUMBER

GRAPHIC SCALE

100 0 100 200

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

FIGURE 4D

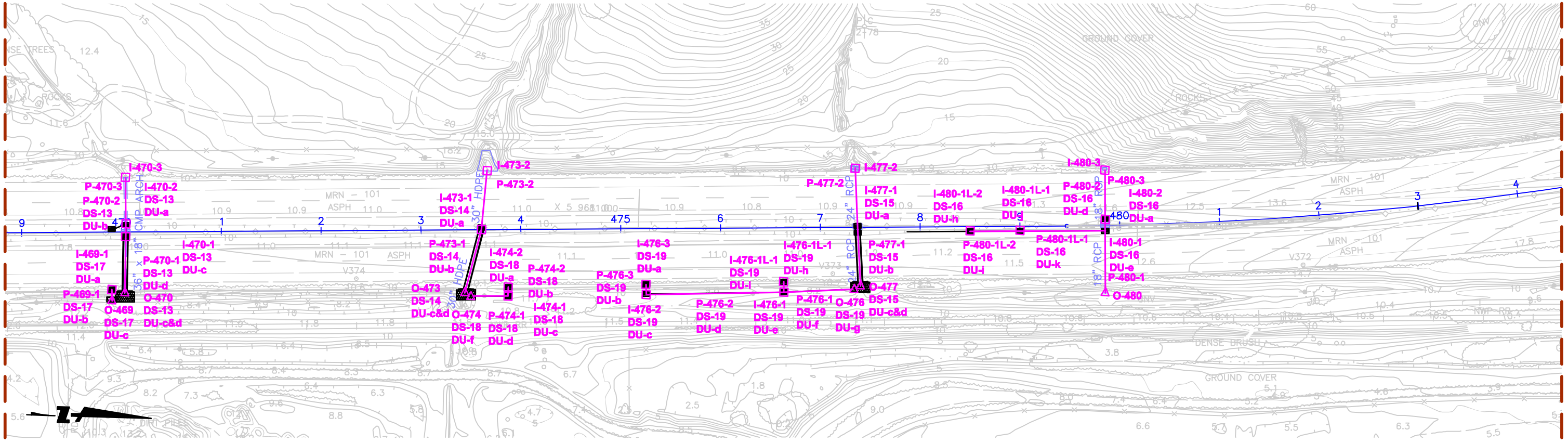
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BKF

DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101%\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

© BKF Engineers

MATCHLINE - SEE FIGURE 4D



DRAWING NAME: K:\Eng08\087003-20\DWG\FIGURES-101\MSN-Figure-4.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

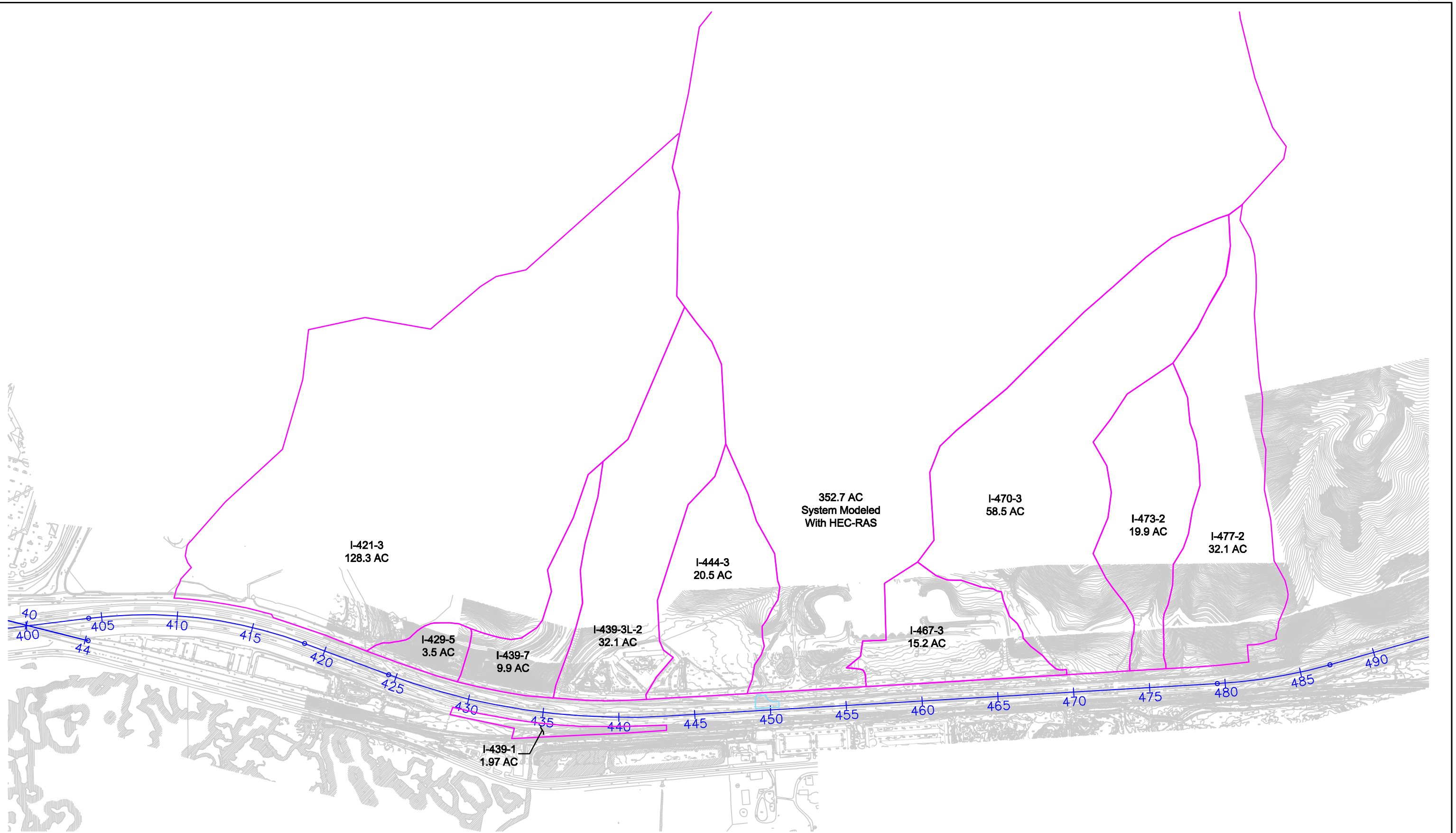
GRAPHIC SCALE
100 0 100 200

LEGEND:
I–200–X STORMCAD SYSTEM – ELEMENT NUMBER
DS–X DRAINAGE PLAN SYSTEM NUMBER
DU–x DRAINAGE PLAN UNIT NUMBER

FIGURE 4E
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
STORM DRAIN NODE IDENTIFIERS

BkF

©BKF Engineers



JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

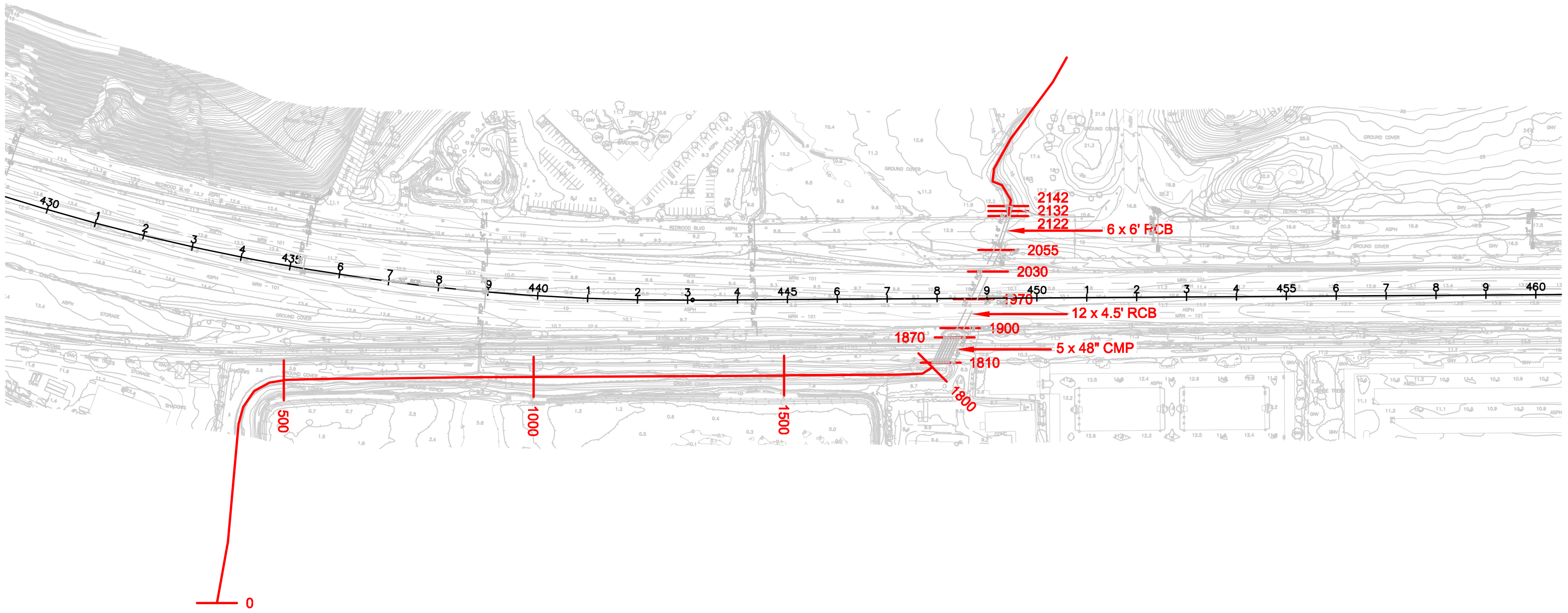
GRAPHIC SCALE
600 0 600 1200

FIGURE 5
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
OFF-SITE DRAINAGE AREAS

BkF

DRAWING NAME: \\Bkf-rc\vol4\Engdb\087003-20\DWG\FIGURES-101%\MSN-Figure-5.dwg
PLOT DATE: 08-13-12
PLOTTED BY: smit

© BKF Engineers



DRAWING NAME: \\Bkf-rc\vol4\Engdb\087003-20\DWG\FIGURES-101%\MSN-AREAS-FIG6.dwg
PLOT DATE: 06-13-12
PLOTTED BY: smit

JOB No: 20087003-20
DATE: JUNE, 2012
BY: R.A.M
REV: E.B.

GRAPHIC SCALE
200 0 200 400

FIGURE 6
ROUTE 101 IMPROVEMENT MSN A3
NB HOV LANE WIDENING PROJECT
DRAINAGE REPORT
HEC-RAS CROSS SECTIONS FOR CREEK CROSSINGS 449+00

BkF

TABLE 1A

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Area and Slope

Drainage Area Station Outfall	Overland + Rill			Transition Elevation (feet)	End of Rill Elevation (feet)	Overland Slope (feet/ft)	Overland Length (feet)	Rill Flow Length (feet)	Rill Flow Slope (feet/ft)	Concentrated Flow Distance (feet)
	Drainage Area (acres)	Flow Path (feet)	Upstream Elevation (feet)							
449	352.7	1,642	1,560	1,440	880	0.400	300	1,342	0.42	6,385
467	15.2	300	40	35	34	0.017	86	214	0.00	779
470	58.5	2,468	740	680	120	0.200	298	2,170	0.26	1,370
473	19.9	819	440	360	200	0.267	300	519	0.31	1,290
477	32.1	2,376	760	675	150	0.283	300	2,076	0.25	782
444	20.5	1,537	210	170	11	0.133	243	1,294	0.12	365
439	42.0	2,473	360	320	12	0.133	243	2,230	0.14	660
429	3.5	318	140	20	12	0.400	300	18	0.44	0
421	128.3	2,246	520	470	80	0.167	272	1,974	0.20	2,160

TABLE 1B

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Runoff Coefficient

Drainage Area Station Outfall	Drainage Area (acres)	Upstream Elevation (feet)	Downstream Elevation (feet)	HDM C -COEFFICENT COMPONENTS							Percent Impervious (%)	10-Year Runoff Coefficient	25-Year Runoff Coefficient	100-Year Runoff Coefficient
				Overall Length (feet)	Overall Slope (feet/feet)	Relief "C"	Soil Infiltration "C"	Vegetal Cover "C"	Surface Storage "C"	Overall Pervious "C"				
449	352.7	1,560	10	8,027	.19	0.240	0.140	0.070	0.11	0.56	5	0.58	0.63	0.70
467	15.2	40	14	1,079	.02	0.110	0.140	0.070	0.11	0.43	55	0.69	0.76	0.70
470	58.5	740	9	3,838	.19	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
473	19.9	440	7	2,109	.21	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
477	32.1	760	14	3,158	.24	0.240	0.070	0.070	0.11	0.49	0	0.49	0.54	0.70
444	20.5	210	5	1,902	.11	0.240	0.070	0.070	0.11	0.49	10	0.53	0.58	0.70
439	42.0	360	4	3,133	.11	0.240	0.070	0.070	0.11	0.49	5	0.51	0.56	0.70
429	3.5	140	12	318	.40	0.315	0.070	0.070	0.11	0.57	50	0.73	0.81	0.70
421	128.3	520	3	4,406	.12	0.240	0.070	0.070	0.11	0.49	10	0.53	0.58	0.70

TABLE 1C

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rational Method Parameters, Intensity and Flow

Drainage Area Station Outfall	Overland + Rill			Shallow Conc. Flow (minutes)	Conc. Flow (minutes)	Time of Conc (minutes)	25-Year Rainfall Intensity (in/hour)	100-Year Rainfall Intensity (in/hour)	25-Year Runoff Coef.	100-Year Runoff Coef.	25-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
	Drainage Area (acres)	Overland Flow Travel (minutes)	Rill Velocity (fps)									
449	352.7	6.81	4.5	5.0	21	33	1.45	1.80	0.63	0.70	324.0	445.0
467	15.2	8.94	.5	7.5	3	19	1.87	2.33	0.76	0.70	21.5	24.7
470	58.5	8.94	3.5	10.2	5	24	1.69	2.10	0.54	0.70	53.2	86.0
473	19.9	8.01	3.9	2.2	4	15	2.11	2.63	0.54	0.70	22.7	36.6
477	32.1	7.81	3.5	9.8	3	20	1.81	2.26	0.54	0.70	31.4	50.7
444	20.5	8.94	2.4	8.8	1	19	1.87	2.33	0.58	0.70	22.4	33.4
439	42.0	8.94	5.0	7.4	2	19	1.89	2.35	0.56	0.70	44.5	69.1
429	3.5	6.81	4.7	.1		10	2.51	3.12	0.81	0.70	7.1	7.7
421	128.3	8.94	3.1	10.6	7	27	1.60	1.99	0.58	0.70	119.6	178.5

Intercept Coefficient (Shallow) n = 0.15 (short pasture grass) Rainfall Intensity, 2-yr 24 3.5
Intercept Coefficient (Sheet) k = 0.213 (short grass prairie) Sheeting flow distance is 300-feet

TABLE 2

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Creek Hydraulics at Station 449+00

River Station (feet)	25-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)	Minimum Channel Elevation (feet)	Water Level 25-Year (feet)	Water Level 100-Year (feet)	Energy Grade Line 25-Year (feet)	Energy Grade Line 100-Year (feet)	25-Year Energy Grade Slope (ft/ft)	25-Year Channel Velocity (fps)	25-Year Flow Area (fps)	25-Year Top Width (sqft)	25-Year Froude Number	Length (ft)	Notes
2142	324	445	8.4	11.8	11.9	13.0	13.9	.0034	9.0	35.9	14.9	1.0		
2132	324	445	2.7	9.8	11.9	10.7	12.8	.0024	7.5	43.1	6.2	.5	10	
2122	324	445	2.4	9.8	11.9	10.6	12.8	.0021	7.2	45.1	6.2	.5	10	
2056	324	445	2.3	8.9	9.9	9.9	11.3	.0225	8.1	40.0	6.2	.6	66	6' x 6' RCB
2055	324	445	2.3	9.4	10.7	9.6	11.0	.0027	3.8	85.8	12.2	.3	1	
2030	324	445	2.2	9.1	10.1	9.4	10.5	.0029	3.9	83.9	12.2	.3	25	
1970	324	445	2.0	8.9	9.7	9.2	10.1	.0029	3.9	83.7	12.2	.3	60	12' x 4.5' RCB
1900	324	445	1.6	8.7	9.3	8.9	9.6	.0026	3.5	93.3	17.7	.3	70	
1870	324	445	1.6	8.9	9.5	8.9	9.5	.0001	.9	357.9	88.3	.1	30	
1810	324	445	1.5	8.5	8.8	8.5	8.9	.0001	.8	384.5	90.1	.1	60	5 x 48" Steel Pipes
1800	324	445	1.3	8.5	8.8	8.5	8.9	.0003	1.4	234.3	62.2	.1	10	
1500	324	445	1.2	8.3	8.6	8.4	8.6	.0008	1.8	177.9	60.9	.2	300	
1000	324	445	1.2	8.1	8.2	8.1	8.3	.0003	1.3	251.8	71.9	.1	500	
500	324	445	1.1	8.0	8.0	8.0	8.0	.0002	1.1	292.9	74.8	.1	500	
0	324	445	1.0	8.0	8.0	8.0	8.0	.0000	.3	1076.4	202.5	.0	500	

Note:
Tailwater is set Petaluma River 100-Year Flood Elevation 8.
Culvert at River Sttaion 1840 is 5 x 48" steel pipes conveying flow past the SMART tracks
This creek reach is the upper reach of the Creek labeled as Basalt Creek on USGS Topo maps.
Analyses based on Flow is Contained.

TABLE 3A

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Caltrans Culvert Hydrology - 25 Year Storm

Node [1] #	Drainage System	Drainage Unit	Ground Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Inlet Area (acres)	Lateral Area (acres)	Inlet C	Inlet C*A (acres)	Cumulative Area (acres)	Cumulative C*A (acres)	Inlet Tc (minutes)	System Tc (minutes)	Intensity (in/hr)	**Discharge [3] (cfs)**
Culvert Station Outfall 480																
I-480-1L-2	16	h	10.7	6.8	7.03	7.03	0.13		0.95	0.12	0.13	0.12	5.0	5.0	3.45	**0.4**
I-480-1L-1	16	j	10.7	6.6	6.93	6.93	0.05		0.95	0.05	0.05	0.17	5.0	5.4	3.37	**0.6**
I-480-3	-	-	10.0	5.1	6.51	6.51	1.16		0.95	1.10	1.16	1.10	10.0	10.0	2.51	**2.8**
I-480-2	16	a	10.6	4.8	6.48	6.46	0.98		0.95	0.93	2.14	2.03	5.0	10.2	2.49	**5.1**
I-480-1	-	-	10.0	4.8	6.43	6.41		0.05	(N/A)	0.00	2.19	2.20	0.0	10.3	2.48	**5.5**
Culvert Station Outfall 477																
I-477-2	-	-	9.3	7.1	8.41	8.41	33.45		0.56	18.62	33.45	18.62	20.3	20.3	1.88	**35.3**
I-477-1	15	a	9.1	6.1	7.48	7.45	0.34		0.95	0.32	33.79	18.94	5.0	20.4	1.88	**35.9**
Culvert Station Outfall 476																
I-476-1L-1	19	h	9.3	6.3	6.56	6.56	0.15		0.95	0.14	0.15	0.14	5.0	5.0	3.45	**0.5**
I-476-3	19	a	8.8	6.4	6.88	6.88	0.34		0.95	0.32	0.34	0.32	5.0	5.0	3.45	**1.1**
I-476-2	-	-	10.2	6.4	6.85	6.81			(N/A)	0.00	0.34	0.32	0.0	5.1	3.44	**1.1**
I-476-1	-	-	8.4	6.0	6.51	6.50		0.15	(N/A)	0.00	0.49	0.47	0.0	6.0	3.26	**1.5**
Culvert Station Outfall 474																
I-474-2	18	a	9.0	6.5	6.97	6.97	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-474-1	-	-	10.7	6.3	6.84	6.77			(N/A)	0.00	0.51	0.48	0.0	5.0	3.44	**1.7**
Culvert Station Outfall 473																
I-473-2	-	-	10.1	6.2	7.64	7.64	20.80		0.56	11.60	21.31	11.60	14.5	14.5	2.12	**24.8**
I-473-1	14	a	9.3	6.0	7.60	7.57	0.18		0.95	0.17	21.49	11.77	5.0	14.7	2.11	**25.0**
Culvert Station Outfall 470																
I-470-3	-	-	10.0	7.7	9.50	9.50	59.14		0.54	32.20	59.14	32.20	23.7	23.7	1.75	**56.9**
I-470-2	13	a	10.0	7.0	9.17	9.09	0.11		0.95	0.11	59.25	32.30	5.0	23.8	1.75	**57.0**
I-470-1	-	-	11.5	6.8	9.00	9.00			(N/A)	0.00	59.25	32.30	0.0	23.8	1.75	**56.9**
Culvert Station Outfall 469																
I-469-1	17	a	10.0	7.0	7.44	7.44	0.28		0.95	0.27	0.28	0.27	5.0	5.0	3.45	**0.9**
Culvert Station Outfall 467																
I-467-1L-2	12	h	11.8	6.8	7.60	7.60	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-467-1L-1	12	f	11.2	6.2	7.55	7.55	0.25		0.95	0.24	0.76	0.72	5.0	6.2	3.23	**2.4**
I-467-3	-	-	9.3	6.4	8.46	8.46	17.06		0.73	12.41	17.06	12.41	19.0	19.0	1.93	**24.1**
I-467-2	12	a	10.1	5.9	8.15	8.10	0.34		0.95	0.32	17.40	12.73	5.0	19.1	1.93	**24.7**
I-467-1	12	d	10.9	5.7	7.47	7.45	0.21	0.76	0.95	0.20	18.37	13.65	5.0	19.3	1.92	**26.4**
Culvert Station Outfall 450																
I-450-4	11	j	11.8	8.7	9.27	9.27	0.51		0.95	0.48	0.51	0.48	5.0	5.0	3.45	**1.7**
I-450-3	11	h	10.9	7.8	8.55	8.53	0.39		0.95	0.37	0.90	0.86	5.0	6.8	3.12	**2.7**
I-450-2	11	g	10.3	7.2	8.05	8.03	0.26		0.95	0.25	1.16	1.10	5.0	7.8	2.92	**3.2**
I-450-1	11	d	10.0	6.7	7.62	7.50	0.22		0.95	0.21	1.38	1.31	5.0	8.7	2.75	**3.6**
Culvert Station Outfall 444																
I-444-3	-	-	7.8	3.2	6.77	6.77	20.50		0.58	11.89	20.50	11.89	19.0	19.0	1.93	**23.1**
I-444-2	-	-	6.7	2.4	6.57	6.55	2.06		0.95	1.96	22.56	13.85	5.0	19.2	1.92	**26.8**
I-444-1	-	-	7.6	2.0	6.41	6.38	0.67		0.95	0.64	23.23	14.48	5.0	19.6	1.91	**27.9**
Culvert Station Outfall 439																
I-439-5L-4	21	a	13.6	8.2	8.63	8.63	0.36		0.95	0.34	0.36	0.34	5.0	5.0	3.45	**1.2**
I-439-5L-3	21	b	13.3	7.9	8.44	8.43	0.16		0.95	0.15	0.16	0.49	5.0	5.7	3.33	**1.7**
I-439-5L-2	21	d	12.5	7.3	8.23	8.22	0.33		0.95	0.31	0.49	0.81	5.0	6.9	3.10	**2.5**
I-439-5L-1	21	g	11.7	5.0	8.11	8.04	0.37		0.95	0.35	0.86	1.16	5.0	8.1	2.87	**3.4**
I-439-4L-1	7	ee	10.8	4.3	7.74	7.74	0.29		0.95	0.28	0.29	0.28	5.0	5.0	3.45	**1.0**
I-439-3L-2	-	-	8.7	3.3	8.70	8.70	32.10		0.56	17.98	32.10	17.98	18.6	18.6	1.95	**35.3**
I-439-3L-1	7	j	7.2	3.1	7.70	7.17	0.64		0.95	0.61	32.74	18.58	5.0	18.7	1.94	**36.4**
I-439-2L-4	22	k	9.6	5.6	8.00	8.00	0.20		0.95	0.19	0.20	0.19	5.0	5.0	3.45	**0.7**
I-439-2L-3	22	h	9.6	5.3	8.00	8.00	0.28		0.95	0.27	0.28	0.46	5.0	9.8	2.54	**1.2**
I-439-2L-2	22	e	9.7	5.0	7.98	7.98	0.12		0.95	0.11	0.40	0.57	5.0	12.6	2.28	**1.3**
I-439-2L-1	22	d	9.9	4.7	7.97	7.97	0.14		0.95	0.13	0.54	0.70	5.0	14.7	2.11	**1.5**
I-439-7	-	-	10.1	5.0	8.81	8.81	9.90		0.56	5.54	9.90	5.54	18.6	18.6	1.95	**10.9**
I-439-6	7	b	9.1	4.5	8.21	8.19	0.99		0.95	0.94	10.89	6.48	5.0	18.7	1.94	**12.7**
I-439-5	7	d	11.3	4.0	8.03	8.01	0.36	0.86	0.95	0.34	12.11	7.99	5.0	19.2	1.92	**15.5**
I-439-4	7	f	10.1	3.2	7.73	7.73	0.12	0.29	0.95	0.11	12.52	8.38	5.0	20.2	1.89	**15.9**
I-439-3	7	h	9.3	2.1	7.37	7.26	0.14	32.74	0.95	0.13	45.40	27.09	5.0	21.1	1.85	**50.5**
I-439-2	22	c	10.1	2.1	7.21	7.12	0.27	0.54	0.95	0.26	46.21	28.05	5.0	21.2	1.85	**52.3**
I-439-1	-	-	9.8	1.5	6.56	6.48	1.97		0.60	1.18	48.18	29.23	5.0	21.4	1.84	**54.2**
Culvert Station Outfall 429																
I-429-1L-3	20	a	15.6	10.5	10.97	10.97	0.35		0.95	0.33	0.35	0.33	5.0	5.0	3.45	**1.2**
I-429-1L-2	20	c	14.6	9.9	10.67	10.66	0.33		0.95	0.31	0.68	0.65	5.0	6.3	3.20	**2.1**
I-429-1L-1	20	e	14.3	9.4	10.62	10.59	0.15		0.95	0.14	0.83	0.79	5.0	6.8	3.12	**2.5**
I-429-5	-	-	12.4	7.9	11.03	11.03	3.50		0.70	2.45	3.50	2.45	10.0	10.0	2.51	**6.2**
I-429-4	6	b	10.8	7.7	10.94	10.84	1.43		0.95	1.36	4.93	3.81	5.0	10.3	2.49	**9.5**
I-429-3	-	-	12.9	6.6	11.37	11.34	0.63		0.95	0.60	5.56	4.41	5.0	10.5	2.47	**11.0**
I-429-2	-	-	13.2	6.3	11.30	11.09			(N/A)	0.00	5.56	4.41	0.0	10.6	2.46	**10.9**
I-429-1	-	-	15.6	9.3	10.56	10.53		0.83	(N/A)	0.00	6.39	5.20	0.0	11.2	2.41	**12.6**
Culvert Station Outfall 421																
I-421-3	-	-	15.0	3.9	6.90	6.90	128.30		0.58	74.41	128.30	74.41	26.7	26.7	1.64	**122.8**
I-421-2	-	-	17.0	2.9	6.80	6.76	0.88		0.95	0.84	129.18	75.25	5.0	27.0	1.63	**123.3**
I-421-1	5	a	16.3	2.7	6.60	6.58	1.07		0.90	0.96	130.25	76.21	5.0	27.4	1.61	**123.8**
Culvert Station Outfall 416																
I-416-2	-	-	18.0	14.5	15.64	15.64	0.72		0.95	0.68	0.72	0.68	5.0	5.0	3.45	**2.4**
I-416-1	-	-	24.2	14.1	15.53	15.52	0.87		0.95	0.83	1.59	1.51	5.0	5.4	3.37	**5.1**
Culvert Station Outfall 411																
I-411-2	3	a	32.4	29.1	29.81	29.81	0.90		0.95	0.86	0.90	0.86	5.0	5.0	3.45	**3.0**
I-411-1	-	-	30.6	17.0	18.11	17.90	0.79		0.95	0.75	1.69	1.61	5.0	5.2	3.42	**5.5**
Culvert Station Outfall 406																
I-406-2	2	a	38.9	35.3	35.98	35.98	0.82		0.95	0.78	0.82	0.78	5.0	5.0	3.45	**2.7**
I-406-1	-	-	37.7	31.8	32.72	32.68	0.73		0.95	0.69	1.55	1.47	5.0	5.2	3.42	**5.1**
Culvert Station Outfall 395																
I-395-3	-	-	36.0	30.6	31.20	31.20	0.68		0.95	0.65	0.68	0.65	5.0	5.0	3.45	**2.3**
I-395-2	1	a	35.8	30.3	30.99	30.98	0.11		0.95	0.11	0.79	0.75	5.0	5.3	3.39	**2.6**
I-395-1	-	-	36.2	12.0	12.97	12.93	1.04		0.95	0.99	1.83	1.74	5.0	5.8	3.30	**5.8**

Notes
(1) ft = feet, in/hr = inches/hour rainfall, cfs = cubic feet per second
(2) Cumlative Area = Inlet CA + Lateral Inlet CA
(3) Discharge is from the Rational Method, Q = CIA

TABLE 3B

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Caltrans Culvert Hydraulics - 25 Year Storm

Pipe #	Drainage System	Drainage Unit	Upstream Node	Downstream Node	Total Discharge [3] (cfs) [1]	Capacity @ Constructed Slope (cfs)	Pipe Size (inches)	Length (feet)	Constructed Slope (ft/ft)	Pipe Roughness (Mannings n)	Invert Elevation Upstream	Invert Elevation Downstream	Ground/Rim Elevation Upstream	Ground/Rim Elevation Downstream	HGL [2] [4] Elevation Upstream	HGL [2] [4] Elevation Downstream	**Freeboard [2] (feet)**	Upstream Cover (feet)	Velocity (ft/s)	Energy Grade (feet)	EGL Freeboard (feet)
Culvert Station Outfall 480																					
P-480-1L-2	16	i	I-480-1L-2	I-480-1L-1	0.4	5.6	18	50	0.003	0.013	6.75	6.61	10.74	10.74	7.03	6.93	**3.7**	2.5	1.9	7.08	3.7
P-480-1L-1	16	k	I-480-1L-1	I-480-1	0.6	5.7	18	85	0.003	0.013	6.61	6.36	10.74	9.97	6.93	6.64	**3.8**	2.6	2.1	7.00	3.7
P-480-3	-	-	I-480-3	I-480-2	2.8	7.3	18	50	0.005	0.013	5.05	4.81	9.99	10.64	6.51	6.48	**3.5**	3.4	3.9	6.74	3.2
P-480-2	16	d	I-480-2	I-480-1	5.1	6.1	18	12	0.003	0.013	4.81	4.77	10.64	9.97	6.46	6.43	**4.2**	4.3	2.9	6.59	4.1
P-480-1	-	-	I-480-1	OF-480	5.5	15.8	18	63	0.023	0.013	4.77	3.34	9.97	6.46	6.41	6.24	**3.6**	3.7	3.1	6.56	3.4
Culvert Station Outfall 477																					
P-477-2	-	-	I-477-2	I-477-1	35.3	90.7	4x2 RCB	58	0.017	0.013	7.07	6.09	9.27	9.09	8.41	7.48	**0.9**	0.2	10.5	10.12	-0.8
P-477-1	15	b	I-477-1	OF-477	35.9	52.6	4x2 RCB	58	0.006	0.013	6.09	5.76	9.09	7.26	7.45	7.00	**1.6**	1.0	7.2	8.26	0.8
Culvert Station Outfall 476																					
P-476-1L-1	19	i	I-476-1L-1	I-476-1	0.5	9.0	18	11	0.007	0.013	6.30	6.22	9.30	8.42	6.56	6.51	**2.7**	1.5	2.7	6.67	2.6
P-476-3	19	b	I-476-3	I-476-2	1.1	3.1	15	9	0.002	0.013	6.38	6.36	8.75	10.16	6.88	6.85	**1.9**	1.1	2.3	6.96	1.8
P-476-2	19	d	I-476-2	I-476-1	1.1	5.7	18	138	0.003	0.013	6.36	5.96	10.16	8.42	6.81	6.51	**3.4**	2.3	2.5	6.91	3.3
P-476-1	19	f	I-476-1	OF-476	1.5	5.6	18	71	0.003	0.013	5.96	5.76	8.42	7.26	6.50	6.24	**1.9**	1.0	2.7	6.61	1.8
Culvert Station Outfall 474																					
P-474-2	18	b	I-474-2	I-474-1	1.7	5.4	15	10	0.007	0.013	6.45	6.38	8.95	10.70	6.97	6.86	**2.0**	1.3	3.9	7.20	1.7
P-474-1	18	d	I-474-1	OF-474	1.7	7.6	18	38	0.005	0.013	6.28	6.08	10.70	7.58	6.77	6.56	**3.9**	2.9	3.5	6.96	3.7
Culvert Station Outfall 473																					
P-473-2	-	-	I-473-2	I-473-1	24.8	41.0	4x2 RCB	58	0.003	0.013	6.19	5.99	10.09	9.29	7.64	7.60	**2.5**	1.9	5.4	8.10	2.0
P-473-1	14	b	I-473-1	OF-473	25.0	-26.0	4x2 RCB	65	-0.001	0.013	5.99	6.08	9.29	8.58	7.57	7.15	**1.7**	1.3	3.1	7.72	1.6
Culvert Station Outfall 470																					
P-470-3	-	-	I-470-3	I-470-2	56.9	85.5	4x2 RCB	46	0.015	0.013	7.65	6.96	9.98	9.96	9.50	9.17	**0.5**	0.3	11.6	11.60	-1.6
p-470-2	13	b	I-470-2	I-470-1	57.0	67.2	4x2 RCB	14	0.009	0.013	6.96	6.83	9.96	11.51	9.09	9.00	**0.9**	1.0	7.1	9.88	0.1
p-470-1	13	b	I-470-1	OF-470	56.9	38.1	4x2 RCB	57	0.003	0.013	6.83	6.66	11.51	8.66	9.00	8.51	**2.5**	2.7	7.1	9.79	1.7
Culvert Station Outfall 469																					
P-469-1	17	b	I-469-1	OF-469	0.9	5.5	18	11	0.003	0.013	7.04	7.01	10.04	8.51	7.44	7.37	**2.6**	1.5	2.3	7.52	2.5
Culvert Station Outfall 467																					
P-467-1L-2	12	g	I-467-1L-2	I-467-1L-1	1.7	5.7	18	200	0.003	0.013	6.77	6.18	11.81	11.21	7.60	7.55	**4.2**	3.5	2.8	7.72	4.1
P-467-1L-1	12	e	I-467-1L-1	I-467-1	2.4	5.7	18	166	0.003	0.013	6.18	5.69	11.21	10.91	7.55	7.47	**3.7**	3.5	3.1	7.70	3.5
P-467-3	-	-	I-467-3	I-467-2	24.1	29.1	2x2 RCB	44	0.010	0.013	6.37	5.92	9.28	10.12	8.46	8.15	**0.8**	0.9	6.0	9.02	0.3
P-467-2	-	-	I-467-2	I-467-1	24.7	16.8	2x2 RCB	68	0.003	0.013	5.92	5.69	10.12	10.91	8.10	7.53	**2.0**	2.2	6.2	8.69	1.4
P-467-1	-	-	I-467-1	OF-467	26.4	40.0	2x2 RCB	14	0.019	0.013	5.69	5.42	10.91	8.49	7.45	6.86	**3.5**	3.2	10.7	9.22	1.7
Culvert Station Outfall 450																					
P-450-4	11	i	I-450-4	I-450-3	1.7	5.8	18	300	0.003	0.013	8.71	7.81	11.81	10.91	9.27	8.55	**2.5**	1.6	2.8	9.39	2.4
P-450-3	11	g	I-450-3	I-450-2	2.7	5.7	18	201	0.003	0.013	7.81	7.22	10.91	10.31	8.53	8.05	**2.4**	1.6	3.2	8.69	2.2
P-450-2	11	e	I-450-2	I-450-1	3.2	5.7	18	175	0.003	0.013	7.22	6.71	10.31	10.01	8.03	7.62	**2.3**	1.6	3.3	8.20	2.1
P-450-1	11	c	I-450-1	OF-450	3.6	6.1	18	9	0.003	0.013	6.71	6.68	10.01	8.18	7.50	7.41	**2.5**	1.8	3.6	7.70	2.3
Culvert Station Outfall 444																					
P-444-3	-	-	I-444-3	I-444-2	23.1	45.0	30	64	0.012	0.013	3.16	2.39	7.80	6.66	6.77	6.57	**1.0**	2.1	4.7	7.11	0.7
P-444-2	-	-	I-444-2	I-444-1	26.8	43.6	36	89	0.004	0.013	2.39	2.01	6.66	7.61	6.55	6.41	**0.1**	1.3	3.8	6.77	-0.1
P-444-1	-	-	I-444-1	OF-444	27.9	45.7	36	81	0.005	0.013	2.01	1.63	7.61	8.00	6.38	6.24	**1.2**	2.6	3.9	6.62	1.0
Culvert Station Outfall 439																					
P-439-5L-4	21	f	I-439-5L-4	I-439-5L-3	1.2	5.7	18	100	0.003	0.013	8.16	7.87	13.61	13.26	8.63	8.44	**5.0**	4.0	2.5	8.73	4.9
P-439-5L-3	21	c	I-439-5L-3	I-439-5L-2	1.7	5.7	18	200	0.003	0.013	7.87	7.28	13.26	12.46	8.43	8.23	**4.8**	3.9	2.8	8.55	4.7
P-439-5L-2	21	e	I-439-5L-2	I-439-5L-1	2.5	5.7	18	228	0.003	0.013	7.28	6.61	12.46	11.72	8.22	8.11	**4.2**	3.7	3.1	8.37	4.1
P-439-5L-1	7	ff	I-439-5L-1	I-439-5	3.4	33.2	18	10	0.100	0.013	4.96	3.96	11.72	11.25	8.04	8.03	**3.7**	5.3	1.9	8.10	3.6
P-439-4L-1	7	dd	I-439-4L-1	I-439-4	1.0	32.1	18	12	0.093	0.013	4.27	3.15	10.80	10.14	7.74	7.73	**3.1**	5.0	0.5	7.74	3.1
Outside of Caltrans - Right-of-Way																					
P-439-3L-2	-	-	I-439-3L-2	I-439-3L-1	35.3	13.0	24	64	0.003	0.013	3.33	3.12	8.70	7.17	8.72	7.17	**ABOVE RIM**	3.4	11.2	10.67	-2.0
P-439-3L-1	-	-	I-439-3L-1	I-439-3	36.4	24.9	24	84	0.012	0.013	3.12	2.10	7.17	9.27	9.54	7.37	**ABOVE RIM**	2.1	11.6	11.62	-4.5
P-439-2L-4	22	i	I-439-2L-4	I-439-2L-3	0.7	5.6	18	108	0.003	0.013	5.64	5.33	9.64	9.58	8.00	8.00	**1.6**	2.5	0.4	8.00	1.6
P-439-2L-3	22	f	I-439-2L-3	I-439-2L-2	1.2	5.6	18	112	0.003	0.013	5.33	5.01	9.58	9.65	8.00	7.98	**1.6**	2.8	0.7	8.01	1.6
P-439-2L-2	22	j	I-439-2L-2	I-439-2L-1	1.3	6.0	18	90	0.003	0.013	5.01	4.72	9.65	9.85	7.98	7.97	**1.7**	3.1	0.7	7.99	1.7
P-439-2L-1	22	c	I-439-2L-1	I-439-2	1.5	5.4	18	105	0.003	0.013	4.72	4.44	9.85	10.06	7.97	7.94	**1.9**	3.6	0.9	7.98	1.9
P-439-7	-	-	I-439-7	I-439-6	10.9	10.6	18	56	0.010	0.013	5.02	4.45	10.12	9.11	8.81	8.21	**1.3**	3.6	6.2	9.40	0.7
P-439-6	-	-	I-439-6	I-439-5	12.7	32.9	30	76	0.006	0.013	4.45	3.96	9.11	11.25	8.19	8.12	**0.9**	2.2	2.6	8.29	0.8
P-439-5	7	e	I-439-5	I-439-4	15.5	27.2	30	184	0.004	0.013	3.96	3.15	11.25	10.14	8.01	7.75	**3.2**	4.8	3.2	8.16	3.1
P-439-4	7	g	I-439-4	I-439-3	15.9	31.0	30	184	0.006	0.013	3.15	2.10	10.14	9.27	7.73	7.45	**2.4**	4.5	3.2	7.89	2.2
P-439-3	7	ff	I-439-3	I-439-2	50.5	21.1	36	10	0.001	0.013	2.10	2.09	9.27	10.06	7.26	7.21	**2.0**	4.2	7.1	8.05	1.2
P-439-2	22	b	I-439-2	I-439-1	52.3	53.0	36	92	0.006	0.013	2.09	1.51	10.06	9.80	7.12	6.56	**2.9**	5.0	7.4	7.97	2.1
P-439-1	-	-	I-439-1	OF-439	54.2	36.9	36	36	0.003	0.013	1.51	1.40	9.80	9.80	6.48	6.24	**3.3**	5.3	7.7	7.39	2.4
Culvert Station Outfall 429																					
P-429-1L-3	20	b	I-429-1L-3	I-429-1L-2	1.2	5.7	18	200	0.003	0.013	10.51	9.92	15.61	14.57	10.97	10.67	**4.6**	3.6	2.5	11.07	4.5
P-429-1L-2	20	d	I-429-1L-2	I-429-1L-1	2.1	6.2	18	84	0.003	0.013	9.92	9.63	14.57	14.30	10.66	10.62	**3.9**	3.2	3.2	10.81	3.8
P-429-1L-1	20	f	I-429-1L-1	I-429-1	2.5	19.8	18	70	0.035	0.013	9.43	6.95	14.30	15.61	10.59	10.56	**3.7**	3.4	7.6	11.50	2.8
P-429-5	-	-	I-429-5	I-429-4	6.2	5.6	18	56	0.003	0.013	7.87	7.71	12.44	10.84	11.03	10.84	**1.4**	3.1	3.5	11.22	1.2
P-429-4	-	-	I-429-4	I-429-3	9.5	13.2	18	72	0.016	0.013	7.71	6.57	10.84	12.91	11.96	11.37	**ABOVE RIM**	1.6	5.4	12.41	-1.6
P-429-3	-	-	I-429-3	I-429-2	11.0	28.0	24	17	0.015	0.013	6.57	6.31	12.91	13.20	11.34	11.30	**1.6**	4.3	3.5	11.53	1.4
P-429-2	-	-	I-429-2	I-429-1	10.9	-33.6	24	133	-0.022	0.013	6.31	9.25	13.20	15.61	11.09	10.57	**2.1**	4.9	3.5	11.28	1.9
P-429-1	-	-	I-429-1	OF-429	12.6	42.9	24	95	0.036	0.013	9.25	5.83	15.61	10.63	10.53	6.58	**5.1**	4.4	11.9	12.72	2.9
Culvert Station Outfall 421																					
P-421-3	-	-	I-421-3	I-421-2	122.8	223.4	48	167	0.006	0.013	3.90	2.89	15.00	16.99	6.90	6.80	**8.1**	7.1	9.1	8.19	6.8
P-421-2	-	-	I-421-2	I-421-1	123.3	113.2	48	103	0.002	0.013	2.89	2.73	16.99	16.25	6.76	6.60	**10.2**	10.1	4.9	7.13	9.9
P-421-1	-	-	I-421-1	OF-421	123.8	130.6	48	208	0.002	0.013	2.73	2.30	16.25	10.00	6.58	6.24	**9.7**	9.5	5.9	7.12	9.1
Culvert Station Outfall 416																					
P-416-2	-	-	I-416-2	I-416-1	2.4	4.1	15	88	0.004	0.013	14.47	14.12	18.00	24.21	15.64	15.53	**2.4**	2.3	3.5	15.82	2.2
P-416-1	-	-	I-416-1	OF-416	5.1	3.9	24	117	0.001	0.024	14.12	14.00	24.21	19.70	15.52	14.80	**8.7**	8.1	1.6	15.56	8.6
Culvert Station Outfall 411																					
P-411-2	-	-	I-411-2	I-411-1	3.0	14.2	15	84	0.048	0.013	29.12	25.09	32.37	30.59	29.81	25.48	**2.6**	2.0	9.1	31.10	1.3
P-411-1	-	-	I-411-1	OF-411	5.5	11.5	18	277	0.041	0.024	16.99	5.70	30.59	12.00	17.90	6.43	**12.7**	12.1	6.4	18.54	12.0
Culvert Station Outfall 406																					
P-406-2	-	-	I-406-2	I-406-1	2.7	12.9	15	86	0.040	0.013	35.32	31.91	38.94	37.71	35.98	32.72	**3.0**	2.4	8.3	37.05	1.9
P-406-1	-	-	I-406-1	OF-406	5.1	70.6	18	68	0.452	0.013	31.81	1.06	37.71	12.60	32.68	6.24	**5.0**	4.4	23.2	41.03	-3.3
Culvert Station Outfall 395																					
P-395-3	-	-	I-395-3	I-395-2	2.3	7.2	18	70	0.005	0.013	30.62	30.29	36.00	35.82	31.20	30.99	**4.8**	3.9	3.6	31.40	4.6
P-395-2	-	-	I-395-2	I-395-1	2.6	6.0	18	90	0.003	0.013	30.29	30.00	35.82	36.20	30.98	30.61	**4.8**	4.0	3.3	31.14	4.7
P-395-1	-	-	I-395-1	OF-395	5.8	31.7	18	66	0.091	0.013	12.00	6.00	36.20	12.00	12.93	6.43	**23.3**	22.7	13.6	15.82	20.4

Notes
(1) ft = feet, cfs = cubic feet per second, ft/s = feet per second
(2) Freeboard is HGL (Hydraulic Grade Line) below Rim of Inlet
(3) Discharge is from the Rational Method, Q = CIA
(4) Downstream HGL set to 6.24 Mean Higher High Water of Mare Island near San Pablo Bay

TABLE 4

BKF #087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Inlet on gutter Drainage Area, 25-year Flow

Drainage System	Drainage Unit	Inlet Type	Alignment	Station	AREA ft^2	C=0.95 CA ft^2	C=0.95 CA acres	Intensity in/hr	Flow cfs
-	-	EX	J1R (Rt)	406+00	31,699	30,114	0.69	3.45	2.39
-	-	EX	J1R (Rt)	411+00	34,746	33,009	0.76	3.45	2.61
20	a	G2	J1R (Med)	425+00	15,442	14,670	0.34	3.45	1.16
20	c	G2	J1R (Med)	427+00	14,436	13,714	0.31	3.45	1.09
20	e	G2	J1R (Med)	427+84	6,562	6,234	0.14	3.45	0.49
21	a	G2	J1R (Med)	430+00	15,666	14,883	0.34	3.45	1.18
21	b	G2	J1R (Med)	431+00	7,262	6,899	0.16	4.45	0.70
21	d	G2	J1R (Med)	433+00	14,364	13,646	0.31	3.45	1.08
21	g	MGDO	J1R (Med)	435+27	16,150	15,343	0.35	3.45	1.22
7	ee	G2	J1R (Med)	437+11	12,851	12,208	0.28	3.45	0.97
22	b	G2	J1R (Med)	438+95	11,554	10,976	0.25	3.45	0.87
22	d	G2	J1R (Med)	440+00	6,157	5,849	0.13	3.45	0.46
22	e	G2	J1R (Med)	440+90	5,079	4,825	0.11	3.45	0.38
22	h	G2	J1R (Med)	442+02	12,294	11,679	0.27	3.45	0.93
22	k	MGDO	J1R (Med)	443+10	8,871	8,427	0.19	3.45	0.67
11	d	G2	J1R (Rt)	449+26	9,731	9,244	0.21	3.45	0.73
11	f	G2	J1R (Rt)	450+00	16,800	15,960	0.37	3.45	1.26
11	h	G2	J1R (Rt)	453+00	16,800	15,960	0.37	3.45	1.26
11	j	G2	J1R (Rt)	456+00	22,391	21,271	0.49	3.45	1.68
12	h	G2	J1R (Rt)	464+00	22,408	21,288	0.49	3.45	1.69
12	f	G2	J1R (Rt)	466+00	11,200	10,640	0.24	3.45	0.84
12	d	G2	J1R (Rt)	467+66	9,301	8,836	0.20	3.45	0.70
17	a	G2	J1R (Rt)	469+89	12,535	11,908	0.27	3.45	0.94
18	a	G2	J1R (Rt)	473+20	22,235	21,123	0.48	3.45	1.67
19	a	G2	J1R (Rt)	475+25	14,911	14,165	0.33	3.45	1.12
19	h	G2	J1R (Rt)	477+14	6,365	6,047	0.14	3.45	0.48
16	h	G2	J1R (Med)	478+50	5,644	5,362	0.12	3.45	0.42
16	j	G2	J1R (Med)	479+00	2,407	2,287	0.05	3.45	0.18

TABLE 5

BKF #087003-20
MSN HOV A3 IMPROVEMENTS
DRAINAGE REPORT
Gutter Spread, Inlet Interception Calculations

Drainage System	Drainage Unit	Alignment (Location)	Inlet[1]	Station	Bypass to Downstream Station	Flow Previous (cfs)	25-year Inflow (cfs)	Total Flow cfs	Manning's Roughness "n"	Longitudinal Slope (ft/foot)	Cross Slope V:H (ft/foot)	Depth (feet)	Spread (feet)	Shoulder (feet)	Area (square feet)	Velocity ft/s	Inlet Width (feet)	Frontal Flow Efficiency	Splash Over Velocity (fps)	Splash-Over Efficiency	Frontal Inflow[2] (cfs)	Side Bypass (cfs)	Inlet Length (feet)	Sideflow Capture Efficiency	Sideflow[2] (cfs)	Captured Flow (cfs)	Flow Bypass (cfs)	Percent Bypass (%)
-	-	J1R (Rt)	EX	406+00	406+00		2.39	2.39	0.016	0.0154	0.050	0.26	5.2	10.0	0.68	3.51	1.97	0.72	5.9	1.00	1.71	0.67	3.33	0.36	0.24	1.95	0.43	18%
-	-	J1R (Rt)	EX	411+00		0.43	2.61	3.05	0.016	0.0154	0.050	0.29	5.7	10.0	0.82	3.73	1.97	0.68	5.9	1.00	2.06	0.99	3.33	0.33	0.33	2.39	0.66	22%
														10.0														
20	a	J1R (Med)	G2	425+00	427+00		1.16	1.16	0.016	0.0063	0.020	0.17	8.4	10.0	0.70	1.66	1.97	0.51	5.9	1.00	0.60	0.57	3.33	0.46	0.26	0.86	0.31	26%
20	c	J1R (Med)	G2	427+00	427+84	0.31	1.09	1.39	0.016	0.0039	0.020	0.20	9.8	10.0	0.96	1.45	1.97	0.45	5.9	1.00	0.63	0.76	3.33	0.52	0.40	1.03	0.37	26%
20	e	J1R (Med)	G2	427+84	430+00	0.37	0.49	0.86	0.016	0.0035	0.020	0.17	8.3	10.0	0.70	1.24	1.97	0.51	5.9	1.00	0.44	0.42	3.33	0.59	0.25	0.69	0.17	20%
21	a	J1R (Med)	G2	430+00	433+00	0.17	1.18	1.35	0.016	0.0035	0.020	0.20	9.9	10.0	0.97	1.39	1.97	0.45	6.9	1.00	0.61	0.75	3.33	0.54	0.40	1.01	0.34	25%
21	b	J1R (Med)	G2	431+00	435+27	0.34	0.70	1.05	0.016	0.0035	0.020	0.18	9.0	10.0	0.80	1.30	1.97	0.48	5.9	1.00	0.51	0.54	3.33	0.57	0.31	0.81	0.23	22%
21	d	J1R (Med)	G2	433+00	435+27	0.34	1.08	1.42	0.016	0.0035	0.020	0.20	10.1	10.0	1.01	1.40	1.97	0.44	5.9	1.00	0.63	0.80	3.33	0.54	0.43	1.05	0.37	26%
21	g	J1R (Med)	MGDO	435+27	437+11	0.37	1.22	1.58	0.016	0.0051	0.020	0.20	9.8	10.0	0.95	1.66	3.94	0.75	5.9	1.00	1.19	0.40	3.33	0.46	0.18	1.37	0.22	14%
7	ee	J1R (Med)	G2	437+11	438+95	0.22	0.97	1.18	0.016	0.0051	0.020	0.18	8.8	10.0	0.77	1.54	1.97	0.49	6.9	1.00	0.58	0.60	3.33	0.49	0.29	0.88	0.30	26%
22	b	J1R (Med)	G2	438+95	440+00	0.30	0.87	1.17	0.016	0.0031	0.020	0.19	9.6	10.0	0.92	1.28	1.97	0.46	6.9	1.00	0.54	0.63	3.33	0.58	0.37	0.90	0.27	23%
22	d	J1R (Med)	G2	440+00	440+90	0.27	0.46	0.73	0.016	0.0020	0.020	0.17	8.7	10.0	0.76	0.96	1.97	0.50	7.9	1.00	0.36	0.37	3.33	0.69	0.26	0.62	0.11	15%
22	e	J1R (Med)	G2	440+90	442+02	0.11	0.38	0.50	0.016	0.0010	0.020	0.17	8.6	10.0	0.73	0.67	1.97	0.50	6.9	1.00	0.25	0.25	3.33	0.81	0.20	0.45	0.05	9%
22	h	J1R (Med)	G2	442+02		0.08	0.93	1.01	0.016		0.020	0.15	7.5	10.0	SEE TABLE 6 "INLETS IN SAG CONDITION"													
22	k	J1R (Med)	MGDO	443+10	442+02		0.67	0.67	0.016	0.0010	0.020	0.19	9.6	10.0	0.92	0.73	3.94	0.76	6.9	1.00	0.51	0.16	3.33	0.79	0.13	0.63	0.03	5%
														10.0														
11	d	J1R (Rt)	G2	449+26		0.15	0.73	0.89	0.016	0.0030	0.037	0.22	5.9	10.0	0.64	1.37	1.97	0.66	2.9	1.00	0.59	0.30	3.33	0.69	0.21	0.79	0.09	11%
11	f	J1R (Rt)	G2	450+00	449+26	0.16	1.26	1.43	0.016	0.0030	0.050	0.29	5.8	10.0	0.85	1.67	1.97	0.67	3.9	1.00	0.95	0.48	3.33	0.68	0.32	1.27	0.15	11%
11	h	J1R (Rt)	G2	453+00	450+00	0.21	1.26	1.47	0.016	0.0030	0.050	0.30	5.9	10.0	0.87	1.68	1.97	0.66	4.9	1.00	0.97	0.50	3.33	0.67	0.34	1.31	0.16	11%
11	j	J1R (Rt)	G2	456+00	453+00		1.68	1.68	0.016	0.0030	0.050	0.31	6.2	10.0	0.97	1.74	1.97	0.64	5.9	1.00	1.08	0.61	3.33	0.66	0.40	1.48	0.21	12%
														10.0														
12	h	J1R (Rt)	G2	464+00	466+00		1.69	1.69	0.016	0.0030	0.050	0.31	6.2	10.0	0.97	1.74	1.97	0.64	7.9	1.00	1.08	0.61	3.33	0.66	0.40	1.48	0.21	12%
12	f	J1R (Rt)	G2	466+00	467+66	0.21	0.84	1.05	0.016	0.0030	0.050	0.26	5.2	10.0	0.68	1.55	1.97	0.72	8.9	1.00	0.75	0.29	3.33	0.71	0.21	0.96	0.09	8%
12	d	J1R (Rt)	G2	467+66	469+89	0.09	0.70	0.79	0.016	0.0030	0.050	0.23	4.7	10.0	0.55	1.44	1.97	0.77	8.9	1.00	0.60	0.18	3.33	0.73	0.13	0.74	0.05	6%
17	a	J1R (Rt)	G2	469+89	473+20	0.05	0.94	0.99	0.016	0.0030	0.050	0.25	5.1	10.0	0.65	1.53	1.97	0.73	9.9	1.00	0.72	0.27	3.33	0.71	0.19	0.91	0.08	8%
18	a	J1R (Rt)	G2	473+20	475+25	0.08	1.67	1.75	0.016	0.0030	0.050	0.32	6.3	10.0	1.00	1.76	1.97	0.63	10.9	1.00	1.11	0.64	3.33	0.66	0.42	1.53	0.22	13%
19	a	J1R (Rt)	G2	475+25		0.27	1.12	1.39	0.016		0.033	0.19	5.6	10.0	SEE TABLE 6 "INLETS IN SAG CONDITION"													
19	h	J1R (Rt)	G2	477+14	475+25		0.48	0.48	0.016	0.0030	0.026	0.15	5.8	10.0	0.44	1.08	1.97	0.67	11.9	1.00	0.32	0.16	3.33	0.71	0.11	0.43	0.05	10%
														10.0														
16	h	J1R (Med)	G2	478+50		0.03	0.42	0.45	0.016	0.0052	0.010	0.09	9.7	10.0	0.45	1.01	1.97	0.45	11.9	1.00	0.21	0.25	3.33	0.50	0.12	0.33	0.13	28%
16	j	J1R (Med)	G2	479+00	478+50	0.00	0.18	0.18	0.016	0.0052	0.010	0.07	6.9	10.0	0.22	0.81	1.97	0.59	12.9	1.00	0.11	0.07	3.33	0.60	0.04	0.15	0.03	16%
														10.0														

Notes: 1. See Table 4 for tributary area, runoff coefficient, rainfall intensity and 25-year flow for each inlet.

For all grate types with L = 3 feet, Rf = 1 if V<5.9 fps (Chart 7, HEC-12)
Inlet modeled on Ground is Caltrans Type 24 grate detail on Pg D77A
Width is 1.97 ft
Length is 3.33 ft

For all grate types with L = 3 feet, Rf = 1 if V<5.9 fps (Chart 7, HEC-12)
Inlet modeled on Ground is 2 Caltrans Type 24 grate detail on Pg D77A
Width is 3.94 ft
Length is 3.33 ft

TABLE 6

BKF #087003-20
MSN HOV A3 IMPROVEMENTS
Inlet Sag Calculations

Station	Flow			Inlet Position & Shape					Weir Calculation					Orifice Calculation					
	previous (cfs)	Inlet (cfs)	Total (cfs)	Location	Width (ft)	Length (ft)	Perimeter (ft)	Area (ft^2)	Cw	Cclogging	Perimeter (ft)	H (ft)	H (in)	Co	Cclogging	Area (ft^2)	g (ft/s^2)	H (ft)	H (in)
442+02	0.08	0.93	1.01	In Sag	1.97	3.33	7.27	6.56	3	0.8	7.27	0.15	1.79	0.6	0.5	6.56	32.2	0.00	0.05
475+25	0.27	1.12	1.39	In Sag	1.97	3.33	7.27	6.56	3	0.8	7.27	0.19	2.22	0.6	0.5	6.56	32.2	0.01	0.09

Weir Discharge Q=CW*Cclogging*LP*H3/2
Q - Discharge
Cw - Weir Coefficient
Cclogging - Clogging Coefficient
LP - Perimeter
H - Height

Orifice Discharge Q=Co*Cclogging*A*(2*g*H).5
Q - Discharge
Co - Orifice Coefficient
Cclogging - Clogging Coefficient
A - Area
g- Gravitational Acceleration
H - Height

Flanking Inlets at Sag Calculations
(per section 4.4.6.3, HEC 22)

Step 1. Find rate of vertical curvature, K.

K= L / (Send-S beg)
K = 800 ft / (0.30% - (-1.200%))
K = 533 ft/ %

Step 2. Determine depth at design spread.

d= Sx T
d= (0.05) (10)
d = 0.5 ft

Step 3. Determine the depth for the flanker locations.

d = 63% of depth over inlet at bottom of sag location, per section 4.4.6.3, HEC 22
d= (.63) (0.5)
d= .32 ft

Step 4. Compute distance from sag point per following equation.

X= (200 d K)0.5
X= ((200) (.18) (533))^0.5
X= 138 ft ----------> Flank inlets 138 ft from sag point

TABLE 7

BKF# 097084
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Drainage Ditches Normal Depth, 25-Year Storm

Begin Ditch Station	End Ditch Station	25-Year Rainfall Intensity (in/hour)	Pavement Drainage Area [1] (acres)	Runoff Coefficient	Total 25-year Flow (cfs)	Swale Slope (ft/foot)	Side-slope (H:V)	Bottom Width (feet)	25-Year Ditch Depth (feet)	Wetter Perimeter Top Width (feet)	Manning's Roughness ("n")	25-year Flow Area (sq feet)	25-year Wetted Perimeter (feet)	25-year Flow (cfs)	25-Year Velocity (fps)	25-Year Velocity Head (feet)	Freeboad .2 x Energy Head (feet)	25-Year Required Depth (feet)	Construction Documents Depth (feet)	Meet Convayence and Freeboard Requirement
Median Ditches																				
402+50	406+00	3.45	0.82	0.95	2.69	0.0070	4	4	.41	7.30	0.0500	2.33	7.40	2.69	1.15	0.02	0.09	0.50	0.75	Yes
406+00	411+00	3.45	0.90	0.95	2.95	0.0168	4	4	.34	6.73	0.0500	1.83	6.82	2.95	1.61	0.04	0.08	0.42	0.75	Yes
Southbound Shoulder Ditches																				
423+00	429+00	3.45	1.43	0.95	4.69	0.0050	4	4	.61	8.84	0.0500	3.89	8.99	4.69	1.21	0.02	0.13	0.73	0.75	Yes
429+00	435+00	3.45	0.99	0.95	3.24	0.0030	4	4	.57	8.57	0.0500	3.59	8.71	3.24	.90	0.01	0.12	0.69	0.75	Yes
435+00	439+00	3.45	0.64	0.95	2.10	0.0080	4	4	.35	6.78	0.0500	1.87	6.86	2.10	1.12	0.02	0.07	0.42	0.75	Yes
439+00	444+00	3.45	0.92	0.95	3.02	0.0025	4	4	.58	8.61	0.0500	3.64	8.75	3.02	.83	0.01	0.12	0.69	0.75	Yes
449+35	446+00	3.45	0.71	0.95	2.33	0.0035	4	4	.46	7.68	0.0500	2.69	7.79	2.33	.87	0.01	0.09	0.55	0.75	Yes
459+50	449+35	3.45	1.24	0.95	4.06	0.0035	4	4	.62	8.94	0.0500	3.99	9.09	4.06	1.02	0.02	0.13	0.74	0.75	Yes
459+50	467+50	3.45	1.18	0.95	3.87	0.0040	4	4	.58	8.65	0.0500	3.67	8.79	3.87	1.05	0.02	0.12	0.70	0.75	Yes

Notes: 1. Pavement Drainage Area includes all unpaved shoulder within the Caltrans right-of-way modeled consevatively as pavement with a C=0.95 for simplicity.

TABLE 8

BKF# 087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Rock Slope Protection Calculations HEC-14 Method

						HEC-14 Calculations					Construction Documents		
Alignment	Drainage System	Drainage Unit	25-Yeak Peak Flow Rate (cfs)	Diamater (inches)	(feet)	$D_{adjusted}$ [1]	D_{50} [2] (feet)	(inches)	Apron Length (feet)	Apron Depth [3] (feet)	D_{50} (inches)	Apron Length (feet)	Apron Depth (feet)
J1R	11	a	3.6	18	1.5	N / A	0.11	1.3	6	0.4	6	6	1.25
J1R	17	d	0.9	18	1.5	N / A	0.02	0.2	6	0.1	6	6	1.25
J1R	18	e	1.7	18	1.5	N / A	0.04	0.5	6	0.1	6	6	1.25
J1R	19	e	1.5	18	1.5	N / A	0.03	0.4	6	0.1	6	6	1.25

N/A - Not Applicable

Notes:
1. HEC-14 Equation 10.5 - Diameter adjustment for supercritical flow only (Diameter adjustment is used for calculations D_{50} only and does not represent a physical change in diameter.)
2. HEC-14 Equation 10.4 - D_{50} sizing for circular culverts
3. Apron Depth are based on calculated D_{50}

TABLE 9

BKF# 087003-20
MSN A3 HOV IMPROVEMENTS
DRAINAGE REPORT
Hydraulic Condition within Bioretention Areas (25-Year Flow Rate)

River Station		25-Year Peak Flow (cfs)	Minimum Channel Elev. (ft)	Water Surface Elevation (ft)	Flow Depth (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Velocity Channel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Linear bioretention areas - 4 foot bottom width												
251		2.1	8.75	9.20	0.45	0	9.22	0.00263	0.9	2.6	7.6	0.24
140.5	Rock Berm	2.1	8.44	9.06	0.62	0	9.06	0.00081	0.6	4.0	8.9	0.14
139.5		2.1	8.76	9.01	0.25	8.95	9.06	0.02351	1.8	1.3	6.0	0.64
139		2.1	8.76	8.95	0.19	8.95	9.04	0.06029	2.4	0.9	5.5	0.98
138		2.1	8.42	8.87	0.45	0	8.88	0.00268	0.9	2.6	7.6	0.24
27.5		2.1	8.09	8.71	0.62	0	8.71	0.00094	0.7	3.6	7.7	0.15
26.5	Rock Berm	2.1	8.41	8.66	0.25	8.6	8.71	0.02348	1.8	1.3	6.0	0.64
26		2.1	8.41	8.60	0.19	8.6	8.69	0.06029	2.4	0.9	5.5	0.98
25		2.1	8.07	8.50	0.43	8.26	8.51	0.00335	1.0	2.4	7.4	0.26
0		2.1	8.00	8.19	0.19	8.19	8.28	0.06029	2.4	0.9	5.5	0.98

Notes Rock Berm every 110-feet based on 0.3% slopea and 4-inch height

APPENDIX A

Drainage Criteria

INTRODUCTION

The following Technical Memorandum documents the design criteria and parameters used for the layout and sizing of drainage improvements for the proposed Marin Sonoma Narrows A3 HOV Improvements, Drainage Report.

DESIGN CRITERIA AND PARAMETERS

Design flow rates to Project facilities are computed using the Rational Method. Depth of flow and flow velocity through Project facilities are computed using Manning's Equation.

Peak Flow Rate – Rational Method

The following parameters are used for computing the peak flow rate:

Drainage Area – Project drainage areas are delineated using contours developed from Project aerial topography, where available. USGS is used to extend drainage areas to the west. Drainage areas are based on natural drainage paths. Local grading for roadways and trails may direct flows away from natural drainage paths.

Runoff Coefficient - Runoff Coefficients were calculated using Figure 819.2A of the Caltrans Highway Design Manual, page 810-18 of the September 2006 version with the following inputs –

Soil types and Infiltration properties are taken from the USDA soil service soil classification website.

Relief is from the site topographic map.

Site visits and aerial photos are used to classify Vegetal Cover and Surface Storage. In general, vegetal cover is excellent and surface storage is normal.

Rainfall Intensity - Rainfall intensities are identified for the following three (3) nearby rainfall measuring stations using the Caltrans WINIDF v1.0 computer program.

Novato FS#1 - 2.4 miles from the MSN site - elevation 35

Petaluma FS No. 2 – 8.2 miles from the MSN site - elevation 16

Nacasio Dam – 10.0 miles from the MSN site - elevation 315.

The Novato Fire Station #1 gage corresponds best to site conditions and is recommended for use on the project. The Petaluma gage provides rainfall intensities about 12% less intense than the Novato gage, corresponding to a mean annual precipitation about 18 percent lower than for the Novato rain gage. The Nacasio gages provide rainfall totals about 10 percent higher than the Novato Fire Station #1 gage. Theis rain gages is at a higher elevation and has more intense rainfall intensities. The IDF for the Novato FS#1 rain gage has a rainfall intensity of 1.5 inches per hour for a 30-minute duration rainfall event.

Time of Concentration

The time of concentration (Tc) is computed as the sum of overland flow time, shallow flow time and concentrated flow. If the initial Tc calculated is less than 5 minutes, a 5-minute Time of Concentration factor is used. See Table 1C for the Times of Concentration. Equations used are presented in Section 816.6 of the Highway Design Manual. Sheet flow travel time is used for the initial flow path and is calculated using the equation presented in Section 816.6 (1) and is based on the Kinematic Wave equation. A coefficient of 0.15 is used representing short prairie grass. The 2-year, 24-hour precipitation amount of 3.5 inches per 24 hours is used in the analyses. The length of overland flow is calculated such that $n * L / S^{1/2}$ is equal to 100 with a maximum length of overland flow of 300 feet. After this distance, the time of concentration is calculated based on shallow concentrated flow. As a simplification, the slope for overland flow is computed using the initial 300 feet of the flow path and the slope for shallow flow uses the same point as the upper point for calculating the slope of the shallow concentrated flow. Refining the transition point location would result in a minor change to the slope and will not significantly change the total time of concentration. The shallow concentrated flow equation is used to a point where there are defined channels on the topographic maps. A k factor of 0.213 is used representing short pasture grasses. A flow velocity of 5 feet per second is used to calculated travel time as concentrated flows. The flow velocity is based on an average of the flow velocities computed in the HEC-RAS analyses for the upper reaches of the modeled Creeks. The total time of concentration is the combined overland flow, shallow concentrated flow and concentrated flow travel times. For the drainage area to Station 439, a shallow concentrated flow velocity of 5 feet per second is used based on developed conditions.

Any travel time within project facilities is added to the inlet time of concentration to calculate flow at downstream locations.

Flow Depth and Velocity – Manning's Equation

Water Levels in Creeks

Water levels in Creeks are computed using the US Army Corps of Engineers HEC-RAS River Analysis System Computer Model. A Manning's Roughness factor of 0.045 is used for the vegetation-lined channels.

The downstream water level is set based on the following:

- Elevation 6.24, (MHHW of Mare Island near San Pablo Bay, Drainage Report – Marin-Sonoma Narrows Segment A (Phase 1), dated February 22, 2010, NAVD 1988)

Flow Depth adjacent to Caltrans Travelway

The HEC-22 method is used to calculate flow depths on the shoulder. Flow is calculated using the Equation:

$$Q = K_c / n * S_x^{1.67} * S_L^{0.5} * T^{2.67}$$

Or T = (Q * N / (Kc * Sx1.67 * Sl.5) 1 /2.67

Where: $K_c = 0.56$

n = 0.016

S_x = Cross Slope

S_L = Longitudinal Slope

T Spread Width (feet)

Highway drainage improvements are sized to convey the 25-year storm event within the shoulder with no inundation of the travel way.

Inlets capacity in sag locations is calculated using the orifice equation, with 50 percent flow reduction for clogging and the weir equation with a coefficient of 3.0 and a 20 percent reduction in flow to account for clogging. The more restrictive equation is used to determine ponding depth.

The flow capacity of inlets on a continuous grade is determined based on a spill-over velocity of 5.9 feet per second, and no reduction in surface area to account for clogging.

Closed conduits systems are designed using the following Caltrans Standards:

- Max HGL in an inlet 0.75-feet below grate elevation HDM 838.3
- Inlets in series are spaced apart 20-feet minimum HDM 837.3
- Max concentrated sheet flow across pavement 0.10 cfs HDM 831.4

- Energy Gradient should not rise above the lip of intake HDM 838.3
- Min pipe diameter under roadbed 18-inches HDM 838.4
- Min pipe design slope, half full velocity of 3.0-feet/second HDM 838.4
- Max pipe access spacing HDM 838.5
- Manning's Coefficient HDM Table 851.2

WINIDF 1.0 OUTPUT TABLE

10/10/2011

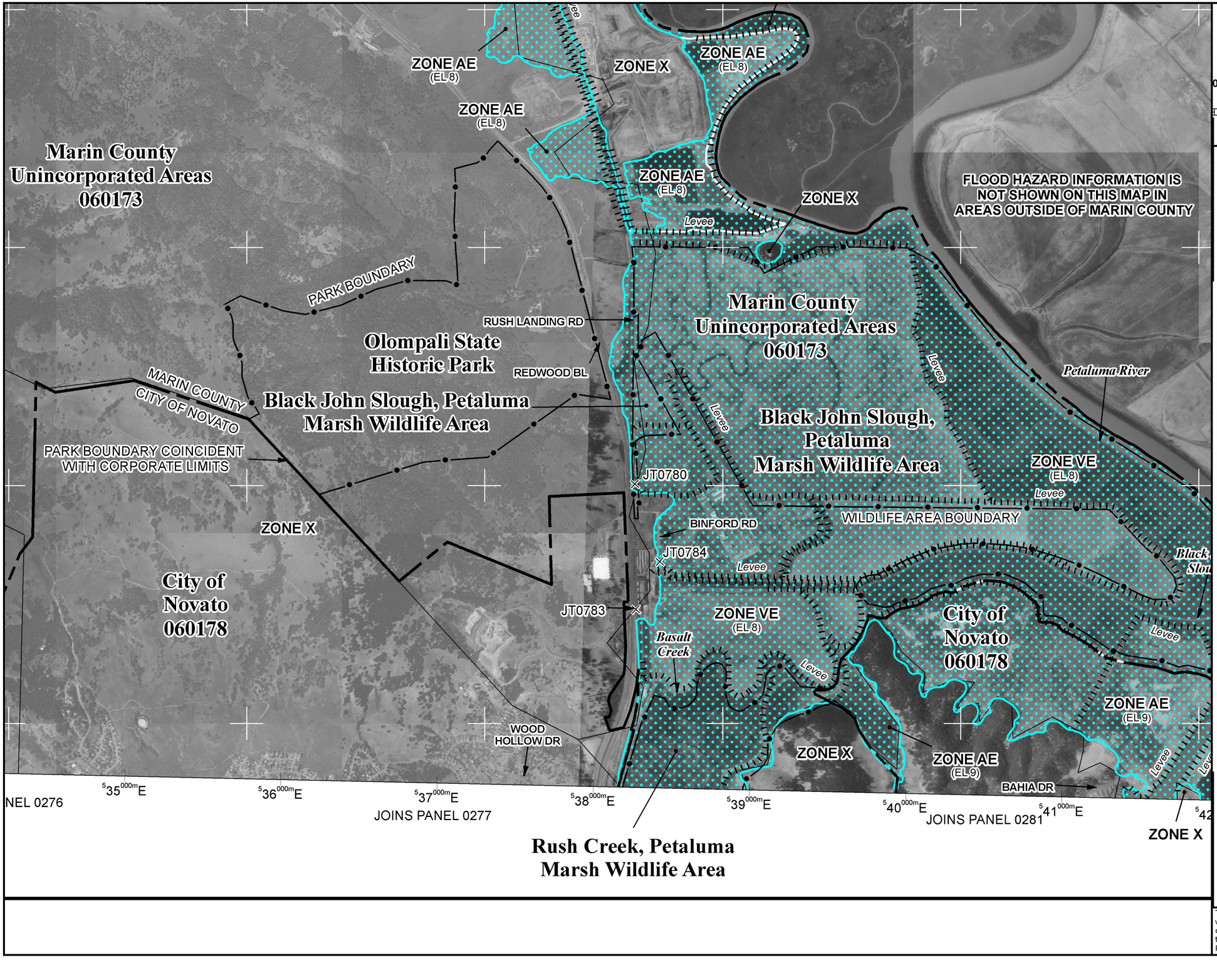
Input values: Lat.: 38.105 deg. Long.: 122.537 deg. Return Period: 2 yrs.

Selected Station(s)	Station ID	Elev.	Lat.	Long.	Dist.
		ft	deg.	deg.	miles
NOVATO FS #1	E206290001	35	38.105	122.537	0.00

Output table (Intensities in inches/hour):

Dur.\RP	2-yr	2-yr	10-yr	25-yr	50-yr	100-yr	10000-yr
5-min	1.713	1.725	2.885	3.450	3.889	4.297	6.900
10-min	1.246	1.254	2.098	2.508	2.827	3.124	5.016
15-min	1.034	1.041	1.741	2.081	2.346	2.592	4.163
30-min	0.751	0.757	1.265	1.513	1.706	1.884	3.026
60-min	0.546	0.550	0.920	1.100	1.240	1.370	2.200
120-min	0.397	0.400	0.669	0.800	0.901	0.996	1.599
4-hr	0.289	0.291	0.486	0.581	0.655	0.724	1.163
8-hr	0.210	0.211	0.353	0.423	0.476	0.526	0.845
16-hr	0.153	0.154	0.257	0.307	0.346	0.383	0.615
24-hr	0.127	0.127	0.213	0.255	0.287	0.318	0.510

a = 0.5463 b = -0.460 1.00 min



MAP SCALE 1" = 2000'

000 0 2000 4000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0175D

FIRM

FLOOD INSURANCE RATE MAP

MARIN COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 175 OF 531

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARIN COUNTY	060173	0175	D
NOVATO, CITY OF	060178	0175	D

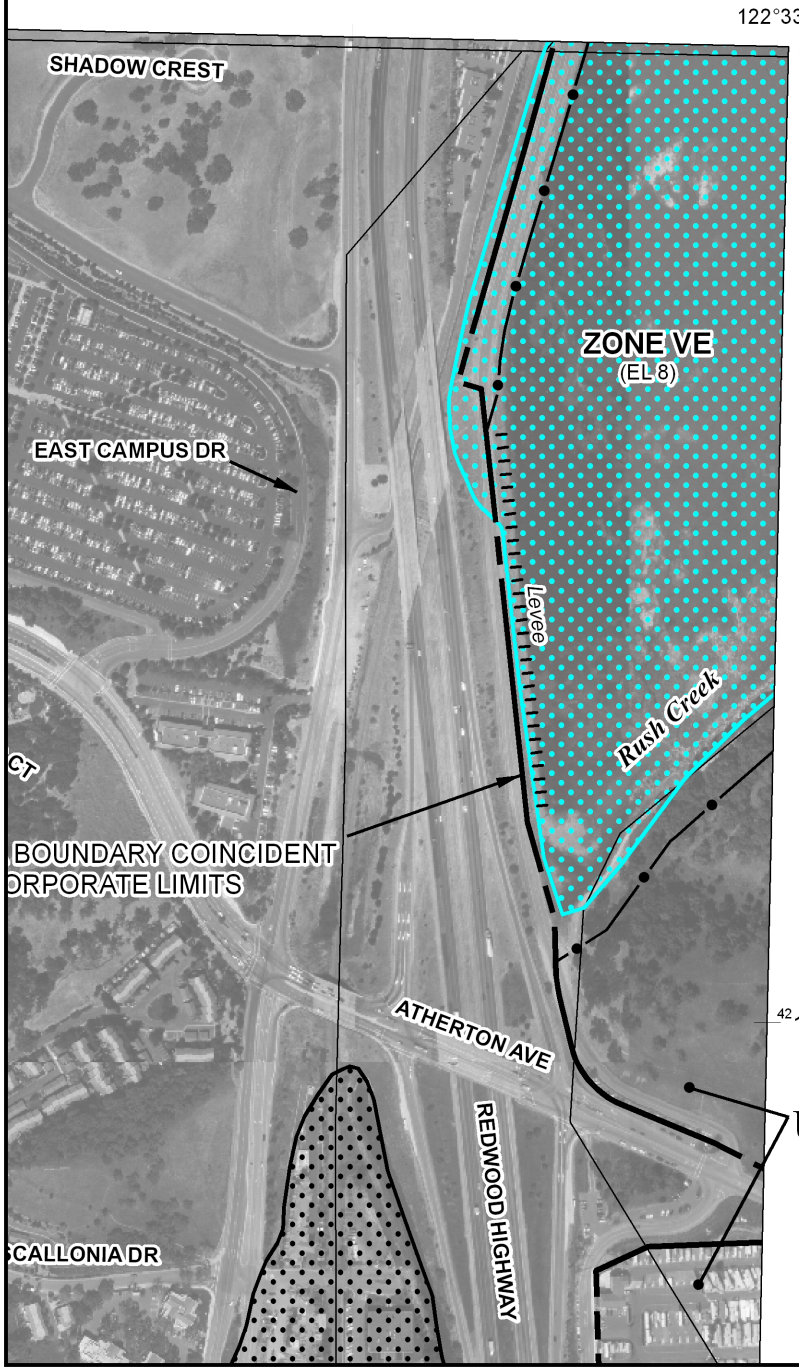
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06041C0175D

EFFECTIVE DATE
MAY 4, 2009

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



Marin County Unincorporated Areas 060173

MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0277D

FIRM

FLOOD INSURANCE RATE MAP

MARIN COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 277 OF 531

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARIN COUNTY	060173	0277	D
NOVATO, CITY OF	060178	0277	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06041C0277D

EFFECTIVE DATE
MAY 4, 2009

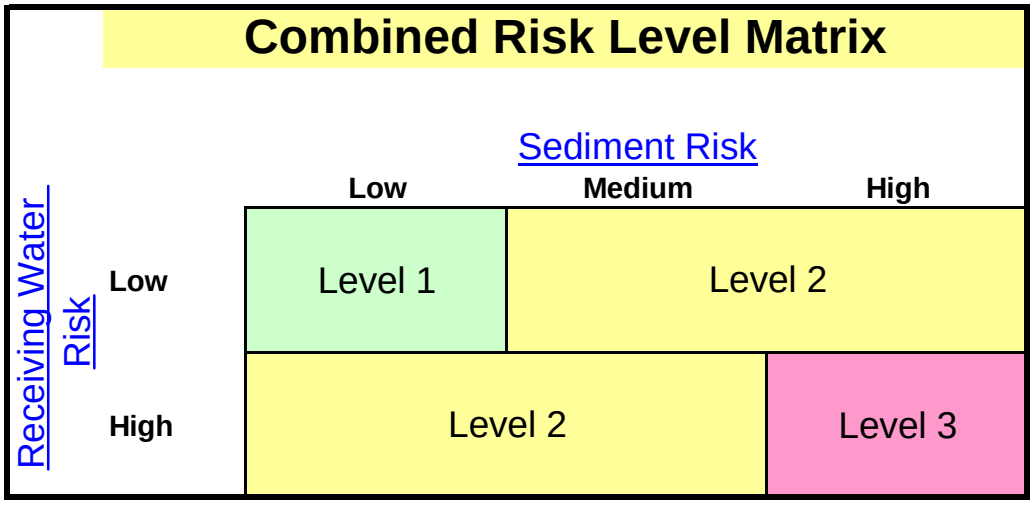
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

RISK LEVEL ASSESSMENT

MSN A3

Combined Risk Level Matrix



Project Sediment Risk:	**Medium**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

	A	B	C
2	**Sediment Risk Factor Worksheet**		**Entry**
3	**A) R Factor**		
4	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
5	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
6	**R Factor Value**		40
7	**B) K Factor (weighted average, by area, for all site soils)**		
8	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
9	Site-specific K factor guidance		
10	**K Factor Value**		0.2
11	**C) LS Factor (weighted average, by area, for all slopes)**		
12	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
13	LS Table		
14	**LS Factor Value**		1.16
15			
16	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		9.3
17	**Site Sediment Risk Factor**		**Low**
18	Low Sediment Risk: < 15 tons/acre		
19	Medium Sediment Risk: >=15 and <75 tons/acre		
20	High Sediment Risk: >= 75 tons/acre		
21			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	**Yes**	**High**
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml		

Region 1 Basin Plan

Region 2 Basin Plan

Region 3 Basin Plan

Region 4 Basin Plan

Region 5 Basin Plan

Region 6 Basin Plan

Region 7 Basin Plan

Region 8 Basin Plan

Region 9 Basin Plan

USDA United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Link | Logout | Help

A | A | A

Area of Interest (AOI) | Soil Map | Soil Data Explorer | Shopping Cart (Free)

View Soil Information By Use: All Uses

Printable Version | Add to Shopping Cart

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Search

Properties and Qualities Ratings

Open All | Close All

Soil Chemical Properties

Soil Erosion Factors

K Factor, Rock Free

View Description | View Rating

View Options

Map

Table

Description of Rating

Rating Options

Detailed Description

Advanced Options

Aggregation Method: Dominant Condition

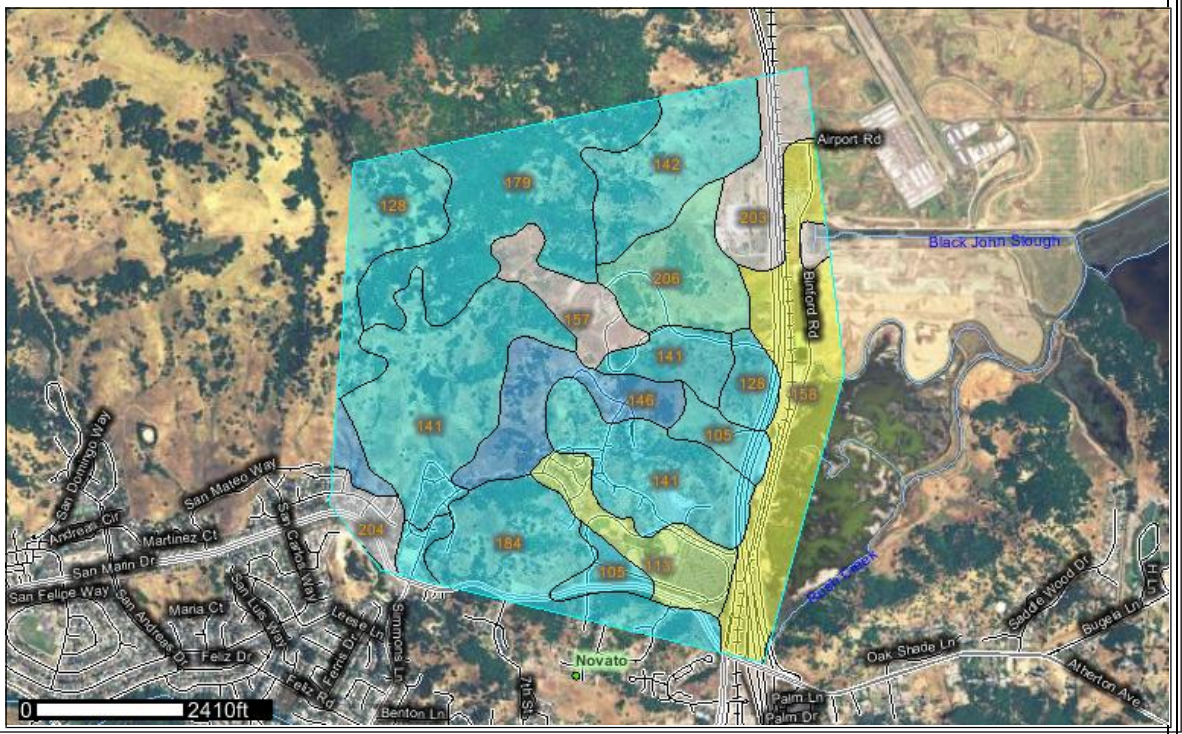
Component Percent Cutoff

Tie-break Rule: Lower / Higher

Layer Options: Surface Layer / Depth Range

Map — K Factor, Rock Free

Scale (not to scale)



Tables — K Factor, Rock Free — Summary By Map Unit

Summary by Map Unit — Marin County, California (CA041)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI

Top Depth

Bottom Depth

Inches

Centimeters

All Layers

View Description View Rating

K Factor, Whole Soil

T Factor

Wind Erodibility Group

Wind Erodibility Index

Soil Physical Properties

Soil Qualities and Features

Water Features

105	BLUCHER-COLE COMPLEX, 2 TO 5 PERCENT SLOPES	.37	58.2	4.1%
113	CLEAR LAKE CLAY	.24	64.7	4.5%
128	GILROY-GILROY VARIANT-BONNYDOON VARIANT LOAMS, 30 TO 50 PERCENT SLOPES	.37	99.2	7.0%
141	LOS OSOS-BONNYDOON COMPLEX, 15 TO 30 PERCENT SLOPES	.37	313.1	22.0%
142	LOS OSOS-BONNYDOON COMPLEX, 30 TO 50 PERCENT SLOPES	.37	102.1	7.2%
146	MONTARA CLAY LOAM, 15 TO 30 PERCENT SLOPES	.43	91.5	6.4%
157	PITS, QUARRIES		47.4	3.3%
158	REYES CLAY	.20	171.3	12.0%
179	TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES	.37	175.2	12.3%
184	TOCALOMA-SAURIN ASSOCIATION, VERY STEEP	.37	123.5	8.7%
203	XERORTHENTS, FILL		70.5	5.0%
204	XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES		25.1	1.8%
206	YORKVILLE CLAY LOAM, 15 TO 30 PERCENT SLOPES	.32	81.0	5.7%
Totals for Area of Interest			1,422.7	100.0%

Description — K Factor, Rock Free

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kf (rock free)" indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Rating Options — K Factor, Rock Free

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

MSN A3 HOV IMPROVEMENTS
Weighted LS Factor

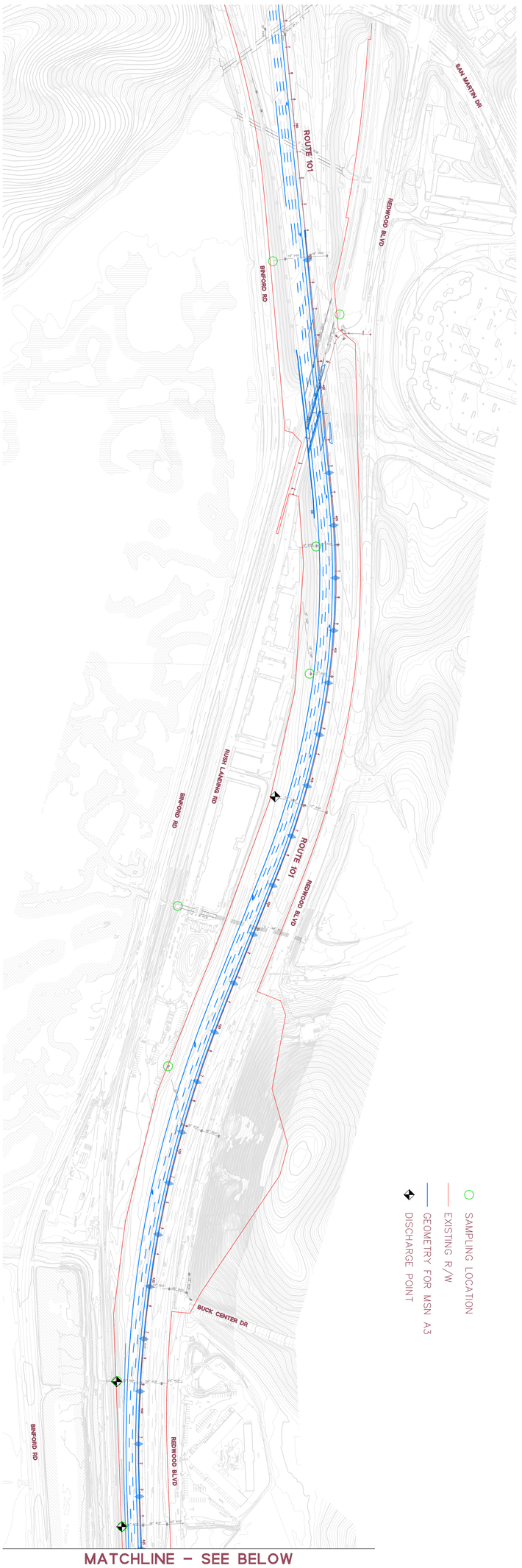
Station	Line Segment 1			Line Segment 2			Line Segment 3					Weighted Ave by Length	Table Value
	Length ft	Slope	LxS	Length ft	Slope	LxS	Length ft	Slope	LxS	$S_1+S_2+S_3$	$L_1+L_2+L_3$	S	LS
395				36	0.10	3.60				0.100	36	0.10	0.74
400										0.000	0	-	0.00
405				38	0.10	3.80				0.100	38	0.10	0.74
410				37	0.10	3.70				0.100	37	0.10	0.74
415			0.00	31	0.10	3.10				0.100	31	0.10	0.57
420			0.00	31	0.10	3.10				0.100	31	0.10	0.57
425	17	0.04	0.68	37	0.10	3.70				0.140	54	0.08	0.70
430	17	0.08	1.36	33	0.10	3.30				0.180	50	0.09	0.91
435	17	0.08	1.36	37	0.10	3.70				0.180	54	0.09	0.91
440	17	0.09	1.53	21	0.10	2.10	19	0.400	7.60	0.590	57	0.20	2.10
445				20	0.10	2.00	19	0.250	4.75	0.350	39	0.17	1.64
450	12	0.25	3.00	21	0.10	2.10	16	0.200	3.20	0.550	49	0.17	1.64
455	27	0.25	6.75	23	0.10	2.30	11	0.200	2.20	0.550	61	0.18	2.21
460	17	0.16	2.72	25	0.10	2.50	11	0.200	2.20	0.460	53	0.14	1.40
465	20	0.08	1.60	24	0.10	2.40	13	0.200	2.60	0.380	57	0.12	1.40
470				24	0.10	2.40	15	0.220	3.30	0.320	39	0.15	1.64
475				16	0.10	1.60	16	0.250	4.00	0.350	32	0.18	1.64
480				20	0.10	2.00	25	0.260	6.50	0.360	45	0.19	2.10
490							23	0.080	1.84	0.080	23	0.08	0.45
												Weighted Average LS Factor =	1.16

Note: LS Computed using the cross section method as outlined in the Project Risk Level Determination Guideliines by Caltrans dated July 2010

SAMPLING ANALYSIS LOCATIONS AND DISCHARGE POINTS

DRAWING NAME: \\BKF-PL\Vol4\Eng08\087003-20\DWG\EXHIBITS\005 - Sampling Locations\MSN A3 - Sampling Locations.dwg
PLOT TIME: 06-14-12
PLOTTED BY: MANA

MATCHLINE - SEE ABOVE



MATCHLINE - SEE BELOW

SAMPLING LOCATION
EXISTING R/W
GEOMETRY FOR MSN A3
DISCHARGE POINT

GRAPHIC SCALE
(IN FEET)
1 inch = 200 ft.
200 0 100 200 400 800

Date: 2012 01-31	No.	Revisions	
Scale: 1:200			
Design: XXX			
Drawn: XXX			
Approved: XXX			
Job No: 20087003			

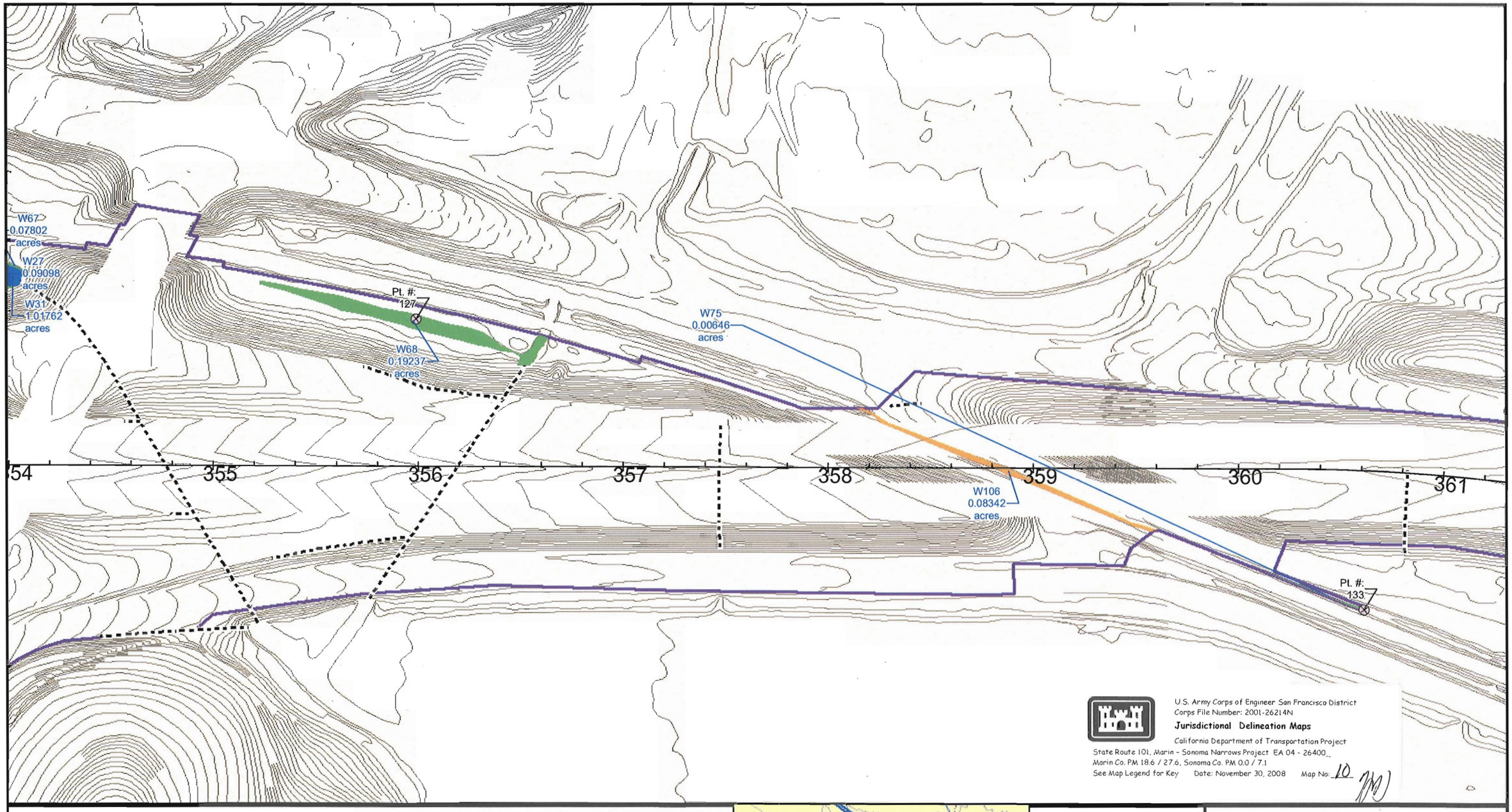
Drawing Number: 1 OF 1

MARIN/SONOMA NARROWS HOV WIDENING
SEGMENT A3
SAMPLING LOCATIONS AND DISCHARGE POINTS

BkF
ENGINEERS / SURVEYORS / PLANNERS
4670 WILLOW RD
SUITE 250
PLEASANTON, CA 94588
925-396-7700
925-396-7799 (FAX)

© BKF ENGINEERS

WETLANDS AND WATER OF THE U.S. DELINEATION MAPS



U.S. Army Corps of Engineer San Francisco District
Corps File Number: 2001-26214N
Jurisdictional Delineation Maps
California Department of Transportation Project
State Route 101, Marin - Sonoma Narrows Project EA 04 - 26400_
Marin Co. PM 18.6 / 27.6, Sonoma Co. PM 0.0 / 7.1
See Map Legend for Key Date: November 30, 2008 Map No: 10

LEGEND

- Alignment
- Project Area
- Existing Culverts
- Sheet Flow
- WRA 2007 data points
- Caltrans 2005 data points
- Culvert WRA 2007
- Waters of the US (Wetlands)
- Waters of the US (Other Waters))
- Waters of the US (Culverted)
- State & Federal Non-Jurisdictional Areas

0 150 Feet
1 inch equals 150 feet

USACE VERIFICATION MAP 10 OF 40

MARIN SONOMA NARROWS
MARIN COUNTY, CA

BAO \\ZINFANDEL\PROJ\CALTRANS\364064\GIS\MARIN_SONOMA_NARROWS\MAPFILES\WETLANDS_MAPBOOK.MXD WETLANDS_MAPBOOK.PDF 9/3/2008 08:05:01

361 362 363 364 365 366 367 1368

U.S. Army Corps of Engineer San Francisco District
Corps File Number: 2001-26214N

Jurisdictional Delineation Maps

California Department of Transportation Project
State Route 101, Marin - Sonoma Narrows Project EA 04 - 26400_
Marin Co. PM 18.6 / 27.6, Sonoma Co. PM 0.0 / 7.1
See Map Legend for Key Date: November 30, 2008 Map No: 11 of 40

LEGEND

- Alignment
- Project Area
- Existing Culverts
- Sheet Flow
- WRA 2007 data points
- Caltrans 2005 data points
- Culvert WRA 2007
- Waters of the US (Wetlands)
- Waters of the US (Other Waters))
- Waters of the US (Culverted)
- State & Federal Non-Jurisdictional Areas

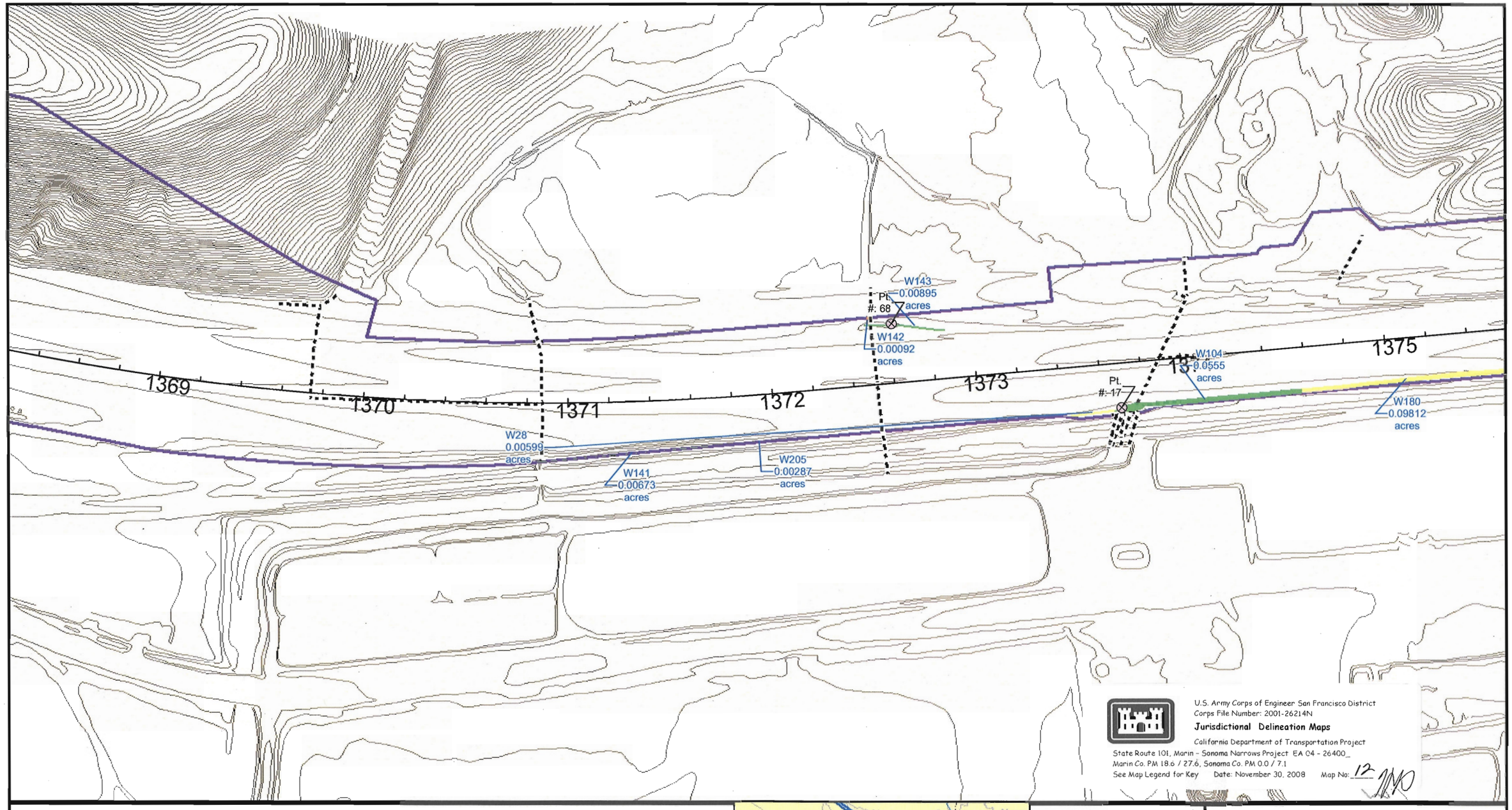
N

0 150 Feet

1 inch equals 150 feet

USACE VERIFICATION MAP 11 OF 40

MARIN SONOMA NARROWS
MARIN COUNTY, CA



U.S. Army Corps of Engineer San Francisco District
Corps File Number: 2001-26214N

Jurisdictional Delineation Maps

California Department of Transportation Project
State Route 101, Marin - Sonoma Narrows Project EA 04 - 26400_
Marin Co. PM 18.6 / 27.6, Sonoma Co. PM 0.0 / 7.1
See Map Legend for Key Date: November 30, 2008 Map No: 12

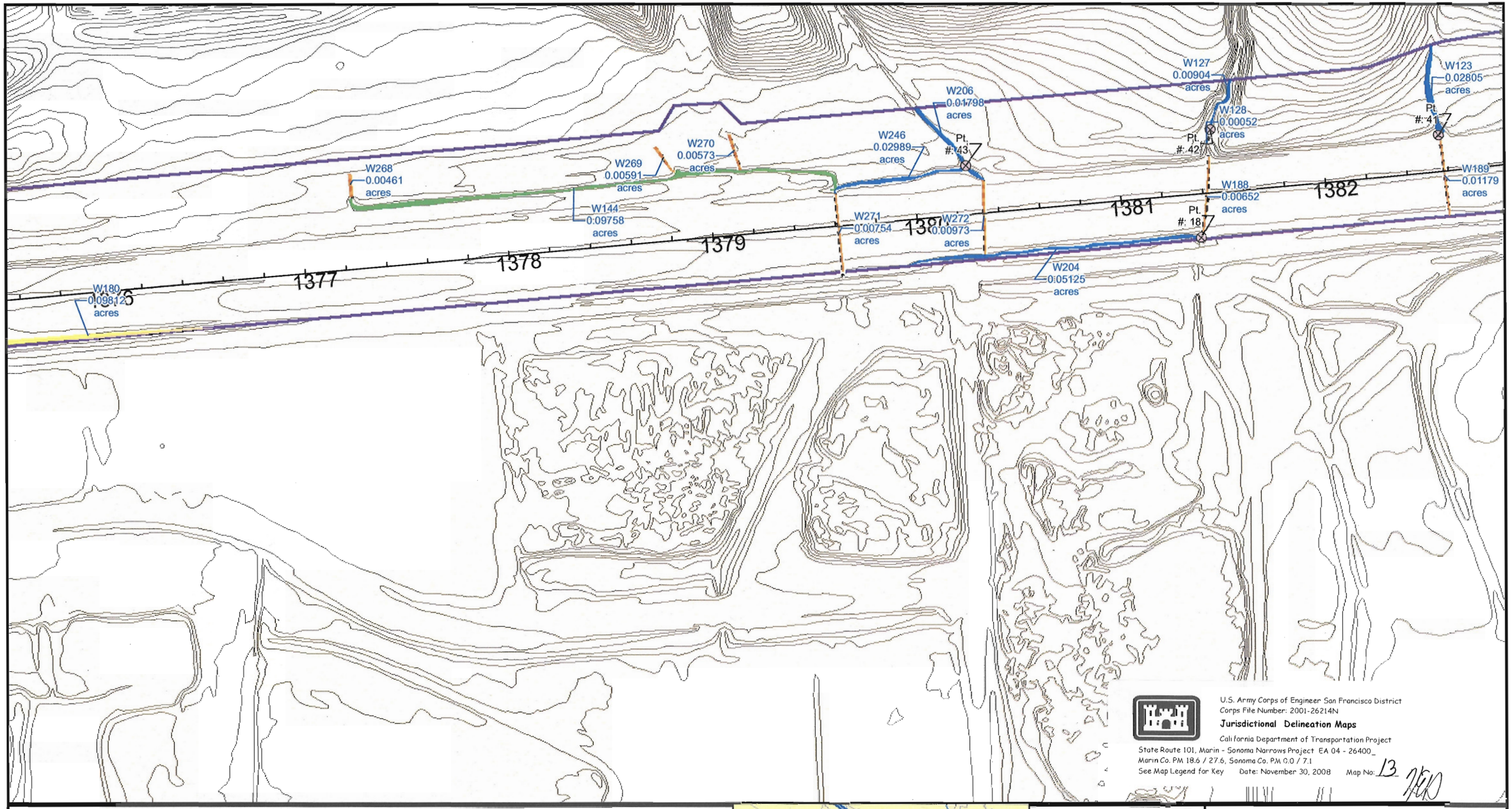
LEGEND

- Alignment
- Project Area
- Existing Culverts
- Sheet Flow
- WRA 2007 data points
- Caltrans 2005 data points
- Culvert WRA 2007
- Waters of the US (Wetlands)
- Waters of the US (Other Waters))
- Waters of the US (Culverted)
- State & Federal Non-Jurisdictional Areas

0 150 Feet
1 inch equals 150 feet

USACE VERIFICATION MAP 12 OF 40

MARIN SONOMA NARROWS
MARIN COUNTY, CA



U.S. Army Corps of Engineer San Francisco District
Corps File Number: 2001-26214N

Jurisdictional Delineation Maps

California Department of Transportation Project
State Route 101, Marin - Sonoma Narrows Project EA 04 - 26400_
Marin Co. PM 18.6 / 27.6, Sonoma Co. PM 0.0 / 7.1
See Map Legend for Key Date: November 30, 2008 Map No: 13

LEGEND

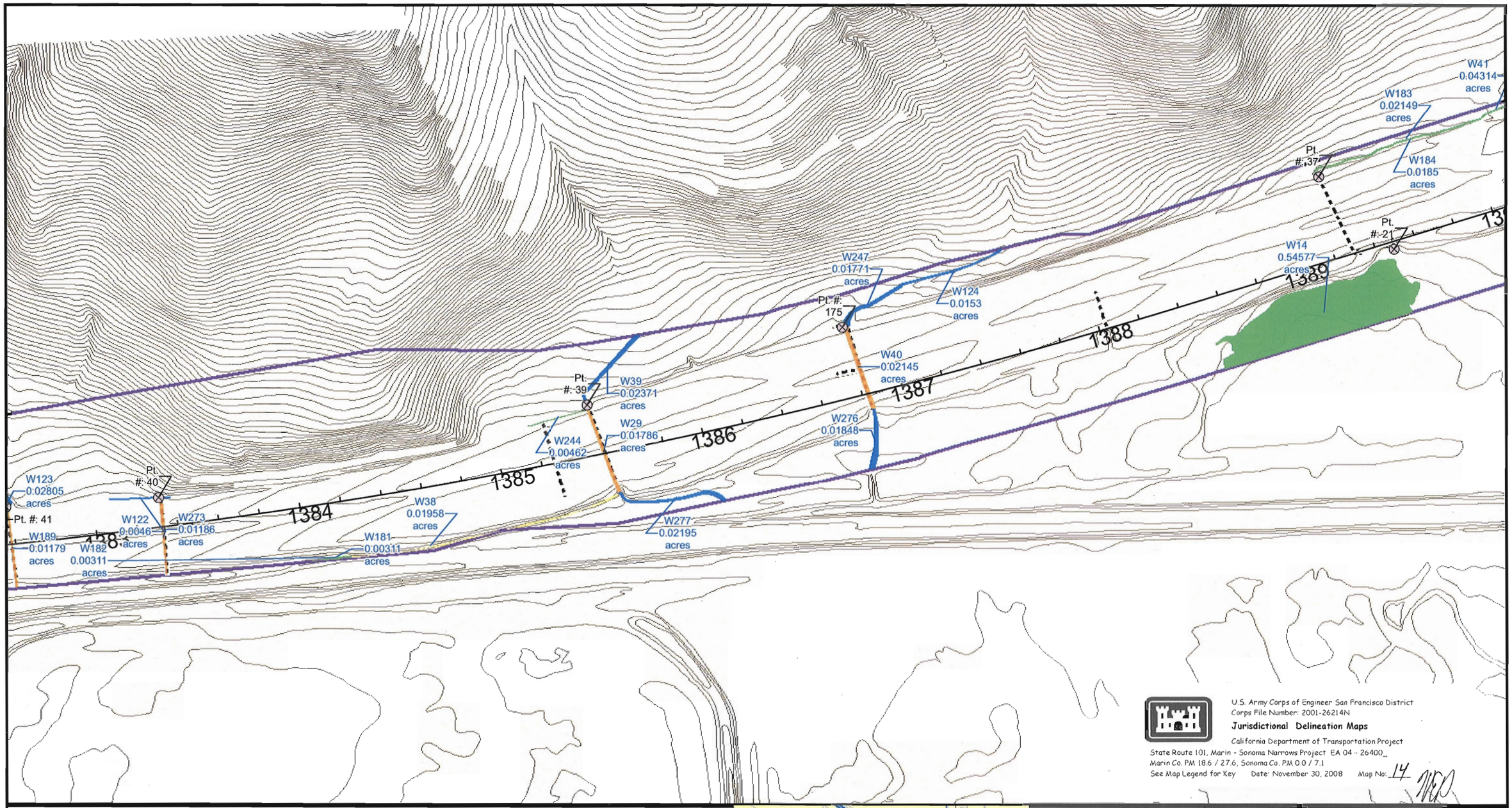
- Alignment
- Project Area
- Existing Culverts
- Sheet Flow
- WRA 2007 data points
- Caltrans 2005 data points
- Culvert WRA 2007
- Waters of the US (Wetlands)
- Waters of the US (Other Waters))
- Waters of the US (Culverted)
- State & Federal Non-Jurisdictional Areas

0 150 Feet
1 inch equals 150 feet

USACE VERIFICATION MAP 13 OF 40

MARIN SONOMA NARROWS
MARIN COUNTY, CA

BAO \\ZINFANDEL\PROJ\CALTRANS\364064\GIS\MARIN_SONOMA_NARROWS\MAPFILES\WETLANDS_MAPBOOK.MXD WETLANDS_MAPBOOK.PDF 9/3/2008 08:05:01



BAO \\ZINFANDEL\PROJ\CALTRANS\364064\GIS\MARIN_SONOMA_NARROWS\MAPFILES\WETLANDS_MAPBOOK.MXD WETLANDS_MAPBOOK.PDF 9/3/2008 08:05:01

SFRWQCB 401 CERTIFICATION

June 1, 2012
CIWQS Place No. 781608
401 Database No.: 02-21-C0814

Sent via electronic mail--no hard copy to follow

California Department of Transportation
Attn: Ms. Betcy Joseph
Betcy_Joseph@dot.ca.gov
111 Grand Ave.
Oakland, CA 94612-3717

Subject: Water Quality Certification for the Marin Sonoma Narrows Widening Project, Contract A3, City of Novato, Marin County

Department Project No.: EA 04-2640L1

Dear Ms. Joseph:

We have reviewed and hereby issue water quality certification to the California Department of Transportation (Department) for the Marin Sonoma Narrows Widening Project, Contract A3 (Project). The Department is seeking an Individual Permit for the Project from the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act (33 U.S.C. § 1344). As such, the Department has applied to the San Francisco Bay Regional Water Quality Control Board (Water Board) for a Clean Water Act Section 401 water quality certification that the Project will not violate State water quality standards.

Project: The Department is proposing to widen United States Highway 101 (US 101) between Marin County US 101 post-miles 22.2 and 24.1 through the city of Novato as a component of the Marin-Sonoma Narrows HOV Widening Project (MSN). The Department has divided the overall MSN project into at least seven individual contracts:

- A1, from State Route 37 to just north of Atherton Avenue in Novato. A 401 certification was issued for this project on July 22, 2010;
- A2, in Novato, between US 101 northbound post-miles 20.5 and 20.9. A 401 certification application was submitted to the Water Board on May 4, 2012;
- A3, the subject of this certification;

- B-1, between Marin County US 101 post-miles 23.3 and 27.6 in the vicinity of Old Redwood Landfill Road. A 401 certification was issued for the project on March 26, 2012;
- B-3, in the vicinity of San Antonio Creek between Marin County US 101 post-miles 27.0 and 27.6, and Sonoma County US 101 post-miles 0.0 and 2.5. The Department intends to submit a 401 certification application in 2013;
- B-2/B-4, between Sonoma County US 101 post-miles 3.4 and 4.1, from the Petaluma Bridge south to the vicinity of Cloud Lane. A 401 certification was issued for the project on March 26, 2012; and
- C-3, between just north of the Petaluma River Bridge and approximately 0.2 miles north of Caulfield Lane, in the City of Petaluma, between US 101 Sonoma post-miles 3.4 and 4.1. A 401 certification was issued for the project on May 17, 2012.

This certification addresses proposed widening of northbound US 101 and the North Novato US 101 Overhead Bridge. A new high-occupancy-vehicle lane would be added in the northbound direction. Ten-foot road shoulders would be added adjacent the inside and outside lanes. The North Novato Overhead Bridge would require construction of a new foundation and columns to accommodate widening. Three existing cross culverts would be replaced with box culverts to meet current and stormwater runoff volumes anticipated from the future southbound US 101 widening.

The Project area drains to tributaries of Rush Creek. Construction is estimated to start in November 2012, and last approximately one year.

Wetland and Water Impacts: Project implementation would result in the permanent fill of approximately 0.024 acres of jurisdictional seasonal freshwater wetlands and approximately 469 linear feet (0.050 acres) of jurisdictional waters.

Construction access would result in temporary impacts to approximately 0.041 acres of jurisdictional seasonal freshwater wetlands and waters.

Roadway Pollutant Impacts: Project implementation would result in approximately 3.99 acres of new and 3.36 acres of reworked impervious area. Stormwater runoff from impervious areas may contain hydrocarbons, metals, volatile organic compounds, trash, and sediment at levels that may significantly impact jurisdictional waters if left untreated.

Hydromodification Impacts: Added impervious areas may result in alterations to existing hydrologic regimes, resulting in erosion and/or changes of sediment transport in receiving waters (hydromodification). Because this Project discharges to tidally-influenced receiving waters, potential hydromodification impacts would be insignificant and mitigation is not required.

Avoidance and Minimization: The Department has avoided and minimized impacts to wetland and waters by utilizing steepened roadside embankments and by selecting a project alternative with fewer impacts to wetlands and trees.

Mitigation: The Department purchased 0.3 acres of wetland mitigation bank credits from Burdell Ranch Wetland Conservation Bank on December 15, 2010, to mitigate for permanent impacts to approximately 0.226 acres of jurisdictional seasonal freshwater wetlands associated with the MSN C3 project. The Department will utilize the 0.074 acre mitigation credit surplus to mitigate for permanent impacts to 0.024 acres of seasonal freshwater wetlands.

To mitigate for permanent impacts to 469 linear feet of jurisdictional waters, the Department shall reconstruct no less than 500 linear feet of jurisdictional waters onsite (see Condition No. 2).

To mitigate for 0.041 acres of temporarily impacted wetlands and waters, the Department shall restore those areas to their original or improved conditions (see condition no. 5).

Roadway Pollutant Mitigation: As mitigation for increased pollutant loads associated with impervious areas, the Department shall provide treatment of stormwater runoff from no less than 7.54 acres of impervious area using nine bioretention swales and three biofiltration strips (see Table 3 below, for swale and strip information).

Table 1: Stormwater Treatment BMP Summary

BMP Type	Location	NB US 101 Post Mile Location	From US 101 NB Station	To US 101 NB Station	Treatment BMP Size (acres)	Treated Impervious Area (acres)
Biofiltration Swale	Median	22.36	402+50	406+00	0.032	0.45
Biofiltration Swale	Median	22.43	406+03	411+00	0.046	0.60
Biofiltration Strip	Outside Shoulder northbound (NB) 101	22.52	411+05	422+50	0.386	1.84
Biofiltration Swale	Outside Shoulder southbound (SB) 101	22.75	423+00	429+00	0.055	0.76
Biofiltration Swale	Outside Shoulder SB 101	22.87	429+03	435+26	0.057	0.66

Table 1: Stormwater Treatment BMP Summary (continued)

BMP Type	Location	NB US 101 Post Mile Location	From US 101 NB Station	To US 101 NB Station	Treatment BMP Size (acres)	Treated Impervious Area (acres)
Biofiltration Swale	Outside Shoulder SB 101	22.98	435+29	438+91	0.033	0.41
Biofiltration Swale	Outside Shoulder SB 101	23.05	438+94	443+97	0.045	0.52
Biofiltration Swale	Outside Shoulder SB 101	23.25	449+25	446+00	0.030	0.28
Biofiltration Swale	Outside Shoulder SB 101	23.64	459+70	449+28	0.095	0.80
Biofiltration Swale	Outside Shoulder SB 101	23.64	459+70	467+50	0.071	0.60
Biofiltration Strip	Outside Shoulder NB 101	24.15	486+61	491+29	0.161	0.35
Biofiltration Strip	Outside Shoulder NB 101	24.24	491+29	494+86	0.123	0.27
					total:	7.54

CEQA Compliance: The Department prepared and approved an Environmental Impact Report for this Project pursuant to the provisions of the California Environmental Quality Act. The Department filed a Notice of Determination on July 27, 2009 (SCH No. 2001042115).

California Wetlands Portal: It has been determined through regional, state, and national studies that mitigation/restoration project tracking must be improved to better assess their performance over several years of monitoring. Additionally, the State needs to closely track wetland losses, gains, and mitigation/restoration project success to effectively carry out the State's wetland No Net Loss Policy. Therefore, we require the Department use the California Wetlands Standard Form to provide Project impact information and mitigation/restoration measures (see Condition No. 4 of this certification). An electronic copy of the form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml

Project information concerning impacts and mitigation/restoration will be made available at the web link: http://www.californiawetlands.net.

Certification: I hereby issue an order certifying that any discharge from the referenced project will comply with the applicable provisions of sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003 - 0017 – DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification" which requires compliance with all conditions of this Water Quality Certification. The following conditions are associated with this certification:

1. As mitigation for increased pollutant loads associated with impervious areas, the Department shall provide treatment of stormwater runoff from no less than 7.54 acres of impervious area using three biofiltration strips and nine biofiltration swales. The swales shall be installed consistent with the swale summary in Table 1 and Attachment A of this certification. The swales shall be prepared per the soil specifications in Attachment A of this certification. Notwithstanding Notes 1 & 2 of Attachment A, sheet ECD-1, any change in swale dimension or placement shall be prohibited without prior acceptance of Water Board staff. The swales shall be maintained regularly to ensure optimal performance;

2. The Department shall submit a Mitigation and Monitoring Plan (MMP) that details:

    a. A proposal to create not less than 500 linear feet (0.050 acres) of jurisdictional waters adjacent northbound US 101 between "J1R Line" stations 416+00 and 421+00;
    b. Hydrology, design and planting plan details;
    c. A plan to submit an as-built report to the Water Board no later than three months from jurisdictional water creation;
    d. Performance criteria; and
    e. Success criteria that meets federal jurisdictional water parameters;
    f. A plan to submit monitoring reports for years 1, 3, and 5 to the Water Board.

    The MMP shall be submitted to and found acceptable to Water Board staff prior to commencement of Project construction;

3. Creation of jurisdictional waters shall be constructed prior to the completion of Project construction. Any delay in mitigation implementation shall be immediately reported to the Water Board and additional mitigation shall be required as appropriate;

4. The Department is required to use the California Wetlands Standard Form to provide project information describing impacts and mitigation/restoration measures within 30 days from the date of this certification. An electronic copy of the form can be

downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed California Wetlands form shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both: 1) The Water Board, 1515 Clay St., Suite 1400, Oakland, CA 94612, to the attention of California Wetlands Portal; and 2) San Francisco Estuary Institute, 4911 Central Ave., Richmond, CA 94804, to the attention of Mike May;

5. The Department shall restore all temporarily impacted jurisdictional wetlands and waters to their pre-project or improved conditions, within the first growing season following cessation of construction activity in those areas. All temporarily disturbed areas shall be re-vegetated using only native plant species. The Department shall not cause, through operation of heavy machinery, or any other construction activity, compaction of wetlands or waters. Any compaction of wetlands or waters shall require mitigation;

6. The Project shall be constructed in conformance with the Project Description described in this certification and certification application materials. Any change in the Project may require modification to the certification and shall be reported to and found acceptable by Water Board staff prior to implementation of the changes;

7. The Department shall adhere to the conditions imposed by the Individual Permit issued to the Department by the U.S. Army Corps of Engineers, to the Streambed Alteration Agreement issued to the Department by the California Department of Fish and Game, the Biological Opinion issued to the Department by the National Marine Fisheries Service on January 26, 2009, and to the Biological Opinion issued to the Department by the U.S. Fish and Wildlife Service on April 1, 2009;

8. Regardless of date, erosion control measures shall be utilized throughout all phases of construction where sediment-laden runoff threatens to enter waters of the State. At no time shall sediment-laden runoff be allowed to enter waters of the State;

9. No fueling, cleaning or maintenance of vehicles or equipment shall take place within jurisdictional waters or within any areas where an accidental discharge to waters of the State may occur;

10. Except as expressly allowed in this Certification, the discharge, or creation of the potential for discharge, to waters of the State of any construction wastes and/or soil materials including cement, fresh concrete, or washings thereof, silts, clay, sand, oil or petroleum products and other organic materials to waters of the State is prohibited;

11. This certification does not allow for the take, or incidental take, of any special status species. The Department shall use the appropriate protocols, as approved by the California Department of Fish and Game and the U.S. Fish and Wildlife Service, to ensure that Project activities do not impact the Beneficial Use of the Preservation of Rare and Endangered Species;

12. The Department shall maintain a copy of this water quality certification at the Project site so as to be available at all times to site operating personnel. It is the responsibility of the Department to assure that all personnel (employees, contractors, and subcontractors) are adequately informed and trained regarding the conditions of this certification;

13. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section 13330 of the California Water Code (CWC) and Section 3867 of Title 23 of the California Code of Regulations(23 CCR);

14. This certification action does not apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license, unless the pertinent certification application was filed pursuant to California Code of Regulations Title 23, Subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought; and

15. Certification is conditioned upon total payment of the full fee required in State regulations (23 CCR Section 3833). Water Board staff received full payment of $2475.00 on April 17, 2012.

We anticipate your cooperation in implementing these conditions. However, please be advised that any violation of water quality certification conditions is a violation of State law and subject to administrative civil liability pursuant to California Water Code (CWC) section 13350. Failure to respond, inadequate response, late response, or failure to meet any condition of this certification may subject you to civil liability imposed by the Water Board to a maximum of $5,000 per day per violation or $10 for each gallon of waste discharged in violation of this certification.

Certification condition numbers 2 and 4 are requirements for information and reports. Any requirement for a report made as a condition to this action is a formal requirement pursuant to CWC section 13267, and failure or refusal to provide, or falsification of such required report is subject to civil liability as described in CWC section 13268.

We anticipate no further action on this request. Should new information come to our attention that indicates a water quality problem with this project, the Water Board may issue Waste Discharge Requirements pursuant to 23 CCR Section 3857.

If you have any question, please contact Brendan Thompson at (510) 622-2506, or via e-mail to BThompson@waterboards.ca.gov.

Sincerely,

Bruce H. Wolfe
Executive Officer

Attachments: A- Biofiltration Swale and Strip Design and Soil Specifications

cc (via e-mail): Mr. Bill Orme SWRCB-DWQ
Ms. Laurie Monarres, USACE
Ms. Jane Hicks, Regulatory Branch, USACE
Ms. Melissa Escaron, CDFG
Ms. Paula Gill, USAC
Mr. Dale Bowyer, Water Board
Mr. Cyrus Vafai, Caltrans
Mr. Hardeep Takhar, Caltrans
Mr. Jason Brush, USEPA

Attachment A

Biofiltration Swale and Strip Design and Soil Specifications

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — 4/16/12 DATE

PLANS APPROVAL DATE

N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

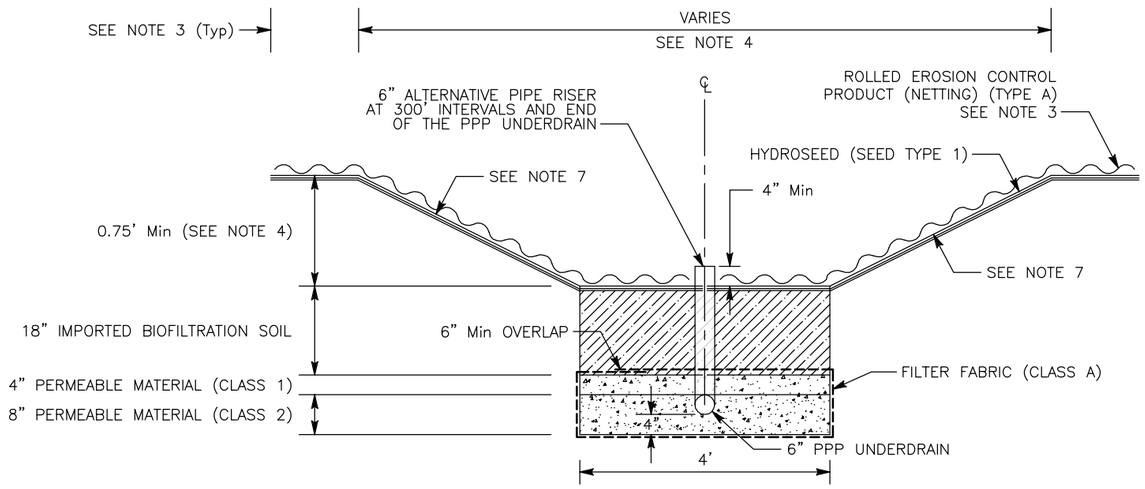
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

NOTES:

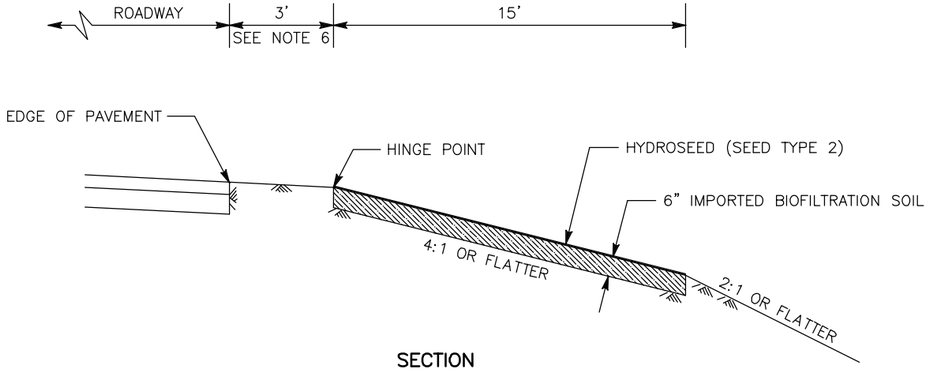
1. DIMENSIONS MAY VARY TO FIT ACTUAL FIELD CONDITIONS.
2. BEGINNING AND END OF LINEAR BIORETENTION AREA MAY VARY. EXACT DIMENSIONS SHALL BE DETERMINED BY THE ENGINEER.
3. WHERE ROLLED EROSION CONTROL PRODUCT (NETTING) IS PROPOSED, INSTALLATIONS SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS AND CALTRANS SPECIFICATIONS.
4. FOR LINEAR BIORETENTION AREA FLOW LINE ELEVATIONS AND PROFILES AND UNDERDRAIN PROFILES AND DETAILS, SEE DRAINAGE PLAN, PROFILES, AND DETAILS.
5. FOR PERFORATED PLASTIC PIPE UNDERDRAIN AND ALTERNATIVE PIPE RISER QUANTITIES, SEE DRAINAGE QUANTITIES SHEETS.
6. IF EXISTING PAVEMENT ADJACENT TO THE BIOFILTRATION STRIP WILL REMAIN UNMODIFIED, EROSION CONTROL (TYPE 3) SHALL BE PLACE BETWEEN THE EDGE OF PAVEMENT AND BIOFILTRATION STRIP. OTHERWISE, SHOULDER BACKING SHALL BE PLACE PER REVISED Std PLAN RSP P75.
7. SEE TABLE BELOW FOR SIDE SLOPE REQUIREMENTS FOR LINEAR BIORETENTION AREAS::

LOCATION	SIDE SLOPE REQUIREMENT
WEST OF SB ROUTE 101	WESTERN SIDE SLOPE (ADJACENT TO R/W): 2:1 EASTERN SIDE SLOPE (ADJACENT TO SB 101): 4:1
ROUTE 101 MEDIAN	2:1 FOR BOTH SLOPES



SECTION

LINEAR BIORETENTION AREA



SECTION
ADJACENT TO ROADWAY PAVEMENT

BIOFILTRATION STRIP

EROSION CONTROL DETAILS

NO SCALE

ECD-1

MV	4/16/12			
REVISED BY	DATE REVISED			
MARY VIDRA	GORDON SWEET			
CALCULATED–DESIGNED BY	CHECKED BY			

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

P:\Engdk\08T003-20\PWS\SHEETS\EROSION CONTROL\ECD-01.dwg 16 Apr 2012 4:28:21pm lara

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 16 2012 | TIME PLOTTED => 4:28 pm

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

10-1.__ IMPORTED BIOFILTRATION SOIL

GENERAL

Summary

This work includes furnishing and placing imported biofiltration soil.

Submittals

Compost: Before mixing compost with sand and topsoil, submit:

1. A Certificate of Compliance from the compost supplier in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
2. A copy of the compost producer's compost technical data sheet. The compost technical data sheet must include:

    2.1. Laboratory analytical test results
    2.2. List of product ingredients

3. A copy of the compost producers Seal of Testing Assurance certification.

Imported biofiltration soil: Imported biofiltration soil must be accompanied by a Certificate of Compliance, from the soil supplier, in conformance with the provisions in Section 6-1.07, “Certificates of Compliance,” of the Standard Specifications.

Quality Control and Assurance

Saturated hydraulic conductivity for imported biofiltration soil must be at least 5 inches per hour.

MATERIAL

Imported biofiltration soil must be a uniform mixture of sand, compost, and topsoil. Volumetric proportion of the mixture must be: four-parts sand; two-parts compost; one-part topsoil.

Sand

Sand must be free of wood, waste, coating such as clay, stone dust, carbonate, or any other deleterious material. All aggregate passing No. 200 sieve size must be non-plastic. Sand must be graded within the following limits:

Sieve Size	Percentage Passing
3/8"	100
No. 4	90 - 100
No. 8	70 - 100
No. 16	40 - 95
No. 30	15 - 70
No. 40	5 - 55
No. 100	0 - 15
No. 200	0 - 5

Grain size analysis results of the sand component must be performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies, and any other State and Local Agencies that regulate solid waste facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in the United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials in a manner that reduces presence of weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical and Chemical Requirements

Property	Test Method	Requirement
pH	TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.5 - 8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0 - 6.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70 +/- 5 deg C % Wet Weight Basis	30 - 60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	35 - 75
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	 80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	Inches % Passing 3 100% 1/2 0 - 95% 1/4 0 - 75% Max. Length 4 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4 mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4 mm fraction	None Detected

NOTE: TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Topsoil

Topsoil must be free of wood, waste or other deleterious material. The topsoil texture must be loamy. Overall dry weight percentages must be 60 to 90 percent sand, with less than 20 percent passing the No. 200 sieve, less than 5 percent clay, and no gravel.

CONSTRUCTION

Comply with Section 20-3.02, "Preparation," of the Standard Specifications.

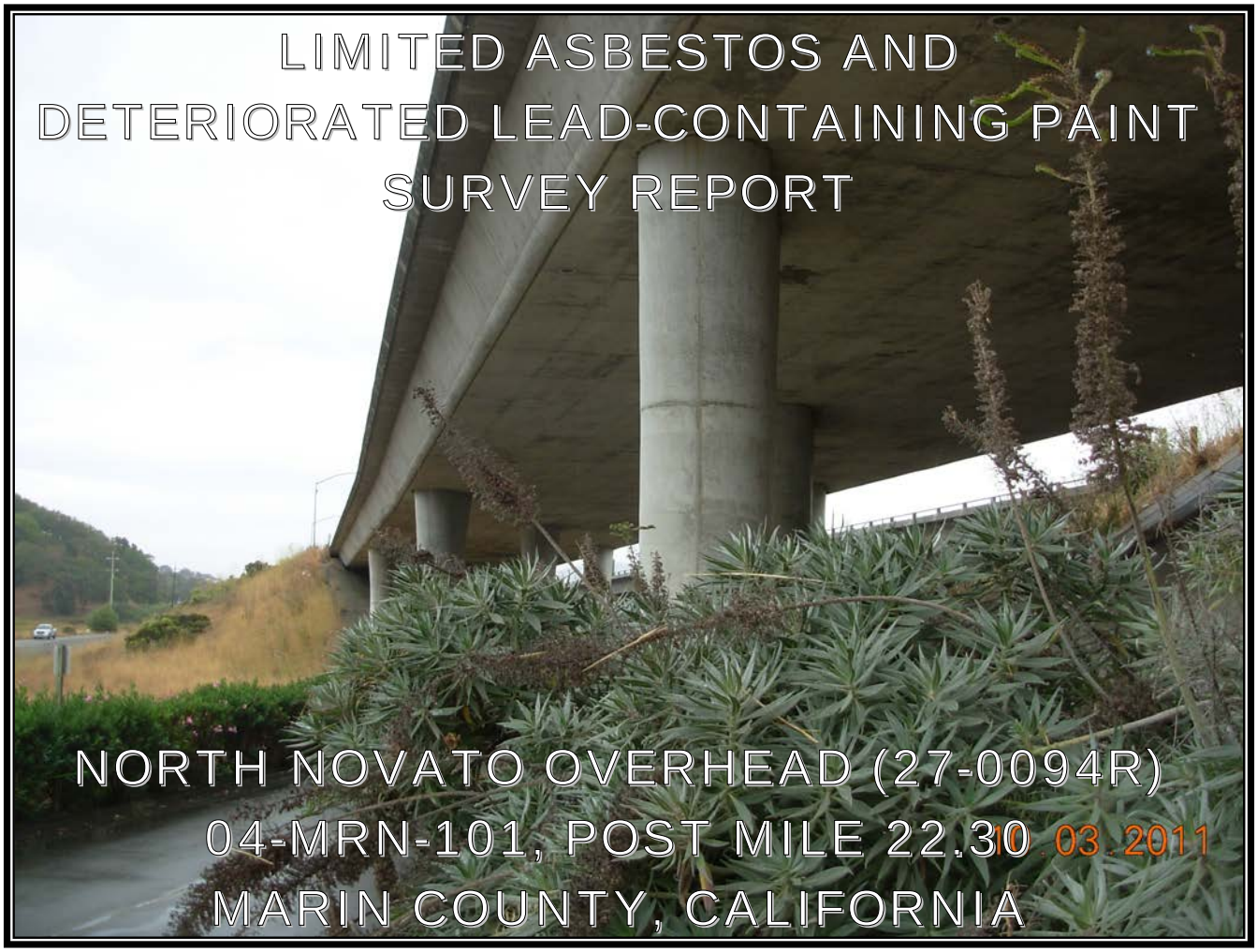
Place imported biofiltration soil in 8 to 12- inch lifts. Do not compact the lifts.

MEASUREMENT AND PAYMENT

Quantity of imported biofiltration soil is measured by the cubic yard.

The contract unit price paid per cubic yard for imported biofiltration soil includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in imported biofiltration soil, complete in place, including testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

LIMITED ASBESTOS AND DETERIORATED LEAD-CONTAINING PAINT SURVEY REPORT



NORTH NOVATO OVERHEAD (27-0094R)
04-MRN-101, POST MILE 22.30
MARIN COUNTY, CALIFORNIA

PREPARED FOR:
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CALIFORNIA 94588

PREPARED BY:
GEOCON CONSULTANTS, INC.
6671 BRISA STREET
LIVERMORE, CALIFORNIA 94550

GEOCON

GEOCON PROJECT NO. E8469-06-03

NOVEMBER 2011

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. E8469-06-03
November 22, 2011

Natalina Bernardi
BKF Engineers
4670 Willow Road, Suite 250
Pleasanton, California 94588

Subject: LIMITED ASBESTOS AND DETERIORATED LEAD-CONTAINING PAINT SURVEY REPORT
NORTH NOVATO OVERHEAD (27-0094R)
04-MRN-101, POST MILE 22.30
MARIN COUNTY, CALIFORNIA

Dear Ms. Bernardi:

We have performed a limited asbestos and deteriorated lead-containing paint survey at the subject site. The scope of services provided by Geocon included surveying the number 1 lane shoulder, barriers, deck, and expansion joints at the Site for suspect asbestos-containing materials and deteriorated lead-containing paint, collecting bulk samples, and submitting the samples to laboratories for analysis.

The accompanying report summarizes the services performed and the results of laboratory testing.

The contents of this report reflect the views of Geocon, who are responsible for the facts and accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.

If there are questions concerning the contents of this report, or if we may be of further service, please contact us at your convenience.

Sincerely,

GEOCON CONSULTANTS, INC.

David Watts, CAC
Senior Project Scientist

Richard Day, CEG, CHG
Vice President

(1) Addressee
(3) Shawn Enjily, Caltrans District 4

TABLE OF CONTENTS

LIMITED ASBESTOS AND DETERIORATED LEAD-CONTAINING PAINT SURVEY REPORT

Page

1.0 INTRODUCTION 1
- 1.1 Site Description 1
- 1.2 Objectives 1

2.0 BACKGROUND 1
- 2.1 Asbestos 1
- 2.2 Lead Paint 2

3.0 SCOPE OF SERVICES 3
- 3.1 Asbestos 3
- 3.2 Lead Paint 4

4.0 INVESTIGATIVE RESULTS 4
- 4.1 Asbestos 4
- 4.2 Lead Paint 4

5.0 CONCLUSIONS AND RECOMMENDATIONS 5
- 5.1 Asbestos 5
- 5.2 Lead Paint 5

6.0 REPORT LIMITATIONS 6

FIGURES
1. Vicinity Map
2. Site Plan

SITE PHOTOGRAPHS (1 through 6)

TABLE
1. Summary of Analytical Laboratory Test Results – Asbestos
2. Summary of Analytical Laboratory Test Results – Paint

APPENDIX
A. Analytical Laboratory Report and Chain-of-custody Documentation

LIMITED ASBESTOS AND DETERIORATED LEAD-CONTAINING PAINT SURVEY REPORT

1.0 INTRODUCTION

1.1 Site Description

The subject site (Site) consists of the North Novato Overhead (27-0094R) located at Post Mile (PM) 22.30 on Highway 101 in Marin County, California. The approximate project location is depicted on the Vicinity Map, Figure 1, and Site Plan, Figure 2.

1.2 Objectives

Our objectives were to assess the potential presence and quantity of asbestos and deteriorated lead-containing paint (LCP) of the number 1 lane shoulder, barriers, deck, and expansion joints at the Site prior to planned improvements. The information obtained from this investigation will be used by BKF Engineers for waste profiling, determining California Occupational Safety and Health Administration (Cal/OSHA) applicability, and coordinating asbestos and LCP disturbance activities.

> *It was <u>not</u> Geocon's intent during this inspection to conduct an evaluation of lead-based paint hazards in accordance with HUD guidelines.*

2.0 BACKGROUND

2.1 Asbestos

The *Code of Federal Regulations (CFR),* 40 CFR 61, Subpart M, National Emissions Standards for Hazardous Air Pollutants (NESHAP) and Federal Occupational Safety and Health Administration (FED OSHA) classify asbestos-containing material (ACM) as any material or product that contains *greater than* 1% asbestos. Nonfriable ACM is classified by NESHAP as either Category I or Category II material defined as follows:

- **Category I** – asbestos-containing packings, gaskets, resilient floor coverings, and asphalt roofing products.
- **Category II** – all remaining types of nonfriable asbestos-containing material not included in Category I that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Regulated asbestos-containing material (RACM), a hazardous waste when friable, is classified as any manufactured material that contains *greater than* 1% asbestos by dry weight *and* is:

- Friable (can be crumbled, pulverized, or reduced to powder by hand pressure); or
- Category I material that has become friable; or

- Category I material that has been subjected to sanding, grinding, cutting, or abrading; or
- Category II nonfriable material that has a high probability of becoming crumbled, pulverized, or reduced to a powder during demolition or renovation activities.

Activities that disturb materials containing *any* amount of asbestos are subject to certain requirements of the Cal/OSHA asbestos standard contained in Title 8, CCR Section 1529. Typically, removal or disturbance of more than 100 square feet of material containing more than 0.1% asbestos must be performed by a registered asbestos abatement contractor, but associated waste labeling is not required if the material contains 1% or less asbestos. When the asbestos content of a material exceeds 1%, virtually all requirements of the standard become effective.

Materials containing more than 1% asbestos are also subject to NESHAP regulations (40 CFR Part 61, Subpart M). RACM (friable ACM and nonfriable ACM that will become friable during demolition operations) must be removed from structures prior to demolition. Certain nonfriable ACM and materials containing 1% or less asbestos may remain in structures during demolition; however, there are waste handling/disposal issues and Cal/OSHA work requirements that must be addressed. Contractors are responsible for segregating and characterizing waste streams prior to disposal.

With respect to potential worker exposure, notification, and registration requirements, Cal/OSHA defines asbestos-containing construction material (ACCM) as construction material that contains more than 0.1% asbestos (Title 8, CCR 341.6).

2.2 Lead Paint

Construction activities (including demolition) that disturb materials or paints containing *any* amount of lead are subject to certain requirements of the Cal/OSHA lead standard contained in Title 8, CCR, Section 1532.1. Deteriorated paint is defined by Title 17, CCR, Division 1, Chapter 8, §35022 as a surface coating that is cracking, chalking, flaking, chipping, peeling, non-intact, failed, or otherwise separating from a substrate. Demolition of a deteriorated LCP component would require waste characterization and appropriate disposal. Intact LCP on a component is currently accepted by most landfills and recycling facilities; however, contractors are responsible for segregating and characterizing waste streams prior to disposal.

For a solid waste containing lead, the waste is classified as California hazardous when: 1) the total lead content equals or exceeds the respective Total Threshold Limit Concentration (TTLC) of 1,000 milligrams per kilogram (mg/kg); or 2) the soluble lead content equals or exceeds the respective Soluble Threshold Limit Concentration (STLC) of 5 milligrams per liter (mg/l) based on the standard Waste Extraction Test (WET). A waste has the potential for exceeding the lead STLC when the waste's total lead content is greater than or equal to ten times the respective STLC value since the WET uses a 1:10 dilution ratio. Hence, when total lead is detected at a concentration greater than or equal to

50 mg/kg, and assuming that 100 percent of the total lead is soluble, soluble lead analysis is required. Lead-containing waste is classified as "Resource, Conservation, and Recovery Act" (RCRA) hazardous, or Federal hazardous, when the soluble lead content equals or exceeds the Federal regulatory level of 5 mg/l based on the Toxicity Characteristic Leaching Procedure (TCLP).

The above regulatory criteria are based on chemical concentrations. Wastes may also be classified as hazardous based on other criteria such as ignitability; however, for the purposes of this investigation, toxicity (i.e., lead concentration) is the primary factor considered for waste classification since waste generated during the construction activities would not likely warrant testing for ignitability or other criteria. Waste that is classified as either California-hazardous or RCRA-hazardous requires management as a hazardous waste.

Potential hazards exist to workers who remove or cut through LCP coatings during demolition. Dust containing hazardous concentrations of lead may be generated during scraping or cutting materials coated with lead-containing paint. Torching of these materials may produce lead oxide fumes. Therefore, air monitoring and/or respiratory protection may be required during the demolition of materials coated with LCP. Guidelines regarding regulatory provisions for construction work where workers may be exposed to lead are presented in Title 8, CCR, Section 1532.1.

3.0 SCOPE OF SERVICES

Mr. David Watts, a California-Certified Asbestos Consultant (CAC), certification No. 98-2404 (expiration September 16, 2012), and Certified Lead Paint Inspector/Assessor and Project Monitor with the California Department of Public Health (DPH), certification numbers I-1734 and M-1734 (expiration December 4, 2012), performed the limited asbestos and deteriorated LCP survey at the Site on October 3, 2011.

3.1 Asbestos

Suspect ACM were grouped into homogeneous areas with representative samples randomly collected from each. In addition, each potential ACM was evaluated for quantity and friability. A total of three bulk asbestos samples were collected during our survey.

Geocon's procedures for inspection and sampling are discussed below:

- Collected bulk asbestos samples after first wetting friable material with a light mist of water. The samples were then cut from the substrate and transferred to labeled containers. Note that when multiple samples were collected, the sampling locations were distributed throughout the homogeneous area (spaces where the material was observed).
- Relinquished bulk asbestos samples to EMSL Analytical, Inc., a California-licensed laboratory, for asbestos analysis in accordance with EPA Test Method 600/R-93/116 using polarized light microscopy (PLM) under standard chain-of-custody procedures. EMSL Analytical, Inc. is a laboratory accredited by the National Institute of Standards and Technology National

Voluntary Laboratory Accreditation Program (NIST-NVLAP) for bulk asbestos fiber analysis. The laboratory analyses were requested on a 48-hour turn-around-time.

Sample identification numbers, material descriptions, approximate quantities, friability assessments, and photo references are summarized in Table 1. Sample locations are presented on the Site Plan, Figure 2. Materials represented by the samples collected are shown in the attached photographs.

3.2 Lead Paint

One bulk sample of deteriorated yellow traffic striping was collected during our survey. Our sampling procedures are discussed below:

- Collected the bulk sample using techniques presented in HUD guidelines. The painted area was evaluated for deterioration.
- Relinquished the bulk LCP sample under chain-of-custody protocol to McCampbell Analytical, Inc. (MAI), a California-licensed and Caltrans-approved subcontractor, for lead analysis in accordance with EPA Test Method 6010B. MAI is accredited by the DPH for lead analysis. The laboratory analysis was requested on a 48-hour turn-around-time.

The paint sample identification number, description, and peeling and flaking quantity are summarized in Table 2. The approximate sample location is presented on the Site Plan, Figure 2. Material represented by the sample collected is shown in the attached photographs.

4.0 INVESTIGATIVE RESULTS

4.1 Asbestos

Chrysotile asbestos at a concentration of 70% was detected in a sample representing approximately 10 square feet of nonfriable sheet packing used as shims on the bridge barrier rail system.

No asbestos was detected in samples of the remaining suspect materials collected during our survey. A summary of the analytical laboratory test results for asbestos is presented on Table 1. Reproductions of the laboratory report and chain-of-custody documentation are presented in Appendix A.

4.2 Lead Paint

Deteriorated yellow traffic striping exhibited a total lead concentration of 49 mg/kg. The sample did not contain WET lead above the method reporting limit of 0.2 mg/l.

A summary of the analytical laboratory test results for paint is presented on Table 2. Reproductions of the laboratory report and chain-of-custody documentation are presented in Appendix A.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Asbestos

NESHAP regulations do not require that asbestos-containing sheet packing (a Category I nonfriable/nonhazardous material) identified during our survey be removed prior to renovation or be treated as a hazardous waste. However, the disturbance of the material is still covered by the Cal/OSHA asbestos standard (Title 8, CCR Section 1529).

We recommend that a licensed contractor registered with Cal/OSHA for asbestos-related work perform any activities that would *disturb* the asbestos-containing sheet packing identified during our survey. Contractors are responsible for informing the landfill of the contractor's intent to dispose of asbestos waste. Some landfills and recycling facilities may require additional waste characterization. Contractors are responsible for segregating and characterizing waste streams prior to disposal.

Geocon also recommends the notification of contractors (that will be conducting renovation or related activities) of the presence of asbestos in their work areas (i.e., provide contractor[s] with a copy of this report and a list of asbestos removed during subsequent activities). Contractors not trained for asbestos work should be instructed not to disturb asbestos during their activities.

In accordance with Bay Area Air Quality Management District (BAAQMD) Regulation 11, Rule 2, written notification is required ten working days prior to commencement of *any* demolition activity (whether asbestos is present or not).

5.2 Lead Paint

Based on lead content, the yellow traffic striping sampled during our survey would not be considered a California or Federal hazardous waste.

We recommend that all paints at the Site (traffic striping, graffiti, graffiti abatement, signage, etc.) be treated as lead-containing for purposes of determining the applicability of the Cal/OSHA lead standard during any maintenance, renovation, or demolition activities. This recommendation is based on the LCP sample result and the fact that lead was a common ingredient of paints manufactured before 1978, and is still an ingredient of some paints. Compliance and training requirements regarding construction activities where workers may be exposed to lead are presented in Title 8, CCR, Section 1532.1, subsections (e) and (l), respectively. Contractors are responsible for segregating and characterizing waste streams prior to disposal.

6.0 REPORT LIMITATIONS

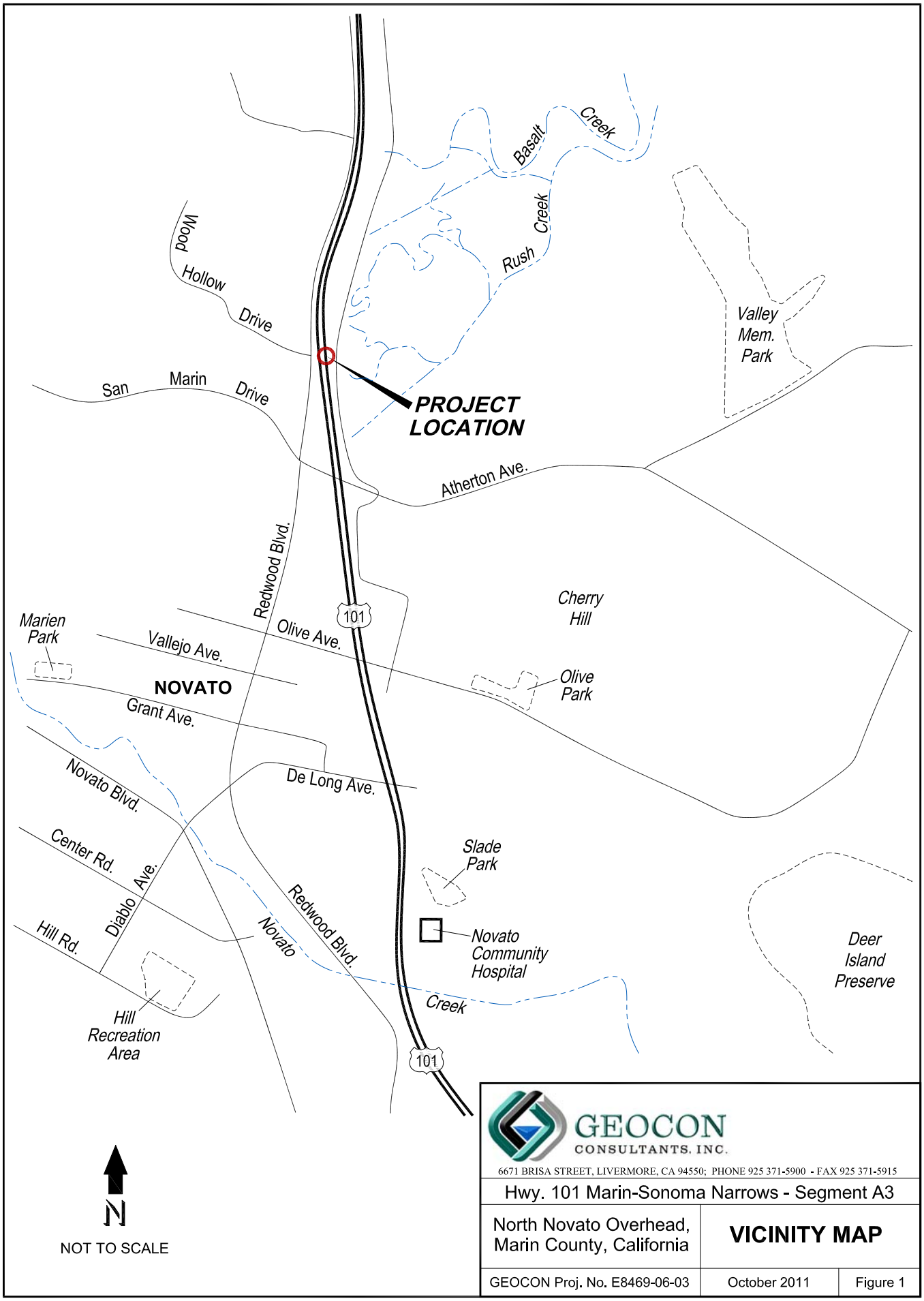
This limited report has been prepared exclusively for BKF Engineers. The information contained herein is only valid as of the date of the report and will require an update to reflect additional information obtained.

The limited asbestos and deteriorated LCP survey was conducted in conformance with generally accepted standards of practice for identifying and evaluating asbestos and LCP in structures. The survey addressed only the areas identified in Sections 1.1 and 1.2. Due to the nature of structure surveys, asbestos and LCP use, and laboratory analytical limitations, some asbestos or deteriorated LCP in the structures may not have been identified. Spaces, such as cavities, crawlspaces, voids, and pipe chases, may have been concealed to our investigator. Previous renovation work may have concealed or covered spaces or materials, or may have partially demolished materials and left debris in inaccessible areas. Additionally, renovation activities may have partially replaced asbestos with indistinguishable non-asbestos. Asbestos and/or LCP may exist in areas not accessible or sampled in conjunction with our scope of services.

During renovation or demolition operations, suspect materials may be uncovered which are different from those accessible for sampling during this assessment. Personnel in charge of renovation/demolition should be alerted to note materials uncovered during such activities that differ substantially from those included in this or previous assessment reports. If additional suspect materials are found, they should be treated as ACM and/or LCP until/unless sampling and analysis indicate otherwise.

This report is not a comprehensive site characterization and should not be construed as such. The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. Therefore, the report should be deemed conclusive with respect to only the information obtained. We make no warranty, express or implied, with respect to the content of this report or any subsequent reports, correspondence, or consultation. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.



GEOCON CONSULTANTS. INC.
6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

Hwy. 101 Marin-Sonoma Narrows - Segment A3

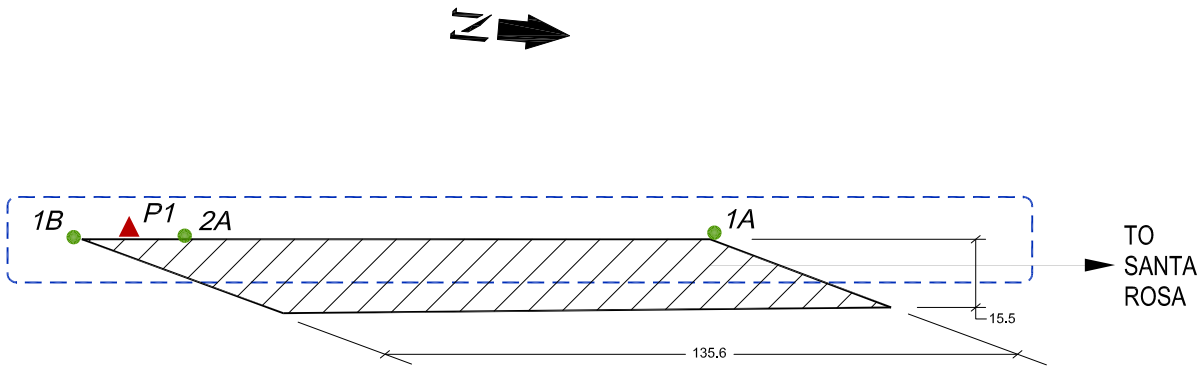
North Novato Overhead, Marin County, California

VICINITY MAP

GEOCON Proj. No. E8469-06-03 | October 2011 | Figure 1

N–NOVATO–OVHD.DWG

Approximate Asbestos Sample Location
Approximate Paint Sample Location
Survey Limit



NORTH NOVATO OVERHEAD

27-0094R

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

Hwy. 101 Marin-Sonoma Narrows - Segment A3

North Novato Overhead,
Marin County, California

SITE PLAN

GEOCON Proj. No. E8469-06-03 | October 2011 | Figure 2

N-NOVATO-OVHD.DWG

Photo 1 – North Novato Overhead (27-0094R) on Highway 101 in Marin County, California

Photo 2 – South abutment, columns, and barriers

Photo 3 – Bridge deck

Photo 4 – Deteriorated yellow traffic striping

Photo 5 – North abutment

Photo 6 – Barrier rail shims

TABLE 1
SUMMARY OF ANALYTICAL LABORATORY TEST RESULTS - ASBESTOS
NORTH NOVATO OVERHEAD (27-0094R)
MARIN COUNTY, CALIFORNIA

Polarized Light Microscopy (PLM) - EPA Test Method 600/R-93/116

Sample ID	Description of Material	Approximate Quantity	Friable	Site Photos	Asbestos Content
1A 1B	Expansion joint fill material	NA	NA	5	ND ND
2A	**Barrier rail shims**	**10 square feet**	**No**	**6**	**70%**

Notes:

NA = Not applicable

ND = No asbestos fibers detected

TABLE 2
SUMMARY OF ANALYTICAL LABORATORY TEST RESULTS - PAINT
NORTH NOVATO OVERHEAD (27-0094R)
MARIN COUNTY, CALIFORNIA

Total and Soluble Lead

Sample ID	Paint Description	Approximate Quantity Peeling and Flaking	Site Photos	Total Lead (mg/kg)	WET Lead (mg/l)
P1	Yellow traffic striping	10 square feet	3 and 4	49	<0.2

Notes:

mg/kg = milligrams per kilogram (EPA Test Method 6010)
WET = Waste Extraction Test (EPA Test Method 7420)
mg/l = milligrams per liter
< = analyte was not detected at or above the stated laboratory reporting limit

APPENDIX A

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: (510) 895-3680 Email: sanleandrolab@emsl.com

Attn: **Dave Watts**
Geocon Consultants, Inc.
6671 Brisa Street

Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8469-06-03 / N. Novato OH**

Customer ID: GECN21
Customer PO: E8469-06-03
Received: 10/04/11 9:00 AM
EMSL Order: 091111243

EMSL Proj:
Analysis Date: 10/5/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**		**% Non-Fibrous**	**% Type**
0094R-1A-Joint Fill *091111243-0001*		Brown Fibrous Heterogeneous	90%	Cellulose	10% Non-fibrous (other)	**None Detected**
0094R-1B-Joint Fill *091111243-0002*		Brown Fibrous Heterogeneous	90%	Cellulose	10% Non-fibrous (other)	**None Detected**
0094R-2A-Shims *091111243-0003*		Gray Fibrous Heterogeneous			30% Non-fibrous (other)	**70% Chrysotile**

Initial report from 10/05/2011 18:12:16

Analyst(s)

Rui Cindy Geng (3)

Baojia Ke, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client.Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc San Leandro, CA NVLAP Lab Code 101048-3, MA AA000201, WA C2007

THIS IS THE LAST PAGE OF THE REPORT.

091111243

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 091111243

EMSL ANALYTICAL, INC.
2235 POLVOROSA DR., STE. 230
SAN LEANDRO, CA 94577
PHONE: (510) 895-3675
FAX: (510) 895-3680

Company: GEOCON
Street: 6671 BRISA ST
City: BRENTWOOD State/Province: CA Zip/Postal Code: 94550 Country: USA
Report To (Name): D. WALTS Fax #: 925-371-5915
Telephone #: 925-371-5900 Email Address: WALTS@GEOCONINC.COM
Project Name/Number: N. NOVATO OH / E8469-06-03
Please Provide Results: ☐ Fax ☒ Email Purchase Order: U.S. State Samples Taken:

EMSL-Bill to: ☒ Same ☐ Different
If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*For TEM Air 3 hours/6 hours, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air
☐ NIOSH 7400
☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
☒ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
Point Count
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
☐ NYS 198.1 (friable in NY)
☐ NYS 198.6 NOB (non-friable-NY)
☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT** (AHERA only)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP
☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
Fibers >10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
☐ Microvac - ASTM D 5755
☐ Wipe - ASTM D6480
☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
☐ PLM CARB 435 - A (0.25% sensitivity)
☐ PLM CARB 435 - B (0.1% sensitivity)
☐ TEM CARB 435 - B (0.1% sensitivity)
☐ TEM CARB 435 - C (0.01% sensitivity)
☐ EPA Protocol (Semi-Quantitative)
☐ EPA Protocol (Quantitative)

Other:
☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Samplers Name: **Samplers Signature:**

(0094R-) Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
1A/B	EXPANSION JOINT FILL MAT'L	NA	30CT2011
2A	SHIMS	↓	↓

Client Sample # (s): -
Total # of Samples: 3
Relinquished (Client): WALTS FED-EX **Date:** 30CT 2011 **Time:** 1711
Received (Lab): **Date:** 30CT 2011 **Time:** 1711
Comments/Special Instructions:

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

GEOCON Env. Consultants	Client Project ID: #E8469-06-03; MSN-A3	Date Sampled: 10/03/11
		Date Received: 10/03/11
6671 Brisa St	Client Contact: David A. Watts	Date Reported: 10/04/11
Livermore, CA 94550	Client P.O.:	Date Completed: 10/04/11

WorkOrder: 1110029

October 04, 2011

Dear David:

Enclosed within are:

1) The results of the **1** analyzed sample from your project: **#E8469-06-03; MSN-A3,**
2) A QC report for the above sample,
3) A copy of the chain of custody, and
4) An invoice for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions or concerns, please feel free to give me a call. Thank you for choosing McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

The analytical results relate only to the items tested.

1110029

RUSH

McCAMPBELL ANALYTICAL, INC.

1534 WILLOW PASS ROAD
PITTSBURG, CA 94565-1701
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (877) 252-9262 Fax: (925) 252-9269

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☒ 48 HR ☐ 72 HR ☐ 5 DAY

GeoTracker EDF ☐ PDF ☒ Excel ☐ Write On (DW) ☐

☐ Check if sample is effluent and "J" flag is required

Report To:	D. WATTS	Bill To:	GEOCON
Company:	6671 BRISA ST. LIVERMORE, CA 94550		
		E-Mail:	
Tele:	(925) 371-5900	Fax:	(925) 371-5915
Project #:	E8469-06-03	Project Name:	MSN-A3
Project Location:	N. NOVATO OH (BRIDGE)		
Sampler Signature:			

SAMPLE ID	LOCATION/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	MATRIX Soil	MATRIX Air	MATRIX Sludge	MATRIX Other Paint	METHOD PRESERVED ICE	METHOD PRESERVED HCL	METHOD PRESERVED HNO_3	METHOD PRESERVED Other	Analysis Request: BTEX & TPH as Gas (602 / 8021 + 8015) / MTBE	TPH as Diesel (8015)	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 502.2 / 601 / 8010 / 8021 (HVOCs)	MTBE / BTEX ONLY (EPA 602 / 8021)	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ONLY; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.7 / 200.8 / 6010 / 6020)	LUFT 5 Metals (200.7 / 200.8 / 6010 / 6020)	Lead (200.7 / 200.8 / 6010 / 6020)	Other	Comments
0094R-81	PAINT	10/3/11	1401	1	Bag					X				X																	X		YELLOW TS

**MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and compliance.

Relinquished By:	Date:	Time:	Received By:
WATTS	10/3/11	1610	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

ICE/t°_____
GOOD CONDITION_____
HEAD SPACE ABSENT_____
DECHLORINATED IN LAB_____
APPROPRIATE CONTAINERS_____
PRESERVED IN LAB_____

COMMENTS: ANTICIPATE SOLUBLE METALS REQUESTS

PRESERVATION VOAS O&G METALS OTHER pH<2

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1110029 **ClientCode: GECL**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David A. Watts
GEOCON Env. Consultants
6671 Brisa St
Livermore, CA 94550
(925) 371-5900 FAX: 925-371-5915

Email: watts@geoconinc.com; Livermore@geoco
cc:
PO:
ProjectNo: #E8469-06-03; MSN-A3

Bill to:
Accounts Payable
GEOCON Env. Consultants
6671 Brisa St
Livermore, CA 94550

Requested TAT: 2 days

Date Received: **10/03/2011**
Date Printed: **10/03/2011**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1110029-001	0094R-P1	Paint Chips	10/3/2011 14:01	☐	A											

Test Legend:

1	PB_CHIP	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments: 48hr Rush

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name: **GEOCON Env. Consultants**

Date and Time Received: **10/3/2011 4:10:09 PM**

Project Name: **#E8469-06-03; MSN-A3**

Checklist completed and reviewed by: Maria Venegas

WorkOrder N°: **1110029** Matrix: Paint Chips

Carrier: Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☑	No ☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp:		NA ☑
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☐	No ☑	

** NOTE: If the "No" box is checked, see comments below.*

Client contacted: Date contacted: Contacted by:

Comments:

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

GEOCON Env. Consultants 6671 Brisa St Livermore, CA 94550	Client Project ID: #E8469-06-03; MSN-A3	Date Sampled: 10/03/11
		Date Received: 10/03/11
	Client Contact: David A. Watts	Date Extracted: 10/03/11
	Client P.O.:	Date Analyzed: 10/04/11

Lead by ICP*

Extraction method: SW3050B | Analytical methods: SW6010B | Work Order: 1110029

Lab ID	Client ID	Matrix	Extraction Type	Lead	DF	% SS	Comments
1110029-001A	0094R-P1	C	TOTAL	49	1	108	

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	TOTAL	NA	µg/L
	C	TOTAL	5.0	mg/Kg

*water samples are reported in µg/L, product/oil/non-aqueous liquid samples and all TCLP / STLC / DISTLC / SPLP extracts are reported in mg/L, soil/sludge/solid/paint chips samples in mg/kg, wipe samples in µg/wipe, filter samples in µg/filter.

means surrogate diluted out of range; ND means not detected above the reporting limit/method detection limit; N/A means not applicable to this sample or instrument.

TOTAL = Hot acid digestion of a representative sample aliquot.
TRM = Total recoverable metals is the "direct analysis" of a sample aliquot taken from its acid-preserved container.
DISS = Dissolved metals by direct analysis of 0.45 µm filtered and acidified sample.

%SS = Percent Recovery of Surrogate Standard
DF = Dilution Factor

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR 6010B

W.O. Sample Matrix: Paint Chips | QC Matrix: Soil | BatchID: 61582 | WorkOrder: 1110029

EPA Method: SW6010B | **Extraction: SW3050B** | **Spiked Sample ID: N/A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)			
	mg/Kg	mg/Kg	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	RPD	LCS/LCSD	RPD
Lead	N/A	10	N/A	N/A	N/A	96	80.7	17.3	N/A	N/A	75 - 125	25
%SS:	N/A	500	N/A	N/A	N/A	99	98	0.811	N/A	N/A	70 - 130	20

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 61582 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1110029-001A	10/03/11 2:01 PM	10/03/11	10/04/11 9:40 AM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not applicable to this method.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

GEOCON Env. Consultants	Client Project ID: #E8469-06-03; MSN-A3	Date Sampled: 10/03/11
		Date Received: 10/03/11
6671 Brisa St	Client Contact: David A. Watts	Date Reported: 10/04/11
Livermore, CA 94550	Client P.O.:	Date Completed: 10/10/11

WorkOrder: 1110029 A

October 10, 2011

Dear David:

Enclosed within are:

1) The results of the **1** analyzed sample from your project: **#E8469-06-03; MSN-A3,**
2) A QC report for the above sample,
3) A copy of the chain of custody, and
4) An invoice for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions or concerns, please feel free to give me a call. Thank you for choosing McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

The analytical results relate only to the items tested.

1110029

RUSH

McCAMPBELL ANALYTICAL, INC.

1534 WILLOW PASS ROAD
PITTSBURG, CA 94565-1701
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (877) 252-9262 Fax: (925) 252-9269

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☒ 48 HR ☐ 72 HR ☐ 5 DAY

GeoTracker EDF ☐ PDF ☒ Excel ☐ Write On (DW) ☐

☐ Check if sample is effluent and "J" flag is required

Report To:	R. WATTS	Bill To:	GEOCON
Company:	6621 BRISA ST. LIVERMORE, CA 94550		
		E-Mail:	
Tele:	(925) 371-5900	Fax:	(925) 371-5915
Project #:	E8469-06-03	Project Name:	MSN-A3
Project Location:	N. NOVATO OH (BRIDGE)		
Sampler Signature:			

SAMPLE ID	LOCATION/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	MATRIX Soil	MATRIX Air	MATRIX Sludge	MATRIX Other	METHOD PRESERVED ICE	METHOD PRESERVED HCL	METHOD PRESERVED HNO_3	METHOD PRESERVED Other
C094R-P1	PAINT	10/3/11	1401	1	Bag					X				X

Analysis Request

BTEX & TPH as Gas (602 / 8021 + 8015) / MTBE	TPH as Diesel (8015)	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 502.2 / 601 / 8010 / 8021 (HVOCs)	MTBE / BTEX ONLY (EPA 602 / 8021)	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ONLY; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.7 / 200.8 / 6010 / 6020)	LUFT 5 Metals (200.7 / 200.8 / 6010 / 6020)	Lead (200.7 / 200.8 / 6010 / 6020)
															X

Other: X STLC Pb 10&11 5day

Comments: Filter Samples for Metals analysis: Yes / No

YELLOW TS

**MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and compliance.

Relinquished By:	Date:	Time:	Received By:
WATTS	10/3/11	1610	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

ICE/t°_____
GOOD CONDITION_____
HEAD SPACE ABSENT_____
DECHLORINATED IN LAB_____
APPROPRIATE CONTAINERS_____
PRESERVED IN LAB_____

VOAS O&G METALS OTHER
PRESERVATION_____ pH<2_____

COMMENTS: ANTICIPATE SOLUBLE REQUESTS

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1110029 A **ClientCode: GECL**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David A. Watts
GEOCON Env. Consultants
6671 Brisa St
Livermore, CA 94550
(925) 371-5900 FAX: 925-371-5915

Email: watts@geoconinc.com; Livermore@geoco
cc:
PO:
ProjectNo: #E8469-06-03; MSN-A3

Bill to:
Accounts Payable
GEOCON Env. Consultants
6671 Brisa St
Livermore, CA 94550

Requested TAT: 2 days
Date Received: **10/03/2011**
Date Add-On: **10/05/2011**
Date Printed: **10/05/2011**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1110029-001	0094R-P1	Paint Chips	10/3/2011 14:01	☐	A											

Test Legend:

1	STLC_PB_Chip	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments: 48hr Rush. STLC Pb 10/5/11 5d.

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

GEOCON Env. Consultants 6671 Brisa St Livermore, CA 94550	Client Project ID: #E8469-06-03; MSN-A3	Date Sampled: 10/03/11
		Date Received: 10/03/11
	Client Contact: David A. Watts	Date Extracted: 10/05/11
	Client P.O.:	Date Analyzed: 10/10/11

Lead by ICP*

Extraction method: CA Title 22 Analytical methods: SW6010B Work Order: 1110029

Lab ID	Client ID	Matrix	Extraction Type	Lead	DF	% SS	Comments
1110029-001A	0094R-P1	C	WET	ND	1	N/A	

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	TOTAL	NA	µg/L
	C	WET	0.2	mg/L

*water samples are reported in µg/L, product/oil/non-aqueous liquid samples and all TCLP / STLC / DISTLC / SPLP extracts are reported in mg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, filter samples in µg/filter.

means surrogate diluted out of range; ND means not detected above the reporting limit/method detection limit; N/A means not applicable to this sample or instrument.

WET = Waste Extraction Test, i.e., STLC (Soluble Threshold Limit Concentration).
DI WET = Waste Extraction Test using DI water (DI STLC).

%SS = Percent Recovery of Surrogate Standard
DF = Dilution Factor

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW6010B

W.O. Sample Matrix: Paint Chips | QC Matrix: Soil | BatchID: 61629 | WorkOrder: 1110029

EPA Method: SW6010B | **Extraction: CA Title 22** | **Spiked Sample ID: N/A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)			
	mg/L	mg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	RPD	LCS/LCSD	RPD
Lead	N/A	1	N/A	N/A	N/A	87.6	86.3	1.46	N/A	N/A	75 - 125	25

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 61629 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1110029-001A	10/03/11 2:01 PM	10/05/11	10/10/11 10:21 AM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not applicable to this method.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

PRELIMINARY SITE INVESTIGATION REPORT

US-101 MARIN-SONOMA NARROWS - SEGMENT A3
MARIN COUNTY, CALIFORNIA

PREPARED FOR:
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CALIFORNIA 94588

PREPARED BY:
GEOCON CONSULTANTS, INC.
6671 BRISA STREET
LIVERMORE, CALIFORNIA 94550

GEOCON

GEOCON PROJECT NO. E8469-06-03

NOVEMBER 2011
REVISED APRIL 2012

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. E8469-06-03
November 22, 2011
Revised April 30, 2012

Natalina Bernardi
BKF Engineers
4670 Willow Road, Suite 250
Pleasanton, California 94588

Subject: PRELIMINARY SITE INVESTIGATION REPORT
US HIGHWAY 101, MARIN-SONOMA NARROWS
SEGMENT A3 – HOV LANE ADDITION
MARIN COUNTY, CALIFORNIA

Dear Ms. Bernardi:

Geocon has performed environmental engineering services at the subject site. The site investigation was performed along the northbound shoulder, median, and one overcrossing structure within the limits of United States Highway 101 (US-101) Marin-Sonoma Narrows, Segment A3, in Marin County, California.

The accompanying report summarizes the services performed including limited soil sample collection from borings advanced using hand-auger and direct-push drilling equipment, and laboratory testing.

The contents of this report reflect the views of Geocon Consultants, Inc., who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

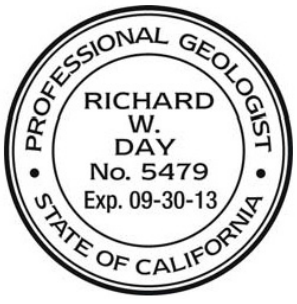
If there are any questions concerning the contents of this report, or if Geocon may be of further service, please contact the undersigned at your convenience.

Sincerely,

GEOCON CONSULTANTS, INC.

Luann Beadle
Senior Staff Scientist

Richard Day, CEG, CHG
Vice President



(1) Addressee
(3) Shawn Enjily, Caltrans District 4

TABLE OF CONTENTS

PRELIMINARY SITE INVESTIGATION REPORT Page

1.0 INTRODUCTION 1
1.1 Project Description and Proposed Improvements 1
1.2 Purpose 1

2.0 BACKGROUND 2
2.1 Hazardous Waste Determination Criteria 2
2.2 DTSC Variance 2
2.3 Naturally Occurring Asbestos 4
2.4 Environmental Screening Levels 4

3.0 SCOPE OF SERVICES 5
3.1 Pre-field Activities 5
3.2 Field Activities 5

4.0 INVESTIGATIVE METHODS 6
4.1 Sampling Procedures 6
4.2 Laboratory Analyses 7
4.3 Laboratory QA/QC 7

5.0 INVESTIGATIVE RESULTS 8
5.1 Subsurface Conditions 8
5.2 Laboratory Analytical Results 8
5.2.1 Soil 8
5.2.2 Groundwater 9
5.3 Laboratory Quality Assurance/Quality Control 9
5.4 Statistical Evaluation for Lead Detected in Soil Samples 9
5.4.1 Calculating the UCLs for the Arithmetic Mean 10
5.4.2 Correlation of Total and WET Lead 11

6.0 CONCLUSIONS 13
6.1 Lead in Soil 13
6.1.1 Northbound Shoulder (borings NB1 to NB20) 13
6.1.2 Northbound Median (borings M21 to M40) 14
6.1.3 Southbound Shoulder (borings SB1 to SB6 and B1 to B4) 14
6.2 CAM 17 Metals 15
6.2.1 Soil 15
6.2.2 Groundwater 16
6.3 Petroleum Hydrocarbons 17
6.3.1 Soil 17
6.3.2 Groundwater 17
6.4 Naturally Occurring Asbestos 17
6.5 Worker Protection 17

7.0 REPORT LIMITATIONS 18

FIGURES

1. Vicinity Map
2a-d. Site Plan

TABLES

1. Boring Coordinates
2. Summary of Lead and pH Results - Soil
3. Summary of CAM 17 Metals Results - Soil
4. Summary of Petroleum Hydrocarbon Results - Soil
5. Summary of CAM 17 Metals Results – Groundwater
6. Summary of Petroleum Hydrocarbon and VOC Results - Groundwater
7a-c. Summary of Lead Statistical Analysis
8. Summary of NOA Results - Soil

APPENDICES

A. DTSC Variance
B. Laboratory Reports and Chain-of-custody Documentation
C. Metals and TPH Statistics

PRELIMINARY SITE INVESTIGATION REPORT

1.0 INTRODUCTION

This Preliminary Site Investigation Report for the United States Highway 101 (US-101) Marin-Sonoma Narrows (MSN) Segment A3 project was prepared by Geocon Consultants, Inc. at the request of BKF Engineers, Inc.

1.1 Project Description and Proposed Improvements

The site area consists of the Segment A3 – High Occupancy Vehicle (HOV) lane addition portion of the MSN Project. Segment A3 begins just north of Atherton Avenue Overcrossing at Post Mile (PM) R22.0 and extends approximately 2.2 miles north. The proposed project will widen, repave, and lane stripe this existing segment of northbound US-101 to accommodate the addition of an HOV lane. In addition to the HOV lane, the proposed project will incorporate linear bioretention areas within a portion of the median of US-101 and adjacent to the outside shoulders of southbound US-101 and biofiltration strips adjacent to the outside shoulder of northbound US-101 in order to meet storm water treatment requirements. The proposed construction activities will be conducted within existing Caltrans right-of-way and within Sonoma Marin Area Rail Transit (SMART) right-of-way.

Soil sampling was conducted on the northbound shoulder, southbound shoulder, and median, and soil and groundwater sampling was conducted near the proposed structure modifications at the North Novato Overhead. The site location is depicted on the Vicinity Map, Figure 1.

1.2 Purpose

The purpose of the proposed scope of services was to evaluate whether impacts due to metals, primarily aerial deposited lead (ADL), petroleum hydrocarbons, or naturally occurring asbestos (NOA) exist in the surface and near surface soil in the road-widening areas, and if soil and groundwater in the vicinity of the North Novato Overhead crossing structure have been impacted with petroleum hydrocarbons and metals. The information obtained from this investigation will be used by BKF Engineers to evaluate soil and groundwater reuse/disposal options.

The project also included a survey of the North Novato Overhead crossing structure to assess the potential presence and quantity of asbestos and potential presence of lead paint prior to planned renovation activities. The results of the survey are provided in our report entitled *Limited Asbestos and Deteriorated Lead-Containing Paint Survey, North Novato Overhead (27-0094R), 04-MRN-101, Post Mile 22.30, Marin County, California*, dated November 22, 2011.

2.0 BACKGROUND

2.1 Hazardous Waste Determination Criteria

Regulatory criteria to classify a waste as California hazardous for handling and disposal purposes are contained in the CCR, Title 22, Division 4.5, Chapter 11, Article 3, §66261.24. Criteria to classify a waste as Resource, Conservation, and Recovery Act (RCRA) hazardous are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), Section 261.

For waste containing metals, the waste is classified as California hazardous when: 1) the representative total metal content equals or exceeds the respective Total Threshold Limit Concentration (TTLC); or 2) the representative soluble metal content equals or exceeds the respective Soluble Threshold Limit Concentration (STLC) based on the standard Waste Extraction Test WET. A waste has the potential of exceeding the STLC when the waste's total metal content is greater than or equal to ten times the respective STLC value since the WET uses a 1:10 dilution ratio. Hence, when a total metal is detected at a concentration greater than or equal to ten times the respective STLC, and assuming that 100 percent of the total metals are soluble, soluble metal analysis is required. A material is classified as RCRA hazardous, or Federal hazardous, when the representative soluble metal content equals or exceeds the Federal regulatory level based on the Toxicity Characteristic Leaching Procedure (TCLP).

The above regulatory criteria are based on chemical concentrations. Wastes may also be classified as hazardous based on other criteria such as ignitability and corrosivity; however, for the purposes of this investigation, toxicity (i.e., representative lead concentrations) is the primary factor considered for waste classification since waste generated during the construction activities would not likely warrant testing for ignitability or other criteria. Waste that is classified as either California hazardous or RCRA hazardous requires management as a hazardous waste.

2.2 DTSC Variance

The California Department of Toxic Substances Control (DTSC) issued a statewide Variance effective July 1, 2009, regarding the management of ADL-impacted soils within Caltrans right-of-way. Under the Variance, soil that is classified as a non-RCRA hazardous waste, based primarily on ADL content, may be suitable for reuse within Caltrans right-of-way. ADL soil that is classified as a RCRA hazardous waste is not eligible for reuse under the Variance and must be disposed of as a RCRA hazardous waste (Caltrans Type Z-3).

ADL soil reused under the Variance must always be at least five feet above the highest groundwater elevation and, depending on lead concentrations, must be covered with at least one foot of non-hazardous soil or a pavement structure. The ADL soil may not be placed in areas where it might contact groundwater or surface water (such as streams and rivers), and must be buried in locations that are protected from erosion that may result from storm water run-on and run-off.

Review of the statewide Variance indicates the following conditions regarding the reuse and management of ADL-impacted soil as fill material for construction and maintenance operations. If ADL soil meets the Variance criteria but is not intended to be reused within Caltrans right-of-way, then the excavated soil must be disposed of as a California hazardous waste (Caltrans Type Z-2). A copy of the Variance is presented as Appendix A.

Caltrans Type Y-1: ADL soil exhibiting a total lead concentration less than or equal to 1,411 milligrams per kilogram (mg/kg), a DI-WET (WET using deionized water as extractant) lead concentration less than or equal to 1.5 milligrams per liter (mg/l), and a pH value greater than or equal to 5.5 may be reused within the same Caltrans corridor and must be covered with at least one foot of non-hazardous soil.

Caltrans Type Y-2: ADL soil exhibiting a total lead concentration less than or equal to 1,411 mg/kg, a DI-WET lead concentration less than or equal to 1.5 mg/l, and a pH value greater than 5 and less than 5.5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

ADL soil exhibiting a total lead concentration less than or equal to 1,411 mg/kg, a DI-WET lead concentration greater than 1.5 mg/l and less than or equal to 150 mg/l, and a pH value greater than 5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

ADL soil exhibiting a total lead concentration greater than 1,411 mg/kg and less than or equal to 3,397 mg/kg, a DI-WET lead concentration less than or equal to 150 mg/l, and a pH value greater than 5 may be reused within the same Caltrans corridor and must be covered and protected from infiltration by a pavement structure.

Caltrans Type Z-2: ADL soil exhibiting a total lead concentration greater than 3,397 mg/kg, a DI-WET lead concentration greater than 150 mg/l, or a pH value less than or equal to 5 is not eligible for reuse under the Variance and must be disposed of as a California hazardous waste.

Caltrans Type Z-3: ADL soil exhibiting a TCLP lead concentration greater than or equal to 5 mg/l is not eligible for reuse under the Variance and must be disposed of as a RCRA hazardous waste.

2.3 Naturally Occurring Asbestos

As defined in current California Air Resources Board (CARB) rules, serpentine material refers to any material that contains at least 10% serpentine, and asbestos-containing serpentine refers to serpentine materials with an asbestos content greater than 5% as determined by CARB Test Method 435 (CARB 435). The use of serpentine material for road surfacing is prohibited in California by Title 17 of the California Code of Regulations (CCR) Section 93106, Asbestos Airborne Toxic Control Measure (ATCM) for Surfacing Application (ATCM 93106), unless the material has been tested and determined to have an asbestos content of less than 0.25%. Materials found to contain asbestos of 0.25% or more are considered to be designated waste if transported offsite, requiring disposal at a landfill facility designated to accept asbestos waste. Alternatively, asbestos-containing materials may be reused onsite if buried beneath a minimum 6 inches of soil.

The CARB specifies mitigation practices for construction, grading, quarrying, and surface mining operations that contain natural occurrences of asbestos outlined in Title 17, Section 93105, Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations (ATCM 93105). Based on Part (e) Subpart (2) of ATCM 93105 an asbestos dust mitigation plan is required and must be implemented for a project if NOA is disturbed after the start of construction. Additionally, ATCM 93105 specifies that the air pollution control district (APCD) must be notified and an asbestos dust mitigation plan submitted to the APCD. The ATCM states that air monitoring may be required on the property. NOA potentially poses a health hazard when it becomes an airborne particulate.

The construction/maintenance activities mentioned above could disturb NOA-laden debris and soil, thereby potentially creating an airborne hazard. Mitigation practices can reduce the risk of exposure to airborne NOA containing dust. Dust suppression practices include wetting the materials being disturbed and wearing approved respirators with high-efficiency particulate air (HEPA) filters during construction activities.

2.4 Environmental Screening Levels

The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) has prepared a technical report entitled *Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater, Interim Final* (May 2008), which presents Environmental Screening Levels (ESLs) for soil, groundwater, soil gas, and surface water, to assist in evaluating sites impacted by releases of hazardous chemicals. The ESLs are conservative values for more than 100 commonly detected contaminants, which may be used to compare with environmental data collected at a site. ESLs are strictly risk assessment tools and "not regulatory cleanup standards." The presence of a chemical at concentrations in excess of an ESL does not necessarily indicate that adverse impacts to human health or the environment are occurring; this simply indicates that a potential for adverse risk may exist and that additional evaluation is or "may be" warranted (SFRWQCB, 2008).

Residential and commercial/industrial land use ESLs are also commonly used by soil trucking companies and private and commercial land owners as default acceptance criteria to evaluate suitability of import soil material.

The most conservative ESL table was used for this characterization: Table A – Shallow Soil (≤3 meters below ground surface; bgs) – Groundwater is a Current or Potential Source of Drinking Water. The respective ESLs are listed at the end of Tables 3 through 6 for comparative purposes.

3.0 SCOPE OF SERVICES

We performed the following scope of services:

3.1 Pre-field Activities

- Prepared a site-specific health and safety plan to provide guidelines on the use of personal protective equipment and the health and safety procedures implemented during the field activities.
- Retained the services of Lane Safety to provide traffic control during field operations.
- Retained the services of Advanced Technology Laboratories (ATL) and EMSL Analytical (EMSL) to perform the sample analyses.
- Notified Underground Service Alert (USA) at least 48 hours prior to fieldwork.

3.2 Field Activities

Geocon performed the primary portion of this site investigation on October 10 and October 19, 2011, which consisted of the following field activities:

- Advanced 40 direct push soil borings along the shoulder and median of northbound US-101. Soil borings were advanced to a maximum depth of 2.5 feet.
- Accompanied Parikh Consultants, Inc. and collected three soil samples from geotechnical boring GB1.
- Advanced hand auger boring GB1A in the vicinity of North Novato Overhead for the purpose of collecting soil and grab-groundwater samples.
- Collected 29 soil samples for analysis of CAM 17 metals.
- Collected 96 soil samples for analysis of total lead.
- Collected 15 soil samples for analysis of pH.
- Collected 24 soil samples for analysis of total petroleum hydrocarbons as gasoline (TPHg), as diesel (TPHd), and as motor oil (TPHmo), benzene, ethylbenzene, toluene and total xylenes (BTEX), and methyl tert-butyl ether (MTBE).
- Collected 15 soil samples for analysis of NOA.
- Collected 1 groundwater sample for analysis of CAM 17 metals.

- Collected 1 groundwater sample for analysis of TPHg. TPHd, TPHmo, BTEX and MTBE.
- Transported samples to ATL and EMSL for analysis under standard chain-of-custody (COC) documentation.

Six additional soil borings (SB1 to SB6) were advanced on April 5, 2011, at the request BKF due to a change in project scope (addition of linear bioretention area adjacent to the outside shoulder of southbound US-101). Two soil samples were collected from each boring and analyzed for total lead. Because the southbound shoulder area overlapped the southern limits of Segment B1, total lead soil data from four borings (B1 to B4) from the MSB Segment B1 investigation were incorporated into the dataset for determining hazardous waste classification in the southbound shoulder area. The data collected from borings B1 to B4 were presented in Geocon's report entitled *Preliminary Site Investigation Report, US 101 Marin Sonoma Narrows Segment B1 – Southerly Interchange, Marin County, California,* dated January 2010, and are not discussed further in this report other than in the statistical evaluation of soil data for determining hazardous waste criteria.

4.0 INVESTIGATIVE METHODS

4.1 Sampling Procedures

Soil samples were collected from 48 boring locations, which are shown on the Site Plan, Figures 2a through 2d. The boring locations were surveyed using Differential Global Positioning System (DGPS) equipment, and coordinates are presented on Table 1.

The soil borings were advanced using hand auger or direct-push drilling methods. Soil samples were collected into new acetate liners or steel sample tubes and were secured with Teflon tape and plastic end caps. Grab-groundwater samples were collected using hand-bailing techniques and placed into glass vials and jars. Sample containers were labeled, placed into a chilled cooler, and transported to ATL using standard COC documentation. Soil borings were backfilled to surface with neat cement.

Sample containers were labeled, placed into a chilled cooler, and transported to ATL and EMSL using standard COC documentation. Soil borings were backfilled to surface with soil cuttings.

Geocon provided QA/QC procedures during the field activities. These procedures included washing the sampling equipment with a Liqui-Nox® solution followed by a double rinse with deionized water. Decontamination water was disposed to the ground surface within Caltrans right-of-way in a manner not to create runoff, away from drain inlets or potential water bodies.

4.2 Laboratory Analyses

Laboratory analyses performed by ATL and EMSL were under standard seven-day and ten-day turn-around-times, respectively. Reproductions of the laboratory reports and COC documentation are presented as Appendix B.

The soil samples were analyzed as follows:

- 108 samples for total lead using Environmental Protection Agency (EPA) Method 6010 ICAP.
- 29 samples for CAM 17 metals according to Title 22 CCR, EPA Test Methods 6010 ICAP and 7471A.
- 24 samples with total lead concentrations greater than 50 mg/kg (i.e., greater than ten times the STLC of 5.0 mg/l) were further analyzed for WET lead.
- 15 samples with WET lead concentrations greater than 5.0 mg/l were further analyzed for DI-WET lead.
- 11 samples with total lead concentrations exceeding 100 mg/kg and WET lead concentrations exceeding 5 mg/l were further analyzed for TCLP lead using EPA Method 1311/7420.
- 9 samples with total chromium concentrations exceeding 50 mg/kg (i.e., ten times the STLC of 5.0 mg/l for hexavalent chromium) were further analyzed for WET chromium.
- 1 sample with total nickel concentrations exceeding ten times the STLC of 20 mg/l were further analyzed for WET nickel.
- 24 samples for TPHg, BTEX, and MTBE using EPA Test Method 8021B.
- 24 samples for TPHd and TPHmo using EPA Test Method 8015M.
- 15 samples for NOA using CARB 435.
- 15 samples for pH using EPA Method 9045.

The groundwater sample was analyzed for:

- CAM 17 metals according to Title 22 CCR, EPA Test Methods 6010 ICAP and 7471A.
- TPHg, TPHd, and TPHmo using EPA Test Method 8015M.
- BTEX and MTBE using EPA Test Method 8021B.

4.3 Laboratory QA/QC

QA/QC procedures were performed for each method of analysis with specificity for each analyte listed in the test method's QA/QC. The laboratory QA/QC procedures included the following:

- One method blank for every ten samples, batch of samples or type of matrix, whichever was more frequent.
- One sample analyzed in duplicate for every ten samples, batch of samples or type of matrix, whichever was more frequent.

- One spiked sample for every ten samples, batch of samples or type of matrix; whichever was more frequent, with spike made at ten times the detection limit or at the analyte level.

Prior to submitting the samples to the laboratories, the COC documentation was reviewed for accuracy and completeness (Appendix B).

5.0 INVESTIGATIVE RESULTS

5.1 Subsurface Conditions

Observations during field activities indicated that surface soil at the project location generally consist of coarse gravel/rock to a depth of 1.5 feet, and dark grey clay from a depth of between 1.5 and 1.0 to 7.0 feet. Groundwater was measured in boring GB1A at a depth of 6.5 feet.

5.2 Laboratory Analytical Results

A summary of the analytical results are presented in Tables 2 to 6 and 8. Reproductions of the laboratory reports and chain-of-custody documentation are presented as Appendix B.

5.2.1 Soil

- Total lead was reported at concentrations ranging from 1.4 mg/kg to 380 mg/kg, with 28 samples exceeding 50 mg/kg (i.e., exceeding ten times the STLC of 5 mg/l).
- WET lead was reported at concentrations ranging from non-detect (less than the laboratory reporting limit of 0.5 mg/l) to 35 mg/l.
- DI-WET lead was not detected at or above the laboratory reporting limit of 0.50 mg/l.
- TCLP lead was reported in two samples at concentrations of 0.54 and 0.80 mg/l
- Total chromium was reported at concentrations ranging from non-detect (<1.0 mg/kg) to 700 mg/kg.
- Hexavalent chromium was not detected at or above the laboratory reporting limit of 0.10 mg/kg.
- WET chromium was not detected at or above the laboratory reporting limit of 1.0 mg/l.
- Nickel was reported at concentrations ranging from 10 to 770 mg/kg, with one sample exceeding 200 mg/kg (i.e., ten times the STLC of 20 mg/l).
- WET nickel was reported at a concentration of 5.5 mg/l.
- The following metals were not detected above their respective laboratory reporting limits: beryllium, selenium, silver, and thallium. Remaining CAM 17 metals were reported at concentrations less than ten times their respective STLC values.
- TPHd as diesel was reported at concentrations ranging from 2.1 mg/kg to 230 mg/kg, exceeding the residential and commercial/industrial ESLs of 83 mg/kg but beneath the construction exposure ESL of 4,200.

- TPHmo was reported at concentrations ranging from 3.3 mg/kg to 1,600 mg/kg, exceeding the residential ESL of 370 mg/kg but below the commercial/industrial and construction exposure ESLs of 2,500mg/kg and 12,000 mg/kg, respectively.
- TPHg, BTEX, or MTBE were not detected at or above the laboratory reporting limits.
- NOA was not reported at or above the laboratory target sensitivity of 0.25%.

5.2.2 Groundwater

- The following metals were not detected above their respective laboratory reporting limits: molybdenum, selenium, silver and thallium. Remaining CAM 17 metals were reported at concentrations ranging from 0.0018 to 3.2 mg/l.
- TPHg was reported at a concentration of 0.053 mg/l, below its freshwater ESL of 0.1 mg/l.
- TPHd, TPHmo, BTEX, MTBE, or VOCs were not detected above the laboratory reporting limits.

5.3 Laboratory Quality Assurance/Quality Control

We reviewed the QA/QC results provided with the laboratory analytical reports. The data indicate several detection results for the method blanks below the reporting limits. The Matrix Spike (MS) and/or Matrix Spike Duplicate was outside recovery criteria for several samples, however, the analytical batch was validated by the Laboratory Control Sample (LCS). The relative percent differences (RPDs) of the duplicate samples for several of the analyses were outside criteria. The RPDs for several of the matrix spike duplicate samples for the analyses were outside criteria. The Case Narratives in the laboratory reports state that each analytical batch was validated by the laboratory control sample (LCS). The data showed acceptable recoveries and RPDs for the remainder of the duplicates and matrix spikes. Dilution was necessary for several analyses due to sample matrix. Dilution was necessary for several samples due to sample matrix. One sample was analyzed passed hold time due to laboratory instrument problems.

Based on this limited data review, no additional qualifications of the soil data are necessary, and the data are of sufficient quality for the purposes of this report.

5.4 Statistical Evaluation for Lead Detected in Soil Samples

The lead data for the Site were treated as three sample populations for statistical evaluation that consisted of the following:

A) Northbound Shoulder (borings NB1 to NB20)

B) Northbound Median (borings M21 to M40)

C) Southbound Shoulder (borings SB1 to SB6 and B1 to B4)

Statistical methods were applied to the total lead data to evaluate: 1) the upper confidence limits (UCLs) of the arithmetic means of the total lead concentrations for each sampling depth; and 2) if an acceptable correlation between total and WET lead concentrations exists that would allow the prediction of WET lead concentrations based on calculated UCLs.

5.4.1 Calculating the UCLs for the Arithmetic Mean

The upper one-sided 90% and 95% UCLs of the arithmetic mean are defined as the values that, when calculated repeatedly for randomly drawn subsets of site data, equal or exceed the true mean 90% and 95% of the time, respectively. Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the arithmetic mean concentration are used as the mean concentrations because it is not possible to know the true mean due to the essentially infinite number of soil samples that could be collected from a site. The UCLs therefore account for uncertainties due to limited sampling data. As data become less limited at a site, uncertainties decrease, and the UCLs move closer to the true mean.

Non-parametric bootstrap techniques were used to calculate the UCLs. For those samples in which total lead was not detected at concentrations exceeding the laboratory reporting limit, a value equal to one-half of the detection limit was used in the UCL calculation. The bootstrap test results are included in Appendix C. The following tables present the calculated UCLs and statistics.

Northbound Shoulder (NB1 to NB20)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	27.43	29.62	18.78	1.4	140
1 to 1.5	60.29	66.87	37.48	2.6	380
2 to 2.5	24.13	26.75	14.4	3.7	160

Northbound Median (M21 to M40)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 0.5	154.5	161.5	130.1	28	340
1 to 1.5	10.52	11.16	8.73	1.5	33
2 to 2.5	11.22	12.1	7.92	0.5	55

Southbound Shoulder (SB1 to SB6 and B1 to B4)

SAMPLE INTERVAL (feet)	90% TOTAL LEAD UCL (mg/kg)	95% TOTAL LEAD UCL (mg/kg)	TOTAL LEAD MEAN (mg/kg)	MINIMUM VALUE (mg/kg)	MAXIMUM VALUE (mg/kg)
0 to 1	55.3	60	38.4	3.9	220

5.4.2 Correlation of Total and WET Lead

Total and corresponding WET lead concentrations are bivariate data with a linear structure. This linear structure should allow for the prediction of WET lead concentrations based on the UCLs calculated above in Section 5.4.1.

To estimate the degree of interrelation between total and corresponding WET lead values (*x* and *y*, respectively), the *correlation coefficient [r]* is used. The correlation coefficient is a ratio that ranges from +1 to –1. A *correlation coefficient* of +1 indicates a perfect direct relationship between two variables; a *correlation coefficient* of –1 indicates that one variable changes inversely with relation to the other. Between the two extremes is a spectrum of less-than-perfect relationships, including zero, which indicates the lack of any sort of linear relationship at all.

The *correlation coefficient* was calculated for 5 (*x, y*) data points (i.e., soil samples analyzed for both total lead [*x*] and WET lead [*y*]) from along the northbound shoulder and for 19 (*x, y*) data points from along the northbound median. Four data points with the highest squared residual WET lead concentrations were eliminated from the median dataset to achieve an acceptable correlation. The resulting *coefficient of determination* (r^2) for the northbound shoulder equaled 0.7982, which yields a corresponding *correlation coefficient* (*r*) of 0.8934. The resulting *coefficient of determination* (r^2) for the northbound median equaled 0.7248, which yields a corresponding *correlation coefficient* (*r*) of 0.8514.

For the *correlation coefficient* that indicates a linear relationship between total and WET lead concentrations, it is possible to compute the line of dependence or a best-fit line between the two variables. A least squares method was used to find the equation of a best-fit line (regression line) by forcing the y-intercept equal to zero since that is a known point. The equation of the regression line was determined to be $y = 0.0791(x)$ for the northbound shoulder and $y = 0.0621(x)$ for the northbound median, where *x* represents total lead concentrations and *y* represents predicted WET lead concentrations. The southbound soil samples were analyzed for total lead only and could not be plotted. As a result, the most conservative regression line equation of $y = 0.0791(x)$ was used to predict the 90% UCL-WET lead concentration for the linear bioretention area along the southbound shoulder.

These equations were used to estimate the expected WET lead concentrations for the UCLs calculated in for samples collected from the Site (see Section 5.4.1). Regression analysis results and scatter plots depicting the (*x*, *y*) data points along with the regression lines are included in Appendix C. The predicted WET lead concentrations are summarized in Tables 7a to 7c.

6.0 CONCLUSIONS

Waste classifications are evaluated based on the 90% UCL of the lead content for the relevant excavation depths; this has historically been considered sufficient to satisfy a good faith effort by the EPA as discussed in SW-846. Risk assessment characterization is based on the 95% UCL of the lead content in the waste for the relevant depths; this is in accordance with the Risk Assessment Guidance for Superfund (RAGS) Volume 1 Documentation for Exposure Assessment. Per Caltrans, the 90% UCLs are to be used to evaluate onsite reuse and the 95% UCLs are to be used to evaluate offsite disposal.

6.1 Lead in Soil

6.1.1 Northbound Shoulder (borings NB1 to NB20)

The following table summarizes the predicted waste classification for excavated soil based on the calculated weighted averages of the total lead UCLs for data collected from this portion of the Site. Weighted averages are calculated by using the total lead UCL concentration for each 0.5-foot depth interval as the value for the underlying 0.5-foot depth interval (unless a sample was collected from the underlying depth interval). The total and WET lead calculations are summarized in Table 7a.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 foot	27	2.2	30	Non-Hazardous
Underlying soil (1 to 2.5 feet)	*48*	*3.8*	*53*	*Non-Hazardous*
0 to 2.0 feet	44	3.5	48	Non-Hazardous
Underlying Soil (2 to 2.5 feet)	*24*	*1.9*	*27*	*Non-Hazardous*
0 to 2.5 feet	40	3.2	44	Non-Hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment and offsite disposal

Based on the data presented in the above table, excavated soil would be classified as non-hazardous since the 90% UCL-predicted WET lead concentrations are less than the lead STLC of 5.0 mg/l.

6.1.2 Northbound Median (borings M21 to M40)

The following table summarizes the predicted waste classification for excavated soil based on the calculated weighted averages of the total lead UCLs for data collected from this portion of the Site. The total and WET lead calculations are summarized in Table 7b.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 foot	155	**9.6**	**162**	**Hazardous**
Underlying soil (1 to 2.5 feet)	*11*	*0.7*	*11*	*Non-Hazardous*
0 to 2.0 feet	83	**5.1**	**86**	**Hazardous**
Underlying Soil (2 to 2.5 feet)	*11*	*0.7*	*12*	*Non-Hazardous*
0 to 2.5 feet	68	4.2	71	Non-Hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment and offsite disposal

Based on the data presented in the above table, soil excavated to a depth of 1 foot would be classified as a California hazardous waste since the 90% UCL-predicted WET lead concentration is greater than the lead STLC of 5.0 mg/l. Based on the TCLP lead results, excavated soil would not be classified as a RCRA hazardous waste. Based on the reported DI-WET results, soil excavated from 0 to 1 foot may be reused onsite (as Caltrans Type Y-1) in accordance with the DTSC Variance by placing the excavated soil under clean fill or pavement.. Underlying soil, below a depth of 1 foot, would be classified as non-hazardous.

Excavated soil would be classified as non-hazardous if excavation extends to 2.5 feet and excavated soil is managed as a whole.

6.1.3 Southbound Shoulder (borings SB1 to SB6 and B1 to B4)

The following table summarizes the predicted waste classification for excavated soil based on the calculated weighted averages of the total lead UCLs for data collected from this portion of the Site. The total and WET lead calculations are summarized in Table 7c.

Excavation Depth	90% UCL Total Lead (mg/kg)	90% UCL Predicted WET Lead (mg/l)	95% UCL Total Lead (mg/kg)	Waste Classification
0 to 1 foot	55.3	4.4	60	Non-hazardous

90% UCL applicable for waste classification and onsite reuse; 95% UCL applicable for risk assessment and offsite disposal

Based on the data presented in the above table, excavated soil would be classified as non-hazardous since the 90% UCL-predicted WET lead concentrations are less than the lead STLC of 5.0 mg/l.

6.2 CAM 17 Metals

6.2.1 Soil

Based on the reported WET chromium and nickel results, soil would not be classified as hazardous waste.

The CAM 17 metals concentrations in Site soil were compared to ESLs (Table A, SFRWQCB, May 2008). Antimony, arsenic, cadmium, cobalt, lead, mercury, nickel and vanadium were reported at concentrations greater than their respective ESL values in the soil samples collected at the site.

Upper one-sided 95% UCLs were calculated for the full set of antimony, arsenic, cadmium, cobalt, lead, mercury, nickel, and vanadium data collected at the Site. The UCLs were compared with the residential and commercial/industrial land use ESLs and with published background levels typically present in California soils as presented in *Background Concentrations of Trace and Major Elements in California Soils* (Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, March 1996). The bootstrap results are included in Appendix C. The calculated standard bootstrap UCLs, ESLs and published background concentrations are summarized in the table below:

Metal	95% UCL	RESIDENTIAL ESL	COMMERCIAL/ INDUSTRIAL ESL	CONSTRUCTION EXPOSURE ESL	PUBLISHED BACKGROUND MEAN[1]	PUBLISHED BACKGROUND RANGE [1]
Antimony	12 [2]	6.3	40	310	0.60	0.15-1.95
Arsenic	3.052	0.39	1.6	15	3.5	0.6 to 11.0
Cadmium	1.9 [2]	1.7	7.4	39	0.36	0.05-1.7
Cobalt	15.7	40	80	94	14.9	2.7 to 46.9
Lead	44.53	200	750	750	23.9	12.4-97.1
Mercury	0.216	1.3	10	58	0.26	0.05-0.90
Nickel	112	150	150	260	57	9 to 509
Vanadium	26.56	16	200	770	112	39 to 288

Concentrations reported in milligrams per kilogram (mg/kg)

[1] Kearney Foundation of Soil Science, March 1996

[2] Maximum Concentration – UCL not calculated due to insufficient distinct observations

Antimony was detected in only one of 29 samples; therefore, UCL data could not be calculated. The maximum antimony concentration is greater than the residential ESL and published background range, and less than the commercial/industrial and construction exposure ESLs.

The 95% UCL arsenic value for soil samples collected at the Site is greater than the residential land use ESL; however, it is less than the commercial/industrial land use and construction exposure ESLs and within the published background range. The SFRWQCB *November 2007 Update to Environmental Screening Levels (ESLs) Technical Document* states that ambient background concentrations of arsenic typically exceed risk-based screening levels. In such instances, it may be more appropriate to compare site data to regionally specific established background levels.

Cadmium was reported in 4 of the 29 samples analyzed, creating an insufficient dataset to calculate UCLs. The maximum cadmium concentration is greater than the residential ESL and published background range, and less than the commercial/industrial and construction exposure ESLs.

The 95% UCL cobalt concentration for soil samples collected at the Site is less than the residential land use ESL and within the published background range.

The 95% UCL lead concentration for soil samples collected at the Site is less than the residential land use ESL and within the published background range.

The 95% UCL mercury concentration for soil samples collected at the Site is less than the residential land use ESL and within the published background range.

The 95% UCL nickel concentration for soil samples collected at the Site is less than the residential land use ESL and within the published background range.

The 95% UCL vanadium concentration for soil samples collected at the Site is greater than the residential land use ESL; however, it is less than the commercial/industrial land use ESL and published background range.

Offsite reuse or disposal of excavated soil may be restricted based on metals content.

6.2.2 Groundwater

The CAM 17 metals concentrations in Site groundwater collected from GB1A were compared to ESLs (Tables A, B and F, SFRWQCB, May 2008). Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium and zinc were reported at concentrations greater than their respective ESLs values for groundwater as a current/potential source for drinking water, groundwater not as a current or potential source for drinking water, and freshwater, marine and estuarine surface waters.

Disposal of groundwater encountered during excavation activities may be restricted based on metals content.

6.3 Petroleum Hydrocarbons

6.3.1 Soil

TPHg, BTEX, or MTBE were not detected at or above the laboratory reporting limits. TPHd concentrations ranged from <1.0 to 230 mg/kg, above the residential and commercial/industrial land use ESL of 83 mg/kg, but below the construction exposure ESL of 4,200 mg/kg. The calculated 95% UCL for TPHd results is 69.92 and less than the residential and commercial/industrial land use ESLs. TPHmo was reported at concentrations ranging from <1.0 to 1,600 mg/kg, exceeding the residential land use ESL of 370 mg/kg, but below the commercial/industrial land use ESL of 2,500 mg/kg and the construction exposure of 12,000 mg/kg. The calculated 95% UCL for the TPHmo results is 396.6 mg/kg, exceeding the residential land use ESL.

Offsite reuse or disposal of excavated soil may be restricted based on TPHd and TPHmo content.

6.3.2 Groundwater

TPHd, TPHmo, BTEX, MTBE, or VOCs were not detected in groundwater sample GB1A-GW. TPHg was reported at a concentration of 0.053 mg/l, below the ESL for groundwater as a current or potential source of drinking water.

6.4 Naturally Occurring Asbestos

The mapped geology of the general area of the Site is indicative of a metamorphic regime where NOA minerals may occur. However, the soil sample results indicate that NOA is not present at concentrations exceeding the CARB regulatory limit of 0.25%.

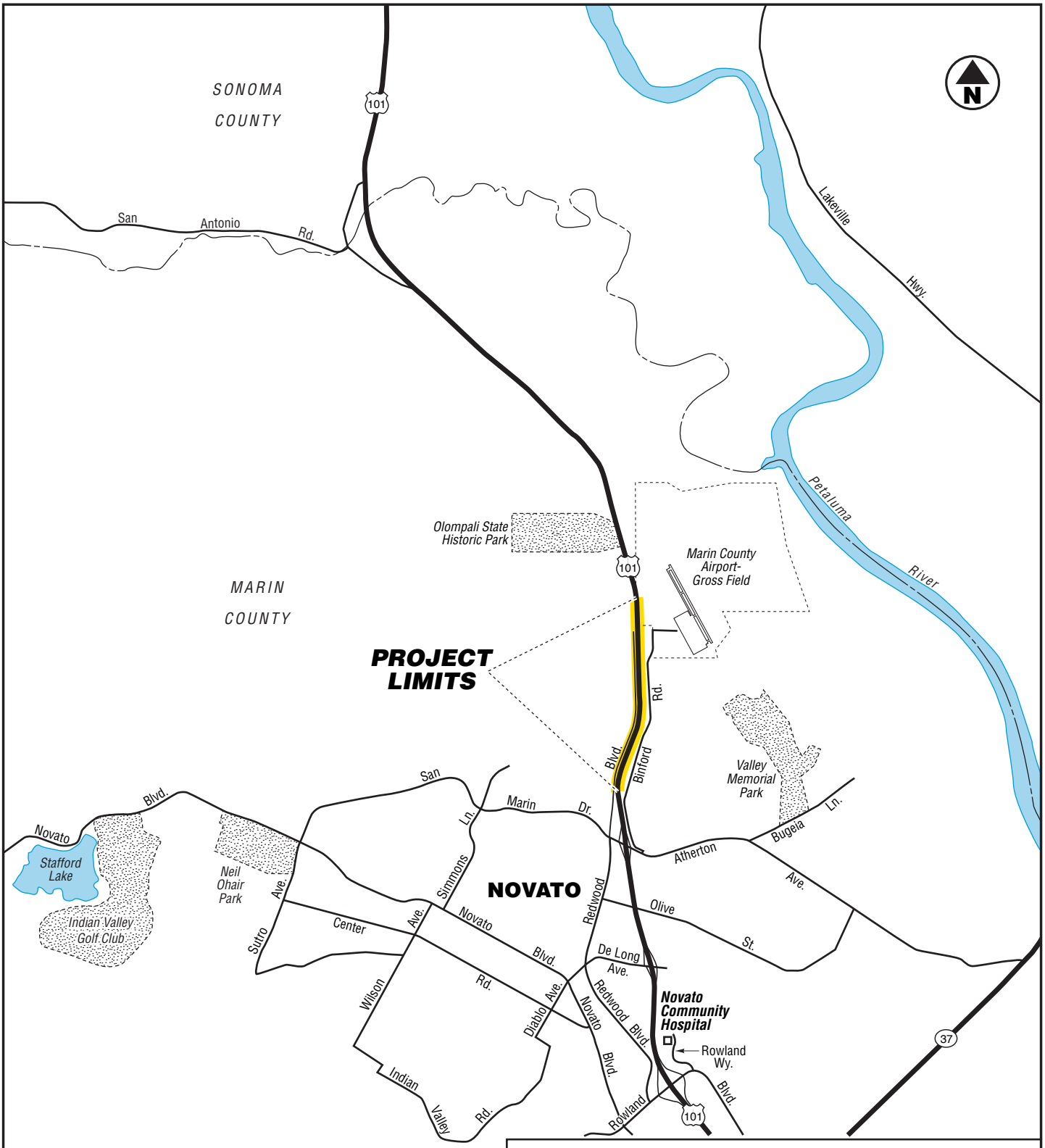
6.5 Worker Protection

Per Caltrans' requirements, the contractor(s) should prepare a project-specific health and safety plan to prevent or minimize worker exposure to impacted soil. The plan should include protocols for environmental and personnel monitoring, requirements for personal protective equipment, and other health and safety protocols and procedures for the handling of impacted soil.

7.0 REPORT LIMITATIONS

This report has been prepared exclusively for BKF Engineers. The information contained herein is only valid as of the date of the field sampling and will require an update to reflect additional information obtained.

This report is not a comprehensive site characterization and should not be construed as such. The findings as presented in this report are predicated on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. Therefore, the report should be deemed conclusive with respect to only the information obtained. We make no warranty, express or implied, with respect to the content of this report or any subsequent reports, correspondence or consultation. Geocon strived to perform the services summarized herein in accordance with the local standard of care in the geographic region at the time the services were rendered.



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

SR 101 Marin Sonoma Narrows, Segment A3

Sonoma and Marin Counties,
California

VICINITY MAP

E8469-06-03	November 2011	Figure 1

GEOCON CONSULTANTS, INC.

6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

US 101 - Marin Sonoma Narrows Segment A3

Marin County, California

SITE PLAN

GEOCON Proj. No. E8469-06-03

EA No.

April 2012

Figure 2a

SITE0412.DWG

GEOCON CONSULTANTS, INC.

6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

US 101 - Marin Sonoma Narrows Segment A3

Marin County, California

SITE PLAN

GEOCON Proj. No. E8469-06-03

EA No.

April 2012

Figure 2b

SITE0412.DWG

GEOCON CONSULTANTS, INC.

6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

US 101 - Marin Sonoma Narrows Segment A3

Marin County, California

SITE PLAN

GEOCON Proj. No. E8469-06-03

EA No.

April 2012

Figure 2c

SITE0412.DWG

GEOCON CONSULTANTS. INC.

6671 BRISA STREET, LIVERMORE, CA 94550; PHONE 925 371-5900 - FAX 925 371-5915

US 101 - Marin Sonoma Narrows Segment A3

Marin County, California	**SITE PLAN**	
GEOCON Proj. No. E8469-06-03		
EA No.	April 2012	Figure 2d

SITE0412.DWG

TABLE 1
Boring Coordinates
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Boring	Latitude	Longitude
NB1	38.1236620	-122.5657139
NB2	38.1248237	-122.5657894
NB3	38.1260016	-122.5655448
NB4	38.1269979	-122.5651526
NB5	38.1280578	-122.5646541
NB6	38.1291068	-122.5641758
NB7	38.1301708	-122.5637827
NB8	38.1312073	-122.5635859
NB9	38.1323417	-122.5634953
NB10	38.1334646	-122.5635292
NB11	38.1347780	-122.5636274
NB12	38.1357909	-122.5636905
NB13	38.1366051	-122.5637789
NB14	38.1376867	-122.5638319
NB15	38.1385654	-122.5638828
NB16	38.1395695	-122.5639599
NB17	38.1406942	-122.5640873
NB18	38.1417333	-122.5641667
NB19	38.1428297	-122.5642402
NB20	38.1438966	-122.5642954
M21	38.1441660	-122.5644796
M22	38.1430433	-122.5644063
M23	38.1419246	-122.5643233
M24	38.1408724	-122.5642372
M25	38.1397743	-122.5641664
M26	38.1386667	-122.5641029
M27	38.1375570	-122.5639958
M28	38.1364401	-122.5639204
M29	38.1353949	-122.5638246
M30	38.1342116	-122.5637770
M31	38.1331663	-122.5637220
M32	38.1320182	-122.5637373
M33	38.1309454	-122.5638501
M34	38.1298716	-122.5641279
M35	38.1288248	-122.5645362
M36	38.1278212	-122.5650475
M37	38.1267011	-122.5655197
M38	38.1256656	-122.5658701
M39	38.1245699	-122.5660258
M40	38.1234829	-122.5659553
GB1	38.1213331	-122.5656439
GB1A	38.1212261	-122.5659905
SB1	38.1390699	-122.5642924
SB2	38.1364883	-122.5640989

TABLE 1
Boring Coordinates
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Boring	Latitude	Longitude
SB3	38.1338601	-122.5640031
SB4	38.1319231	-122.5640117
SB5	38.1302521	-122.5643187
SB6	38.1287844	-122.5648765
B1*	38.13481939	-122.5640647
B2*	38.13654684	-122.5641278
B3*	38.13832856	-122.5642477
B4*	38.13978596	-122.5643633

* = Segment B1 boring location

TABLE 2
Summary of Lead and pH Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	DI-WET Lead (mg/l)	TCLP Lead (mg/l)	pH
Northbound Shoulder						
NB1-0	0	11	---	---	---	---
NB1-1	1	8.6	---	---	---	---
NB1-2	2	7.6	---	---	---	---
NB2-0	0	8.0	---	---	---	---
NB2-1	1	7.7	---	---	---	---
NB2-2	2	6.7	---	---	---	---
NB3-0	0	18	---	---	---	---
NB3-1	1	9.5	---	---	---	---
NB3-2	2	5.3	---	---	---	---
NB4-0	0	34	---	---	---	---
NB4-1	1	7.2	---	---	---	---
NB4-2	2	5.6	---	---	---	---
NB5-0	0	13	---	---	---	---
NB5-1	1	6.0	---	---	---	---
NB5-2	2	6.3	---	---	---	---
NB6-0	0	6.1	---	---	---	---
NB6-1	1	7.7	---	---	---	---
NB6-2	2	6.3	---	---	---	---
NB7-0	0	15	---	---	---	---
NB7-1	1	7.4	---	---	---	---
NB7-2	2	9.0	---	---	---	---
NB8-0	0	17	---	---	---	---
NB8-1	1	2.6	---	---	---	---
NB8-2	2	5.1	---	---	---	---
NB9-0	0	34	---	---	---	---
NB9-1	1	8.6	---	---	---	---
NB9-2	2	6.2	---	---	---	---
NB10-0	0	8.8	---	---	---	---
NB10-1	1	16	---	---	---	---
NB10-2	2	7.0	---	---	---	---
NB11-0	0	22	---	---	---	---
NB11-1	1	29	---	---	---	---
NB11-2	2	160	8.9	<0.50	<0.50	7.6
NB12-0	0	3.1	---	---	---	---
NB12-1	1	7.1	---	---	---	---
NB12-2	2	7.0	---	---	---	---

TABLE 2
Summary of Lead and pH Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	DI-WET Lead (mg/l)	TCLP Lead (mg/l)	pH
NB13-0	0	7.0	---	---	---	---
NB13-1	1	11	---	---	---	---
NB13-2	2	10	---	---	---	---
NB14-0	0	21	---	---	---	---
NB14-1	1	92	9.8	<0.50	---	8.2
NB14-2	2	5.3	---	---	---	---
NB15-0	0	140	1.0	<0.50	<0.50	8.6
NB15-1	1	63	3.4	---	---	---
NB15-2	2	4.1	---	---	---	---
NB16-0	0	4.4	---	---	---	---
NB16-1	1	14	---	---	---	---
NB16-2	2	9.4	---	---	---	---
NB17-0	0	4.0	---	---	---	---
NB17-1	1	24	---	---	---	---
NB17-2	2	8.7	---	---	---	---
NB18-0	0	1.4	---	---	---	---
NB18-1	1	6.2	---	---	---	---
NB18-2	2	6.3	---	---	---	---
NB19-0	0	2.6	---	---	---	---
NB19-1	1	380	35	<0.50	0.54	8.6
NB19-2	2	8.4	---	---	---	---
NB20-0	0	5.1	---	---	---	---
NB20-1	1	42	---	---	---	---
NB20-2	2	3.7	---	---	---	---
Northbound Median						
M21-0	0	53	2.1	---	---	---
M21-1	1	6.4	---	---	---	---
M21-2	2	4.0	---	---	---	---
M22-0	0	100	2.6	---	---	---
M22-1	1	7.1	---	---	---	---
M22-2	2	8.6	---	---	---	---
M23-0	0	55	7.9	<0.50	---	6.8
M23-1	1	33	---	---	---	---
M23-2	2	5.8	---	---	---	---
M24-0	0	28	---	---	---	---
M24-1	1	5.8	---	---	---	---
M24-2	2	5.0	---	---	---	---

TABLE 2
Summary of Lead and pH Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	DI-WET Lead (mg/l)	TCLP Lead (mg/l)	pH
M25-0	0	42	---	---	---	---
M25-1	1	9.6	---	---	---	---
M25-2	2	6.1	---	---	---	---
M26-0	0	270	22	<0.50	0.80	6.8
M26-1	1	13	---	---	---	---
M26-2	2	9.2	---	---	---	---
M27-0	0	130	7.0	<0.50	<0.50	6.9
M27-1	1	11	---	---	---	---
M27-2	2	4.4	---	---	---	---
M28-0	0	98	5.6	<0.50	---	7.1
M28-1	1	10	---	---	---	---
M28-2	2	4.0	---	---	---	---
M29-0	0	130	8.5	<0.50	<0.50	7.1
M29-1	1	14	---	---	---	---
M29-2	2	<1.0	---	---	---	---
M30-0	0	61	13	<0.50	---	7.5
M30-1	1	7.7	---	---	---	---
M30-2	2	1.5	---	---	---	---
M31-0	0	100	9.8	<0.50	<0.50	6.6
M31-1	1	9.7	---	---	---	---
M31-2	2	55	1.1	---	---	---
M32-0	0	210	29	<0.50	<0.50	5.9
M32-1	1	9.7	---	---	---	---
M32-2	2	12	---	---	---	---
M33-0	0	270	19	<0.50	<0.50	6.7
M33-1	1	5.8	---	---	---	---
M33-2	2	12	---	---	---	---
M34-0	0	340	2.0	---	---	---
M34-1	1	5.8	---	---	---	---
M34-2	2	4.7	---	---	---	---
M35-0	0	78	1.2	---	---	---
M35-1	1	1.5	---	---	---	---
M35-2	2	<1.0	---	---	---	---
M36-0	0	65	0.54	---	---	---
M36-1	1	5.5	---	---	---	---
M36-2	2	6.2	---	---	---	---

TABLE 2
Summary of Lead and pH Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	DI-WET Lead (mg/l)	TCLP Lead (mg/l)	pH
M37-0	0	110	3.4	---	---	---
M37-1	1	5.3	---	---	---	---
M37-2	2	3.2	---	---	---	---
M38-0	0	72	2.5	---	---	---
M38-1	1	4.5	---	---	---	---
M38-2	2	6.2	---	---	---	---
M39-0	0	170	5.2	<0.50	<0.50	6.6
M39-1	1	1.5	---	---	---	---
M39-2	2	2.7	---	---	---	---
M40-0	0	220	5.5	<0.50	<0.50	6.6
M40-1	1	7.7	---	---	---	---
M40-2	2	6.8	---	---	---	---
Southbound Shoulder						
SB1-0	0	6.3	---	---	---	---
SB1-1	1	11	---	---	---	---
SB2-0	0	3.9	---	---	---	---
SB2-1	1	19	---	---	---	---
SB3-0	0	68	---	---	---	---
SB3-1	1	6.4	---	---	---	---
SB4-0	0	220	---	---	---	---
SB4-1	1	7.9	---	---	---	---
SB5-0	0	190	---	---	---	---
SB5-1	1	6.3	---	---	---	---
SB6-0	0	73	---	---	---	---
SB6-1	1	9.4	---	---	---	---
B1-0*	0	25	---	---	---	6.9
B1-1.5*	1.5	8.6	---	---	---	---
B2-0*	0	26	---	---	---	---
B2-1.5*	1.5	7.8	---	---	---	---
B3-0*	0	20	---	---	---	---
B3-1.5*	1.5	6.2	---	---	---	---
B4-0*	0	39	---	---	---	---
B4-1.5*	1.5	15	---	---	---	---

TABLE 2
Summary of Lead and pH Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	DI-WET Lead (mg/l)	TCLP Lead (mg/l)	pH
Bridge Structure						
GB1-1	1	8.8	---	---	---	---
GB1-3	3	7.0	---	---	---	---
GB1-5	5	11	---	---	---	---
GB1A-4	4	28	---	---	---	---
GB1A-6.5	6.5	5.5	---	---	---	---
Hazardous Waste Criteria						
TTLC (mg/kg)		1,000	---	---	---	---
STLC (mg/l)		---	5.0	---	---	---
TCLP (mg/l)		---	---	---	5.0	---

Notes:

mg/kg = Milligrams per kilogram
mg/l = Milligrams per liter
--- = Not analyzed
<5.0 = Not detected above the laboratory reporting limit
WET = Waste Extraction Test using citric acid as the extraction fluid
DI-WET = Waste Extraction Test using deionized water as the extraction fluid
TCLP = Toxicity Characteristic Leaching Procedure
TTLC = Total Threshold Limit Concentration
STLC = Soluble Threshold Limit Concentration
* = Denotes sampled in June 2009 as part of earlier phase investigation

TABLE 3
Summary of CAM 17 Metals Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
NB1-1	1	<2.0	3.9	100	<1.0	<1.0	58 *<1.0*	---	13	11	8.6	<0.10	1.8	78	<1.0	<1.0	<1.0	11	33
NB3-0	0	<2.0	3.7	72	<1.0	<1.0	43	---	11	13	18	<0.10	<1.0	64	<1.0	<1.0	<1.0	9.4	39
NB4-2	2	<2.0	1.3	130	<1.0	<1.0	77 *<1.0*	---	17	28	5.6	<0.10	<1.0	80	<1.0	<1.0	<1.0	32	38
NB6-1	1	<2.0	5.2	110	<1.0	<1.0	48	<0.10	16	19	7.7	<0.10	<1.0	69	<1.0	<1.0	<1.0	17	41
NB8-0	0	<2.0	1.5	100	<1.0	<1.0	36	---	8.8	19	17	0.33	<1.0	49	<1.0	<1.0	<1.0	32	45
NB9-2	2	<2.0	3.8	63	<1.0	<1.0	62 *<1.0*	---	10	9.6	6.2	<0.10	<1.0	75	<1.0	<1.0	<1.0	8.0	24
NB11-1	1	<2.0	4.0	220	<1.0	<1.0	100 *<1.0*	---	17	25	29	<0.10	<1.0	110	<1.0	<1.0	<1.0	24	45
NB13-0	0	<2.0	<1.0	66	<1.0	<1.0	17	---	10	26	7.0	0.10	<1.0	28	<1.0	<1.0	<1.0	43	120
NB14-2	2	<2.0	2.6	80	<1.0	<1.0	23	---	3.2	14	5.3	0.15	<1.0	31	<1.0	<1.0	<1.0	21	22
NB16-1	1	<2.0	<1.0	51	<1.0	<1.0	16	---	16	20	14	0.11	<1.0	37	<1.0	<1.0	<1.0	25	34
NB18-0	0	<2.0	<1.0	69	<1.0	<1.0	10	---	13	16	1.4	<0.10	<1.0	30	<1.0	<1.0	<1.0	42	22
NB19-2	2	<2.0	1.1	89	<1.0	<1.0	5.1	<0.10	5.7	6.2	8.4	1.4	<1.0	10	<1.0	<1.0	<1.0	10	28

TABLE 3
Summary of CAM 17 Metals Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
M21-1	1	<2.0	<1.0	29	<1.0	<1.0	10	---	3.6	5.2	6.4	0.13	<1.0	13	<1.0	<1.0	<1.0	12	22
M23-0	0	<2.0	2.0	81	<1.0	<1.0	21	---	8.7	36	55	0.15	<1.0	29	<1.0	<1.0	<1.0	24	150
M24-2	2	<2.0	<1.0	57	<1.0	<1.0	8.4	---	5.5	6.0	5.0	<0.10	<1.0	11	<1.0	<1.0	<1.0	13	24
M26-1	1	<2.0	3.2	51	<1.0	<1.0	17	---	2.7	13	13	0.18	<1.0	10	<1.0	<1.0	<1.0	21	23
M28-0	0	<2.0	<1.0	69	<1.0	1.0	30	<0.10	10	51	98	0.17	<1.0	44	<1.0	<1.0	<1.0	21	190
M29-2	2	<2.0	<1.0	140	<1.0	<1.0	72 *<1.0*	---	20	43	<1.0	<0.10	<1.0	69	<1.0	<1.0	<1.0	49	34
M31-1	1	<2.0	4.9	390	<1.0	<1.0	22	---	11	32	9.7	0.24	<1.0	45	<1.0	<1.0	<1.0	21	56
M33-0	0	<2.0	1.6	110	<1.0	1.9	34	---	7.4	49	270	0.17	2.1	43	<1.0	<1.0	<1.0	19	250
M34-2	2	<2.0	3.4	17	<1.0	<1.0	23	---	8.7	11	4.7	<0.10	<1.0	29	<1.0	<1.0	<1.0	21	35
M36-0	0	<2.0	<1.0	140	<1.0	1.0	28	---	19	50	65	<0.10	<1.0	37	<1.0	<1.0	<1.0	20	98
M37-2	2	12	1.3	64	<1.0	1.0	700 *<1.0*	<0.10	46	21	3.2	<0.10	<1.0	770 *5.5*	<1.0	<1.0	<1.0	21	23
M39-1	1	<2.0	<1.0	290	<1.0	<1.0	40	---	31	73	1.5	<0.10	<1.0	41	<1.0	<1.0	<1.0	23	76

TABLE 3
Summary of CAM 17 Metals Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
GB1-1	1	<2.0	<1.0	280	<1.0	<1.0	71 *<1.0*	---	19	60	8.8	<0.10	<1.0	75	<1.0	<1.0	<1.0	31	63
GB1-3	3	<2.0	4.4	75	<1.0	<1.0	50 *<1.0*	---	11	17	7.0	<0.10	<1.0	58	<1.0	<1.0	<1.0	17	41
GB1-5	5	<2.0	10	110	<1.0	<1.0	57 *<1.0*	---	18	26	11	0.13	<1.0	69	<1.0	<1.0	<1.0	20	52
GB1A-4	4	<2.0	3.1	42	<1.0	<1.0	46	---	5.7	18	28	<0.10	<1.0	55	<1.0	<1.0	<1.0	33	40
GB1A-6.5	6.5	<2.0	3.9	190	<1.0	<1.0	45	---	12	14	5.5	<0.10	<1.0	47	<1.0	<1.0	<1.0	38	25
ESLs																			
Residential Land Use		6.3	0.39	750	4.0	1.7	750	8,000	40	230	200	1.3	40	150	10	20	1.3	16	600
Comm/Ind Land Use		40	1.6	1,500	8.0	7.4	750	8,000	80	230	750	10	40	150	10	40	16	200	600
Construction Exposure		310	15	2,600	98	39	1,200,000	530	94	310,000	750	58	78	260	3,900	3,900	62	770	230,000
Hazardous Waste Criteria																			
TTLC		500	500	10,000	75	100	2,500*	500	8,000	2,500	1,000	20	3,500	2,000	100	500	700	2,400	5,000
STLC		15	5.0	100	0.75	1.0	5.0*	5.0	80	25	5.0	0.2	350	20	1.0	5.0	7.0	24	250
TCLP		---	5.0	100	---	1.0	6.0	6.0**	---	---	5.0	0.2	---	---	1.0	5.0	---	---	---

Notes:

Results are shown in milligrams per kilogram (mg/kg).
*Values listed for chromium are for Chromium III, as there is no standard for total chromium.
**Value listed for Hexavalent Chromium is for total chromium, as there is no standard for Hexavalent Chromium.
< = Analyte was not detected above the laboratory reporting limit.
--- = Not analyzed or no standards exits for this compound
ESLs = Environmental Screening Levels
TTLC = total threshold limit concentration
STLC = soluble threshold limit concentration
TCLP = toxicity characteristic leaching procedure
Data shown in italics indicates results for WET analyses in milligrams per liter (mg/l)

TABLE 4
Summary of Petroleum Hydrocarbon Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (ft)	TPHd (mg/kg)	TPHmo (mg/kg)	TPHg (mg/kg)	BTEX (ug/kg)	MTBE (ug/kg)
NB1-0	0	3.0	5.5	---	---	---
NB1-1	1	---	---	<1.0	ND	<5.0
NB3-0	0	5.3	10	----	---	---
NB3-1	1	---	---	<1.0	ND	<5.0
NB5-0	0	27	120	---	---	---
NB5-1	1	---	---	<1.0	ND	<5.0
NB7-0	0	13	68	---	---	---
NB7-1	1	---	---	<1.0	ND	<5.0
NB9-0	0	230	1,600	----	---	---
NB9-1	1	---	---	<1.0	ND	<5.0
NB11-0	0	150	1,000	---	---	---
NB11-1	1	---	---	<1.0	ND	<5.0
NB13-0	0	43	250	---	---	---
NB13-1	1	---	---	<1.0	ND	<5.0
NB15-0	0	62	360	----	---	---
NB15-1	1	---	---	<1.0	ND	<5.0
NB17-0	0	190	820	---	---	---
NB17-1	1	---	---	<1.0	ND	<5.0
NB19-0	0	13	120	---	---	---
NB19-1	1	---	---	<1.0	ND	<5.0
M22-0	0	73	400	---	---	---
M22-1	1	---	---	<1.0	ND	<5.0
M24-0	0	2.1	3.3	---	---	---
M24-1	1	---	---	<1.0	ND	<5.0
M26-0	0	94	420	---	---	---
M26-1	1	---	---	<1.0	ND	<5.0
M28-0	0	71	470	----	---	---
M28-1	1	---	---	<1.0	ND	<5.0
M30-0	0	52	220	---	---	---
M30-1	1	---	---	<1.0	ND	<5.0
M32-0	0	59	270	---	---	---
M32-1	1	---	---	<1.0	ND	<5.0

TABLE 4
Summary of Petroleum Hydrocarbon Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (ft)	TPHd (mg/kg)	TPHmo (mg/kg)	TPHg (mg/kg)	BTEX (ug/kg)	MTBE (ug/kg)
M34-0	0	17	110	----	---	---
M34-1	1	---	---	<1.0	ND	<5.0
M36-0	0	7.3	33	---	---	---
M36-1	1	---	---	<1.0	ND	<5.0
M38-0	0	4.8	5.0	---	---	---
M38-1	1	---	---	<1.0	ND	<5.0
M40-0	0	44	180	----	---	---
M40-1	1	---	---	<1.0	ND	<5.0
GB1-1	1	11	32	----	---	---
GB1-3	3	14	14	<1.0	ND	<5.0
GB1-5	5	---	---	<1.0	ND	<5.0
GB1A-4	4	2.4	8.0	<1.0	ND	<5.0
GB1A-6.5	6.5	<1.0	<1.0	<1.0	ND	<5.0
ESLs						
Residential		83	370	83	---	23
Commercial/Industrial		83	2,500	83	---	23
Construction Exposure		4,200	12,000	4,200	---	5,000

Notes:
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
TPHg = Total petroleum hydrocarbons as gasoline
TPHd = Total petroleum hydrocarbons as diesel
TPHmo = Total petroleum hydrocarbons as motor oil
BTEX = Benzene, toluene, ethylbenzene, and xylenes
MTBE = Methyl tert-butyl ether
--- = Not Analyzed or no standard for this compound
< = Not detected above the stated laboratory reporting limit
ND = None detected
ESLs = Environmental Screening Levels

TABLE 5
Summary of CAM 17 Metals Results - Groundwater
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
GB1A-GW	0.021	0.11	3.2	0.0032	0.02	2.1	0.42	0.82	0.25	0.0018	<0.005	2.8	<0.010	<0.003	<0.015	1.5	1.2
ESLs																	
GW is current/potential source	0.006	0.036	1.0	0.00053	0.00025	0.05	0.0030	0.0031	0.0025	0.000025	0.035	0.0082	0.0050	0.00019	0.0020	0.015	0.081
W not current/potential source	0.030	0.036	1.0	0.00053	0.00025	0.18	0.0030	0.0031	0.0025	0.000025	0.24	0.0082	0.0050	0.00019	0.0040	0.019	0.081
Surface Water - Freshwater	0.006	0.00014	1.0	0.0027	0.00025	0.05	0.0030	0.0090	0.0025	0.000025	0.035	0.052	0.0050	0.00034	0.0020	0.015	0.12
Surface Water - Marine	0.50	0.00014	1.0	0.00053	0.0093	0.18	0.0030	0.0031	0.0056	0.000025	0.24	0.0082	0.071	0.00019	0.0040	0.019	0.081
Surface Water - Estuarine	0.030	0.00014	1.0	0.00053	0.00025	0.18	0.0030	0.0031	0.0025	0.000025	0.24	0.0082	0.005	0.00019	0.0040	0.019	0.081

Notes:

Data are shown in units of milligrams per liter (mg/l).

--- = Not Analyzed or Not Applicable

< = Not detected above the stated laboratory reporting limit

ESLs = Environmental Screening Levels

TABLE 6
Summary of Petroleum Hydrocarbon and VOC Results - Groundwater
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	TPHg (mg/l)	TPHd (mg/l)	TPHmo (mg/l)	BTEX (ug/l)	MTBE (ug/l)	VOCs (ug/l)
GB1A-GW	0.053	<0.062	<0.062	ND	<0.50	ND
ESLs						
GW is current/potential source	0.10	0.10	0.10	---	5.0	---
GW not current/potential source	0.21	0.21	0.21	---	1,800	---
Surface Water - Freshwater	0.10	0.10	0.10	---	5.0	---
Surface Water - Marine	0.21	0.21	0.21	---	180	---
Surface Water - Estuarine	0.21	0.21	0.21	---	180	---

Notes:

mg/l = milligrams per kilogram
µg/l = micrograms per kilogram
TPHg = Total petroleum hydrocarbons as gasoline
TPHd = Total petroleum hydrocarbons as diesel
TPHmo = Total petroleum hydrocarbons as motor oil
BTEX = Benzene, toluene, ethylbenzene, and xylenes
MTBE = methyl tert-butyl ether
VOCs = Volatile Organic Compounds
--- = Not Analyzed or no standard exists
< = Not detected above the stated laboratory reporting limit
ND = None detected
ESLs = Environmental Screening Levels

TABLE 7a
Summary of Lead Statistical Analysis
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Northbound Shoulder (borings NB1 to NB20)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 foot	27.4	29.6
1 to 1.5 feet	60.3	66.9
2 to 2.5 feet	24.1	26.8

EXCAVATION SCENARIOS

	Weighted Averages		
	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**WET Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 foot	27	2.2	30
Underlying Soil (1 to 2.5 feet)	*48*	*3.8*	*53*
0 to 2 feet	44	3.5	48
Underlying Soil (2 to 2.5 feet)	*24*	*1.9*	*27*
0 to 2.5 feet	40	3.2	44

Notes:

Weighted average values are based upon calculated UCLs for each depth interval.

UCL = Upper Confidence Limit (90% UCL is applicable for waste classification; 95% UCL applicable for risk assessment)

mg/kg = milligrams per kilogram

mg/l = milligrams per liter

* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0791\ x$

TABLE 7b
Summary of Lead Statistical Analysis
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Northbound Median (borings M21 to M40)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 0.5 foot	154.5	161.5
1 to 1.5 feet	10.5	11.2
2 to 2.5 feet	11.2	12.1

EXCAVATION SCENARIOS

	Weighted Averages		
	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**WET Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 foot	155	**9.6**	162
Underlying Soil (1 to 2.5 feet)	*11*	*0.7*	*11*
0 to 2 feet	83	5.1	86
Underlying Soil (2 to 2.5 feet)	*11*	*0.7*	*12*
0 to 2.5 feet	68	4.2	71

Notes:

Weighted average values are based upon calculated UCLs for each depth interval.

UCL = Upper Confidence Limit (90% UCL is applicable for waste classification; 95% UCL applicable for risk assessment)

mg/kg = milligrams per kilogram

mg/l = milligrams per liter

* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y = 0.0621\ x$

TABLE 7c
Summary of Lead Statistical Analysis
US 101 - Marin Sonoma Narrows Segment A3
Marin County, California

Southbound Shoulder (borings SB1 to SB4 and B1 to B4)

TOTAL LEAD UCLs

	Total Lead (mg/kg)	
	90% UCL	**95% UCL**
0 to 1 foot	55.3	60

EXCAVATION SCENARIOS

	90% UCL		95% UCL
Excavation Depth	**Total Lead (mg/kg)**	**WET Lead* (mg/l)**	**Total Lead (mg/kg)**
0 to 1 foot	55	4.4	60

Notes:

UCL = Upper Confidence Limit (90% UCL is applicable for waste classification; 95% UCL applicable for risk assessment)
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
* = Soluble (WET) lead concentrations are predicted using slope of regression line, where y = predicted soluble (WET) lead and x = total lead.

Regression Line Slope: $y =$ 0.0791 x

TABLE 8
Summary of NOA Results - Soil
US-101 Marin-Sonoma Narrows, Segment A3
Marin County, California

Sample ID	Sample Depth (feet)	Asbestos Content (% dry weight)
NB4-2.5	2.5	ND
NB5-2.5	2.5	ND
NB8-2.5	2.5	<0.25%
NB11-2.5	2.5	<0.25%
NB14-2.5	2.5	ND
NB17-2.5	2.5	ND
NB20-2.5	2.5	ND
M21-2.5	2.5	ND
M24-2.5	2.5	ND
M27-2.5	2.5	ND
M30-2.5	2.5	ND
M33-2.5	2.5	ND
M35-2.5	2.5	<0.25%
M36-2.5	2.5	ND
M38-2.5	2.5	ND

ND = None detected at 0.25% target analytical sensitivity.

APPENDIX A

California Environmental Protection Agency
Department of Toxic Substances Control

VARIANCE

Applicant Names:

State of California
Department of Transportation
(Caltrans)
1120 N Street
Sacramento, California 95814

Variance No. V09HQSCD006

Effective Date: July 1, 2009

Expiration Date: July 1, 2014

Modification History:

Pursuant to California Health and Safety Code, Section 25143, the Department of Toxic Substances Control hereby issues the attached Variance consisting of 9 pages to the Department of Transportation.

Beverly Rikala
Team Leader, Operating Facilities Team
Department of Toxic Substances Control

Date: 6/30/09

1. INTRODUCTION.

a) Pursuant to Health and Safety Code, section 25143, the California Department of Toxic Substances Control (DTSC) grants this variance to the applicant below for waste considered to be hazardous solely because of its lead concentrations and as further specified herein.

b) DTSC hereby grants this variance only from the requirements specified herein and only in accordance with all terms and conditions specified herein.

2. IDENTIFYING INFORMATION.

APPLICANT/OWNER/OPERATOR

State of California
Department of Transportation, (Caltrans)
All Districts

3. TYPE OF VARIANCE.

Generation, Manifest, Transportation, Storage and Disposal.

4. ISSUANCE AND EXPIRATION DATES.

DATE ISSUED: July 1, 2009 EXPIRATION DATE: July 1, 2014

5. APPLICABLE STATUTES AND REGULATIONS. The hazardous waste that is the subject of this variance is fully regulated under Health and Safety Code, section 25100, et seq. and California Code of Regulations, title 22, division 4.5 except as specifically identified in Section 8 of this variance.

6. DEFINITION. For purposes of this variance, "lead-contaminated soil(s)" shall mean soil that meets the criteria for hazardous waste but contains less than 3397 mg/kg total lead and is hazardous primarily because of aerially-deposited lead contamination associated with exhaust emissions from the operation of motor vehicles.

7. FINDINGS/DETERMINATIONS. DTSC has determined that the variance applicant meets the requirements set forth in Health and Safety Code, section 25143 for a variance from specific regulatory requirements as outlined in Section 8 of this variance. The specific determinations and findings made by DTSC are as follows:

a) Caltrans intends to excavate, stockpile, transport, bury and cover large volumes of soil associated with highway construction projects. In the more urbanized highway corridors around the State this soil is contaminated with lead, primarily due to historic emissions from automobile exhausts. In situ sampling and laboratory testing has shown that some of the soil contains concentrations of lead in excess of State regulatory thresholds, and thus any generated waste from disturbance of the soil

would be regulated as hazardous waste. Such soil contains a Total Threshold Limit Concentration (TTLC) of 1000 milligrams per kilogram (mg/kg) or more lead and/or it meets or exceeds the Soluble Threshold Limit Concentration (STLC) for lead of 5 milligrams per liter (mg/l). A Human Health Risk Assessment prepared for this variance concludes that soil contaminated with elevated concentrations of lead can be managed in a way that presents no significant risk to human health.

b) The lead-contaminated soil will be placed only in Caltrans' right-of-way. Depending on concentration levels, the wastes will be covered with a minimum thickness of one (1) foot of non-hazardous soil or asphalt/concrete cover and will always be at least five (5) feet above the highest groundwater elevation. Caltrans will assure that proper health and safety procedures will be followed for workers, including any persons engaged in maintenance work in areas where the waste has been buried and covered.

c) DTSC finds and requires that the lead-contaminated soil excavated, stockpiled, transported, buried and covered pursuant to this variance is a non-RCRA hazardous waste, and that the waste management activity is insignificant as a potential hazard to human health and safety and the environment, when managed in accordance with the conditions, limitations and other requirements specified in this variance.

8. PROVISIONS WAIVED.

Provided Caltrans meets the terms and conditions of this variance, DTSC waives the hazardous waste management requirements of Health and Safety Code, Chapter 6.5 and California Code of Regulations, title 22 for the lead-contaminated soil that Caltrans reuses in projects that would require Caltrans to obtain a permit for a disposal facility and any other generator requirements that concern the transportation, manifesting, storage and land disposal of hazardous waste.

9. SPECIFIC CONDITIONS, LIMITATIONS AND OTHER REQUIREMENTS.

In order for the provisions discussed in section 8 to be waived, lead-contaminated soil must not exceed the contaminant concentrations discussed below and Caltrans management practices must meet all the following conditions:

a) Caltrans implementation of this variance shall comply with all applicable state laws and regulations for water quality control, water quality control plans, waste discharge requirements (including storm water permits), and others issued by the State Water Resources Control Board (SWRCB) and/or a California Regional Water Quality Control Board (RWQCB). Caltrans shall provide written notification to the appropriate RWQCB at least 30 days prior to advertisement for bids of projects that involve invocation of this variance, or as otherwise negotiated with the SWRCB or appropriate RWQCB.

b) The waivers in this variance shall only be applied to lead-contaminated soil that is not a RCRA hazardous waste and is hazardous primarily because of aerially-

deposited lead contamination associated with exhaust emissions from the operation of motor vehicles. The variance is not applicable to any other hazardous waste.

c) Soil containing 1.5 mg/l extractable lead or less (based on a modified waste extraction test using deionized water as the extractant) and 1411 mg/kg or less total lead may be used as fill provided that the lead-contaminated soil is placed a minimum of five (5) feet above the maximum historic water table elevation and covered with at least one (1) foot of nonhazardous soil that will be maintained by Caltrans to prevent future erosion.

d) Soil containing 150 mg/L extractable lead or less (based on a modified waste extraction test using deionized water as the extractant) and 3397 mg/kg or less total lead may be used as fill provided that the lead-contaminated soils are placed a minimum of five (5) feet above the maximum historic water table elevation and protected from infiltration by a pavement structure which will be maintained by Caltrans.

e) Lead-contaminated soil with a pH less than 5.5 but greater than 5.0 shall only be used as fill material under the paved portion of the roadway. Lead-contaminated soil with a pH at or less than 5.0 shall be managed as a hazardous waste.

f) For each project that has the potential to generate waste by disturbing lead-contaminated soil (as defined in 6), Caltrans shall conduct sampling and analysis to adequately characterize the soils containing aerially deposited lead in the areas of planned excavation along the project route. Such sampling and analysis shall include the Toxicity Characteristic Leaching Procedure (TCLP) as prescribed by the United States Environmental Protection Agency to determine whether concentrations of contaminants in soil exceed federal criteria for classification as a hazardous waste.

g) Lead-contaminated soil managed pursuant to this variance shall not be moved outside the designated corridor boundaries (see paragraph t) below. All lead-contaminated soil not buried and covered within the same Caltrans corridor where it originated is not eligible for management under this variance and shall be managed as a hazardous waste.

h) Lead-contaminated soil managed pursuant to this variance shall not be placed in areas where it would become in contact with groundwater or surface water (such as streams and rivers).

i) Lead-contaminated soil managed pursuant to this variance shall be buried and covered only in locations that are protected from erosion that may result from storm water run-on and run-off.

j) The lead-contaminated soil shall be buried and covered in a manner that will prevent accidental or deliberate breach of the asphalt, concrete, and/or cover soil.

k) The presence of lead-contaminated soil shall be incorporated into the projects' as-built drawings. The as-built drawings shall be annotated with the location, representative analytical data, and volume of lead-contaminated soil. The as-built drawings shall also state the depth of the cover. These as-built drawings shall be retained by Caltrans.

l) Caltrans shall ensure that no other hazardous wastes, other than the lead-contaminated hazardous waste soil, are placed in the burial areas.

m) Lead-contaminated soil shall not be buried within ten (10) feet of culverts or locations subject to frequent worker exposure.

n) Excavated lead-contaminated soil not placed into the designated area (fill area, roadbed area) by the end of the working day shall be stockpiled and covered with sheets of polyethylene or at least one foot of non-hazardous soil. The lead-contaminated soil, while stockpiled or under transport, shall be protected from contacting surface water and from being dislodged or transported by wind or storm water. The stockpile covers shall be inspected at least once a week and within 24 hours after rainstorms. If the lead-contaminated soil is stockpiled for more than 4 days from the time of excavation, Caltrans shall restrict public access to the stockpile by using barriers that meet the safety requirements of the construction zone. The lead-contaminated soil shall be stockpiled for no more than 90 days from the time the soil is first excavated. If the contaminated soil is stockpiled beyond the 90 day limit Caltrans shall:

1. notify DTSC in writing of the 90 day exceedance and expected date of removal;
2. perform weekly inspections of the stockpiled material to ensure that there is adequate protection from run-on, runoff, public access, and wind dispersion; and
3. notify DTSC on weekly basis of the stockpile status until the stockpile is removed.

The lead-contaminated soil shall be stockpiled for no more than 180 days from the time the soil is first excavated.

o) Caltrans shall ensure that all stockpiling of lead-contaminated soil remains within the project area of the specified corridor. Stockpiling of lead-contaminated soil within the specified corridor, but outside the project area, is prohibited.

p) Caltrans shall conduct confirmatory sampling of any stockpile area in areas not known or expected to contain lead-contaminated soil after removal of the lead-contaminated soil to ensure that contamination has not been left behind or has not migrated from the stockpiled material to the surrounding soils.

q) Caltrans shall stockpile lead-contaminated soil only on high ground (i.e. no sump areas or low points) so that stockpiled soil will not come in contact with surface

water run-on or run-off.

r) Caltrans shall not stockpile lead-contaminated soil in environmentally and ecologically sensitive areas.

s) Caltrans shall ensure that storm/rain run-off that has come into contact with stockpiled lead-contaminated soil will not flow to storm drains, inlets, or waters of the State.

t) Caltrans may dispose of the lead-contaminated soil only within the operating right-of-way of an existing highway, as defined in Streets and Highways Code, section 23. Caltrans may move lead-contaminated soil from one Caltrans project to another Caltrans project only if the lead-contaminated soil remains within the same designated corridor.

Caltrans shall record any movement of lead-contaminated soil by using a bill of lading. The bill of lading must contain: 1) the US DOT description including shipping name, hazard class and ID number; 2) handling codes; 3) quantity of material; 4) volume of material; 5) date of shipment; 6) origin and destination of shipment; and 7) any specific handling instructions. The bill of lading shall be referenced in and kept on file with the project's as-built drawings. The lead-contaminated soil must be kept covered during transportation.

u) For each specific corridor where this variance is to be implemented, all of the following information shall be submitted in writing to DTSC at least five (5) days before construction of any project begins:

1. plan drawing designating the boundaries of the corridor where lead-contaminated soils will be excavated, stockpiled, buried and covered;

2. a list of the Caltrans projects that the corridor encompasses;

3. a list of Caltrans contractors that will be conducting any phase of work on any project affected by this variance;

4. duration of corridor construction;

5. location where sampling and analytical data used to make lead concentration level determinations are kept (e.g. a particular Caltrans project file);

6. name and phone number (including area code) of project resident engineer and project manager;

7. location where Caltrans and contractor health and safety plan and records are kept;

8. location of project special provisions (including page or section number) for soil excavation, transportation, stockpile, burial and placement of cover material;

9. location of project drawings (including drawing page number) for soil excavation, burial and placement of cover in plan and cross section (for example, "The project plans are located at the resident engineer's office located at 5th and Main Streets, City of Fresno, See pages xxxxx of contract xxxx");

10. updated information if a Caltrans project within the corridor is added, changed or deleted; and

11. type of environmental document prepared for each project, date of adoption, document title, Clearing House number and where the document is available for review. A copy of the Caltrans Categorical Exemption, Categorical Exclusion Form, or if filed, the Notice of Exemption for any project shall be submitted to the DTSC Headquarters Project Manager.

v) Changes in location of lead-contaminated soil placement, quantities or protection measures (field changes) shall be noted in the resident engineer's project log within five (5) days of the field change.

w) Caltrans shall ensure that field changes are in compliance with the requirements of this variance.

x) Operational procedures described in the California Environmental Quality Act (CEQA) Special Initial Study shall be followed by Caltrans for activities conducted under this variance.

y) Caltrans shall implement appropriate health and safety procedures to protect its employees and the public, and to prevent or minimize exposure to potentially hazardous wastes. A project-specific health and safety plan must be prepared and implemented. The monitoring and exposure standards shall be based on construction standards for exposure to lead in California Code of Regulations, title 8, section 1532.1.

z) Caltrans shall provide a district Coordinator for this variance. This Coordinator will be the primary point of contact for information flowing to, or received from, DTSC regarding any matter or submission under this variance. Caltrans shall promptly notify DTSC of the name of Coordinator and any change in the Coordinator.

aa) Caltrans shall conduct regular inspections, consistent with Caltrans' Maintenance Division's current Pavement Inspection and Slope Inspection programs, of the locations where lead-contaminated soil has been buried and/or covered pursuant to this variance. If site inspection reveals deterioration of cover so that conditions in the variance are not met, Caltrans shall repair or replace the cover.

bb) Caltrans shall develop and implement a record keeping mechanisms to record and retain permanent records of all locations where lead-contaminated soil has been buried per this variance. The records shall be made available to DTSC.

cc) If areas subject to the terms of this variance are sold, relinquished or abandoned (including roadways), all future property owners shall be notified in writing in advance by Caltrans of the requirements of this variance, and Caltrans shall provide the owner with a copy of the variance. A copy of such a notice shall be sent to DTSC and contain the corridor location and project. Caltrans shall also disclose to DTSC and the new owner the location of areas where lead-contaminated soil has been buried. Future property owners shall be subject to the same requirements as Caltrans.

dd) For the purposes of informing the public about instances where the variance is implemented, Caltrans shall:

1. maintain current fact sheets at all Caltrans resident engineer offices and the Caltrans District office. Caltrans shall make the fact sheets available to anyone expressing an interest in variance-related work.

2. maintain a binder(s) containing copies of all reports submitted to DTSC at the District office. Caltrans shall ensure that the binders are readily accessible to the public.

3. carry out the following actions when it identifies additional projects:

(A) notify the public via a display advertisement in a newspaper of general circulation in that area.

(B) update and distribute the fact sheet to the mailing list and repository locations.

ee) Lead-contaminated soil may be buried only in areas where access is limited or where lead-contaminated soil is covered and contained by a pavement structure.

ff) Dust containing lead-contaminated soil must be controlled. Water or dust palliative may be applied to control dust. If visible dust migration occurs, all excavation, stockpiling and truck loading and burying must be stopped. The granting of this variance confers no relief on Caltrans from compliance with the laws, regulations and requirements enforced by any local air district or the California Air Resources Board.

gg) Sampling and analysis is required to show the lead-contaminated soil meets the variance criteria. All sampling and analysis must be conducted in accordance with the appropriate methods specified in U.S. EPA SW-846.

hh) DTSC retains the right to require Caltrans or any future owner to remove, and properly dispose of, lead-contaminated soil in the event DTSC determines it is necessary for protection of public health, safety or the environment.

ii) DTSC finds that some projects involving lead-contaminated soil are joint projects between Caltrans and other government entities. In these joint projects, Caltrans may not be the lead agency implementing the project although Caltrans is still involved if the project occurs on its right-of-way.

Caltrans may invoke this variance for joint projects where Caltrans and local government entity are involved provided that 1) the project is within the Caltrans Right-of-Way; 2) Caltrans reviews/ oversees all phases of the project including design, contracting, environmental assessment, construction, operation, and maintenance; and 3) Caltrans oversees the project to verify all variance conditions are complied with. Caltrans will be fully responsible for the variance notification and implementation in these joint projects.

jj) All correspondence shall be directed to the following office:

Hazardous Waste Permitting
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826

Attn: Caltrans Lead Variance Notification Unit

10. DISCLAIMER.

a) The issuance of this variance does not relieve Caltrans of the responsibility for compliance with Health and Safety Code, chapter 6.5, or the regulations adopted thereunder, and any other laws and regulations other than those specifically identified in Section 8 of this variance. Caltrans is subject to all terms and conditions herein. The granting of this variance confers no relief from compliance with any federal, State or local requirements other than those specifically provided herein.

b) The issuance of this variance does not release Caltrans from any liability associated with the handling of hazardous waste, except as specifically provided herein and subject to all terms and conditions of this variance.

11. VARIANCE MODIFICATION OR REVOCATION. This variance is subject to review at the discretion of DTSC and may be modified or revoked by DTSC upon change of ownership and at any other time pursuant to Health and Safety Code, section 25143.

12. CEQA DETERMINATION. DTSC adopted a Negative Declaration on June 30, 2009.

Approved:

6/30/09
Date

Beverly Rikala
Operating Facilities Team
Department of Toxic Substances Control

APPENDIX B

October 31, 2011

Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120329

RE: Marin-Sonoma Narrows A3, E8469-06-03

Attention: Rick Day

Enclosed are the results for sample(s) received on October 14, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

CLIENT: Geocon Consultants, Inc.
Project: Marin-Sonoma Narrows A3, E8469-06-03
Lab Order: 120329

CASE NARRATIVE

Analytical Comments for Method 6010

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for samples 120329-012AMS, 120329-072AMS, 120329-072AMSD, 120329-092AMS and 120329-120AMS; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for samples 120329-012AMSD, 120329-092AMSD and 120329-120AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 7196

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for samples 120328-098AMS and 120328-098AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8015 (DRO/ORO)

Dilution was necessary for samples 120329-025A, 120329-031A, 120329-049A and 120329-115A, due to sample matrix.

Surrogate recovery was diluted out for samples 120329-025A and 120328-115A.

Analytical Comments for Method 8015 (GRO)

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 120328-097AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8021

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 120328-097AMSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB1-0
Lab Order:	120329	**Collection Date:**	10/10/2011 8:42:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-001A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011	Analyst: **CBB**	
Lead	11	1.0		mg/Kg	1	10/25/2011 10:14 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	3.0	1.0		mg/Kg	1	10/21/2011 01:26 PM
ORO	5.5	1.0		mg/Kg	1	10/21/2011 01:26 PM
Surr: p-Terphenyl	85.6	39-123		%REC	1	10/21/2011 01:26 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** NB1-1
Lab Order: 120329 **Collection Date:** 10/10/2011 8:43:00 AM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-002A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/25/2011 10:17 AM
Arsenic	3.9	1.0		mg/Kg	1	10/25/2011 10:17 AM
Barium	100	1.0		mg/Kg	1	10/25/2011 10:17 AM
Beryllium	ND	1.0		mg/Kg	1	10/25/2011 10:17 AM
Cadmium	ND	1.0		mg/Kg	1	10/25/2011 10:17 AM
Chromium	58	1.0		mg/Kg	1	10/25/2011 10:17 AM
Cobalt	13	1.0		mg/Kg	1	10/25/2011 10:17 AM
Copper	11	2.0		mg/Kg	1	10/25/2011 10:17 AM
Lead	8.6	1.0		mg/Kg	1	10/25/2011 10:17 AM
Molybdenum	1.8	1.0		mg/Kg	1	10/25/2011 10:17 AM
Nickel	78	1.0		mg/Kg	1	10/25/2011 10:17 AM
Selenium	ND	1.0		mg/Kg	1	10/25/2011 10:17 AM
Silver	ND	1.0		mg/Kg	1	10/25/2011 10:17 AM
Thallium	ND	1.0		mg/Kg	1	10/25/2011 10:17 AM
Vanadium	11	1.0		mg/Kg	1	10/25/2011 10:17 AM
Zinc	33	1.0		mg/Kg	1	10/25/2011 10:17 AM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 01:04 PM
Surr: Bromofluorobenzene (FID)	85.2	69-158		%REC	1	10/19/2011 01:04 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 01:04 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 01:04 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 01:04 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 01:04 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 01:04 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 01:04 PM
Surr: Bromofluorobenzene (PID)	83.6	65-140		%REC	1	10/19/2011 01:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB1-1
Lab Order:	120329	**Collection Date:**	10/10/2011 8:43:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-002A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
MERCURY BY COLD VAPOR TECHNIQUE						
		EPA 7471A				
RunID: AA1_111020C	QC Batch: 76335			PrepDate: 10/19/2011	Analyst: **VV**	
Mercury	ND	0.10		mg/Kg	1	10/20/2011 03:11 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB1-2
Lab Order:	120329	**Collection Date:**	10/10/2011 8:44:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-003A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate:	10/24/2011	Analyst: **CBB**
Lead	7.6	1.0		mg/Kg	1	10/25/2011 10:20 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB2-0
Lab Order:	120329	**Collection Date:**	10/10/2011 8:52:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-004A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011	Analyst: **CBB**	
Lead	8.0	1.0		mg/Kg	1	10/25/2011 10:24 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB2-1
Lab Order:	120329	**Collection Date:**	10/10/2011 8:53:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-005A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate:	10/24/2011	Analyst: **CBB**
Lead	7.7	1.0		mg/Kg	1	10/25/2011 10:28 AM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB2-2
Lab Order:	120329	**Collection Date:**	10/10/2011 8:54:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-006A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011	Analyst: **CBB**	
Lead	6.7	1.0		mg/Kg	1	10/25/2011 10:31 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB3-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:02:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-007A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/25/2011 10:35 AM
Arsenic	3.7	1.0		mg/Kg	1	10/25/2011 10:35 AM
Barium	72	1.0		mg/Kg	1	10/25/2011 10:35 AM
Beryllium	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Cadmium	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Chromium	43	1.0		mg/Kg	1	10/25/2011 10:35 AM
Cobalt	11	1.0		mg/Kg	1	10/25/2011 10:35 AM
Copper	13	2.0		mg/Kg	1	10/25/2011 10:35 AM
Lead	18	1.0		mg/Kg	1	10/25/2011 10:35 AM
Molybdenum	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Nickel	64	1.0		mg/Kg	1	10/25/2011 10:35 AM
Selenium	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Silver	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Thallium	ND	1.0		mg/Kg	1	10/25/2011 10:35 AM
Vanadium	9.4	1.0		mg/Kg	1	10/25/2011 10:35 AM
Zinc	39	1.0		mg/Kg	1	10/25/2011 10:35 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	5.3	1.0		mg/Kg	1	10/21/2011 01:57 PM
ORO	10	1.0		mg/Kg	1	10/21/2011 01:57 PM
Surr: p-Terphenyl	92.1	39-123		%REC	1	10/21/2011 01:57 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:05 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB3-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:03:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-008A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011		Analyst: **CBB**
Lead	9.5	1.0		mg/Kg	1	10/25/2011 10:39 AM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 01:20 PM
Surr: Bromofluorobenzene (FID)	86.0	69-158		%REC	1	10/19/2011 01:20 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 01:20 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 01:20 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 01:20 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 01:20 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 01:20 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 01:20 PM
Surr: Bromofluorobenzene (PID)	84.9	65-140		%REC	1	10/19/2011 01:20 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB3-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:04:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-009A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011		Analyst: **CBB**
Lead	5.3	1.0		mg/Kg	1	10/25/2011 12:57 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB4-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:13:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-010A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate:	10/24/2011	Analyst: **CBB**
Lead	34	1.0		mg/Kg	1	10/25/2011 01:02 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB4-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:14:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-011A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011	Analyst: **CBB**	
Lead	7.2	1.0		mg/Kg	1	10/25/2011 01:05 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB4-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:15:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-012A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111024K	QC Batch: 76409			PrepDate: 10/24/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/25/2011 01:09 PM
Arsenic	1.3	1.0		mg/Kg	1	10/25/2011 01:09 PM
Barium	130	1.0		mg/Kg	1	10/25/2011 01:09 PM
Beryllium	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Cadmium	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Chromium	77	1.0		mg/Kg	1	10/25/2011 01:09 PM
Cobalt	17	1.0		mg/Kg	1	10/25/2011 01:09 PM
Copper	28	2.0		mg/Kg	1	10/25/2011 01:09 PM
Lead	5.6	1.0		mg/Kg	1	10/25/2011 01:09 PM
Molybdenum	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Nickel	80	1.0		mg/Kg	1	10/25/2011 01:09 PM
Selenium	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Silver	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Thallium	ND	1.0		mg/Kg	1	10/25/2011 01:09 PM
Vanadium	32	1.0		mg/Kg	1	10/25/2011 01:09 PM
Zinc	38	1.0		mg/Kg	1	10/25/2011 01:09 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:07 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB5-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:22:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-013A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	13	1.0		mg/Kg	1	10/20/2011 11:56 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	27	1.0		mg/Kg	1	10/21/2011 02:55 PM
ORO	120	1.0		mg/Kg	1	10/21/2011 02:55 PM
Surr: p-Terphenyl	92.5	39-123		%REC	1	10/21/2011 02:55 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB5-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:23:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-014A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020B QC Batch: 76328 PrepDate: 10/20/2011 Analyst: **CBB**						
Lead	6.0	1.0		mg/Kg	1	10/20/2011 12:01 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A QC Batch: E11VS361 PrepDate: Analyst: **TP**						
GRO	ND	1.0		mg/Kg	1	10/19/2011 01:35 PM
Surr: Bromofluorobenzene (FID)	106	69-158		%REC	1	10/19/2011 01:35 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A QC Batch: E11VS361 PrepDate: Analyst: **TP**						
Benzene	ND	5.0		µg/Kg	1	10/19/2011 01:35 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 01:35 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 01:35 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 01:35 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 01:35 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 01:35 PM
Surr: Bromofluorobenzene (PID)	103	65-140		%REC	1	10/19/2011 01:35 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB5-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:24:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-015A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.3	1.0		mg/Kg	1	10/20/2011 12:05 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB6-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:28:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-016A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.1	1.0		mg/Kg	1	10/20/2011 12:10 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB6-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:29:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-017A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 12:13 PM
Arsenic	5.2	1.0		mg/Kg	1	10/20/2011 12:13 PM
Barium	110	1.0		mg/Kg	1	10/20/2011 12:13 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Chromium	48	1.0		mg/Kg	1	10/20/2011 12:13 PM
Cobalt	16	1.0		mg/Kg	1	10/20/2011 12:13 PM
Copper	19	2.0		mg/Kg	1	10/20/2011 12:13 PM
Lead	7.7	1.0		mg/Kg	1	10/20/2011 12:13 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Nickel	69	1.0		mg/Kg	1	10/20/2011 12:13 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 12:13 PM
Vanadium	17	1.0		mg/Kg	1	10/20/2011 12:13 PM
Zinc	41	1.0		mg/Kg	1	10/20/2011 12:13 PM
HEXAVALENT CHROMIUM, DISSOLVED						
				EPA 7196A		
RunID: WETCHEM3_111021B	QC Batch: 76400			PrepDate: 10/21/2011		Analyst: **AAG**
Chromium, Hexavalent	ND	0.10		mg/Kg	1	10/21/2011
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:09 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB6-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:30:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-018A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.3	1.0		mg/Kg	1	10/20/2011 12:17 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB7-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:34:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-019A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	15	1.0		mg/Kg	1	10/20/2011 12:21 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	13	1.0		mg/Kg	1	10/21/2011 02:43 PM
ORO	68	1.0		mg/Kg	1	10/21/2011 02:43 PM
Surr: p-Terphenyl	81.8	39-123		%REC	1	10/21/2011 02:43 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB7-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:35:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-020A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	7.4	1.0		mg/Kg	1	10/20/2011 12:24 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 01:50 PM
Surr: Bromofluorobenzene (FID)	97.8	69-158		%REC	1	10/19/2011 01:50 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 01:50 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 01:50 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 01:50 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 01:50 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 01:50 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 01:50 PM
Surr: Bromofluorobenzene (PID)	95.5	65-140		%REC	1	10/19/2011 01:50 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB7-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:36:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-021A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	9.0	1.0		mg/Kg	1	10/20/2011 12:34 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB8-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:43:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-022A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 12:38 PM
Arsenic	1.5	1.0		mg/Kg	1	10/20/2011 12:38 PM
Barium	100	1.0		mg/Kg	1	10/20/2011 12:38 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Chromium	36	1.0		mg/Kg	1	10/20/2011 12:38 PM
Cobalt	8.8	1.0		mg/Kg	1	10/20/2011 12:38 PM
Copper	19	2.0		mg/Kg	1	10/20/2011 12:38 PM
Lead	17	1.0		mg/Kg	1	10/20/2011 12:38 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Nickel	49	1.0		mg/Kg	1	10/20/2011 12:38 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 12:38 PM
Vanadium	32	1.0		mg/Kg	1	10/20/2011 12:38 PM
Zinc	45	1.0		mg/Kg	1	10/20/2011 12:38 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.33	0.10		mg/Kg	1	10/20/2011 05:11 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB8-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:44:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-023A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	2.6	1.0		mg/Kg	1	10/20/2011 12:42 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB8-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:45:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-024A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	5.1	1.0		mg/Kg	1	10/20/2011 12:46 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB9-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:50:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-025A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	34	1.0		mg/Kg	1	10/20/2011 12:50 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate:	10/19/2011	Analyst: **CBR**
DRO	230	40		mg/Kg	10	10/21/2011 03:59 PM
ORO	1600	40		mg/Kg	10	10/21/2011 03:59 PM
Surr: p-Terphenyl	0	39-123	SDO	%REC	10	10/21/2011 03:59 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB9-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:51:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-026A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020B QC Batch: 76328				PrepDate: 10/20/2011		Analyst: **CBB**
Lead	8.6	1.0		mg/Kg	1	10/20/2011 12:54 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A QC Batch: E11VS361				PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 02:06 PM
Surr: Bromofluorobenzene (FID)	107	69-158		%REC	1	10/19/2011 02:06 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A QC Batch: E11VS361				PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 02:06 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 02:06 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 02:06 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 02:06 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 02:06 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 02:06 PM
Surr: Bromofluorobenzene (PID)	104	65-140		%REC	1	10/19/2011 02:06 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB9-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:52:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-027A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 12:58 PM
Arsenic	3.8	1.0		mg/Kg	1	10/20/2011 12:58 PM
Barium	63	1.0		mg/Kg	1	10/20/2011 12:58 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Chromium	62	1.0		mg/Kg	1	10/20/2011 12:58 PM
Cobalt	10	1.0		mg/Kg	1	10/20/2011 12:58 PM
Copper	9.6	2.0		mg/Kg	1	10/20/2011 12:58 PM
Lead	6.2	1.0		mg/Kg	1	10/20/2011 12:58 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Nickel	75	1.0		mg/Kg	1	10/20/2011 12:58 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 12:58 PM
Vanadium	8.0	1.0		mg/Kg	1	10/20/2011 12:58 PM
Zinc	24	1.0		mg/Kg	1	10/20/2011 12:58 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:13 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB10-0
Lab Order:	120329	**Collection Date:**	10/10/2011 9:57:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-028A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	8.8	1.0		mg/Kg	1	10/20/2011 01:01 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB10-1
Lab Order:	120329	**Collection Date:**	10/10/2011 9:58:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-029A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	16	1.0		mg/Kg	1	10/20/2011 01:05 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB10-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:59:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-030A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	7.0	1.0		mg/Kg	1	10/20/2011 01:08 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB11-0
Lab Order:	120329	**Collection Date:**	10/10/2011 10:06:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-031A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	22	1.0		mg/Kg	1	10/20/2011 01:19 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	150	40		mg/Kg	10	10/21/2011 02:31 PM
ORO	1000	40		mg/Kg	10	10/21/2011 02:31 PM
Surr: p-Terphenyl	50.4	39-123		%REC	10	10/21/2011 02:31 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** NB11-1
Lab Order: 120329 **Collection Date:** 10/10/2011 10:07:00 AM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-032A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020B	QC Batch: 76328			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 01:23 PM
Arsenic	4.0	1.0		mg/Kg	1	10/20/2011 01:23 PM
Barium	220	1.0		mg/Kg	1	10/20/2011 01:23 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Chromium	100	1.0		mg/Kg	1	10/20/2011 01:23 PM
Cobalt	17	1.0		mg/Kg	1	10/20/2011 01:23 PM
Copper	25	2.0		mg/Kg	1	10/20/2011 01:23 PM
Lead	29	1.0		mg/Kg	1	10/20/2011 01:23 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Nickel	110	1.0		mg/Kg	1	10/20/2011 01:23 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 01:23 PM
Vanadium	24	1.0		mg/Kg	1	10/20/2011 01:23 PM
Zinc	45	1.0		mg/Kg	1	10/20/2011 01:23 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 02:21 PM
Surr: Bromofluorobenzene (FID)	98.5	69-158		%REC	1	10/19/2011 02:21 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 02:21 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 02:21 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 02:21 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 02:21 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 02:21 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 02:21 PM
Surr: Bromofluorobenzene (PID)	95.4	65-140		%REC	1	10/19/2011 02:21 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference
	Results are wet unless otherwise specified
DO	Surrogate Diluted Out

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB11-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:07:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-032A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
MERCURY BY COLD VAPOR TECHNIQUE						
		EPA 7471A				
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011	Analyst: **VV**	
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:19 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB11-2
Lab Order:	120329	**Collection Date:**	10/10/2011 10:08:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-033A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	160	1.0		mg/Kg	1	10/20/2011 01:39 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB12-0
Lab Order:	120329	**Collection Date:**	10/10/2011 10:14:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-034A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	3.1	1.0		mg/Kg	1	10/20/2011 01:43 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB12-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:15:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-035A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	7.1	1.0		mg/Kg	1	10/20/2011 01:46 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB12-2
Lab Order:	120329	**Collection Date:**	10/10/2011 10:16:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-036A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	7.0	1.0		mg/Kg	1	10/20/2011 01:50 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB13-0
Lab Order:	120329	**Collection Date:**	10/10/2011 10:23:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-037A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 02:01 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Barium	66	1.0		mg/Kg	1	10/20/2011 02:01 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Chromium	17	1.0		mg/Kg	1	10/20/2011 02:01 PM
Cobalt	10	1.0		mg/Kg	1	10/20/2011 02:01 PM
Copper	26	2.0		mg/Kg	1	10/20/2011 02:01 PM
Lead	7.0	1.0		mg/Kg	1	10/20/2011 02:01 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Nickel	28	1.0		mg/Kg	1	10/20/2011 02:01 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 02:01 PM
Vanadium	43	1.0		mg/Kg	1	10/20/2011 02:01 PM
Zinc	120	1.0		mg/Kg	1	10/20/2011 02:01 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	43	4.0		mg/Kg	1	10/21/2011 03:39 PM
ORO	250	4.0		mg/Kg	1	10/21/2011 03:39 PM
Surr: p-Terphenyl	72.4	39-123		%REC	1	10/21/2011 03:39 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.10	0.10		mg/Kg	1	10/20/2011 05:21 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB13-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:24:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-038A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	11	1.0		mg/Kg	1	10/20/2011 02:05 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 02:36 PM
Surr: Bromofluorobenzene (FID)	102	69-158		%REC	1	10/19/2011 02:36 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 02:36 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 02:36 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 02:36 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 02:36 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 02:36 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 02:36 PM
Surr: Bromofluorobenzene (PID)	99.7	65-140		%REC	1	10/19/2011 02:36 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB13-2
Lab Order:	120329	**Collection Date:**	10/10/2011 10:25:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-039A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	10	1.0		mg/Kg	1	10/20/2011 02:08 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB14-0
Lab Order:	120329	**Collection Date:**	10/10/2011 10:31:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-040A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	21	1.0		mg/Kg	1	10/20/2011 02:11 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB14-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:32:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-041A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	92	1.0		mg/Kg	1	10/20/2011 02:15 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB14-2
Lab Order:	120329	**Collection Date:**	10/10/2011 10:33:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-042A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 02:18 PM
Arsenic	2.6	1.0		mg/Kg	1	10/20/2011 02:18 PM
Barium	80	1.0		mg/Kg	1	10/20/2011 02:18 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Chromium	23	1.0		mg/Kg	1	10/20/2011 02:18 PM
Cobalt	3.2	1.0		mg/Kg	1	10/20/2011 02:18 PM
Copper	14	2.0		mg/Kg	1	10/20/2011 02:18 PM
Lead	5.3	1.0		mg/Kg	1	10/20/2011 02:18 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Nickel	31	1.0		mg/Kg	1	10/20/2011 02:18 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 02:18 PM
Vanadium	21	1.0		mg/Kg	1	10/20/2011 02:18 PM
Zinc	22	1.0		mg/Kg	1	10/20/2011 02:18 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.15	0.10		mg/Kg	1	10/20/2011 05:23 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB15-0
Lab Order:	120329	**Collection Date:**	10/10/2011 11:58:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-043A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	140	1.0		mg/Kg	1	10/20/2011 02:22 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	62	4.0		mg/Kg	1	10/21/2011 04:21 PM
ORO	360	4.0		mg/Kg	1	10/21/2011 04:21 PM
Surr: p-Terphenyl	83.0	39-123		%REC	1	10/21/2011 04:21 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB15-1
Lab Order:	120329	**Collection Date:**	10/10/2011 11:59:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-044A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	63	1.0		mg/Kg	1	10/20/2011 02:26 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 02:51 PM
Surr: Bromofluorobenzene (FID)	99.2	69-158		%REC	1	10/19/2011 02:51 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 02:51 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 02:51 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 02:51 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 02:51 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 02:51 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 02:51 PM
Surr: Bromofluorobenzene (PID)	97.0	65-140		%REC	1	10/19/2011 02:51 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB15-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:00:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-045A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	4.1	1.0		mg/Kg	1	10/20/2011 02:29 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB16-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:07:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-046A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	4.4	1.0		mg/Kg	1	10/20/2011 02:33 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB16-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:08:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-047A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 02:44 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Barium	51	1.0		mg/Kg	1	10/20/2011 02:44 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Chromium	16	1.0		mg/Kg	1	10/20/2011 02:44 PM
Cobalt	16	1.0		mg/Kg	1	10/20/2011 02:44 PM
Copper	20	2.0		mg/Kg	1	10/20/2011 02:44 PM
Lead	14	1.0		mg/Kg	1	10/20/2011 02:44 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Nickel	37	1.0		mg/Kg	1	10/20/2011 02:44 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 02:44 PM
Vanadium	25	1.0		mg/Kg	1	10/20/2011 02:44 PM
Zinc	34	1.0		mg/Kg	1	10/20/2011 02:44 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.11	0.10		mg/Kg	1	10/20/2011 05:25 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB16-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:09:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-048A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	9.4	1.0		mg/Kg	1	10/20/2011 02:48 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB17-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:13:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-049A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	4.0	1.0		mg/Kg	1	10/20/2011 02:51 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	190	40		mg/Kg	10	10/21/2011 02:19 PM
ORO	820	40		mg/Kg	10	10/21/2011 02:19 PM
Surr: p-Terphenyl	113	39-123		%REC	10	10/21/2011 02:19 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB17-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:14:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-050A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	24	1.0		mg/Kg	1	10/20/2011 02:55 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 03:07 PM
Surr: Bromofluorobenzene (FID)	103	69-158		%REC	1	10/19/2011 03:07 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 03:07 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 03:07 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 03:07 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 03:07 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 03:07 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 03:07 PM
Surr: Bromofluorobenzene (PID)	99.9	65-140		%REC	1	10/19/2011 03:07 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB17-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:15:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-051A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	8.7	1.0		mg/Kg	1	10/20/2011 02:59 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB18-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:21:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-052A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020C	QC Batch: 76329			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 03:03 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Barium	69	1.0		mg/Kg	1	10/20/2011 03:03 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Chromium	10	1.0		mg/Kg	1	10/20/2011 03:03 PM
Cobalt	13	1.0		mg/Kg	1	10/20/2011 03:03 PM
Copper	16	2.0		mg/Kg	1	10/20/2011 03:03 PM
Lead	1.4	1.0		mg/Kg	1	10/20/2011 03:03 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Nickel	30	1.0		mg/Kg	1	10/20/2011 03:03 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 03:03 PM
Vanadium	42	1.0		mg/Kg	1	10/20/2011 03:03 PM
Zinc	22	1.0		mg/Kg	1	10/20/2011 03:03 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:27 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB18-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:22:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-053A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	6.2	1.0		mg/Kg	1	10/20/2011 03:27 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB18-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:23:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-054A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.3	1.0		mg/Kg	1	10/20/2011 03:30 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB19-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:27:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-055A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	2.6	1.0		mg/Kg	1	10/20/2011 03:34 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	13	2.0		mg/Kg	1	10/21/2011 03:15 PM
ORO	120	2.0		mg/Kg	1	10/21/2011 03:15 PM
Surr: p-Terphenyl	97.3	39-123		%REC	1	10/21/2011 03:15 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB19-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:28:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-056A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020D QC Batch: 76330 PrepDate: 10/20/2011 Analyst: **CBB**						
Lead	380	1.0		mg/Kg	1	10/20/2011 03:38 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A QC Batch: E11VS361 PrepDate: Analyst: **TP**						
GRO	ND	1.0		mg/Kg	1	10/19/2011 03:22 PM
Surr: Bromofluorobenzene (FID)	97.9	69-158		%REC	1	10/19/2011 03:22 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A QC Batch: E11VS361 PrepDate: Analyst: **TP**						
Benzene	ND	5.0		µg/Kg	1	10/19/2011 03:22 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 03:22 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 03:22 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 03:22 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 03:22 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 03:22 PM
Surr: Bromofluorobenzene (PID)	94.9	65-140		%REC	1	10/19/2011 03:22 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** NB19-2
Lab Order: 120329 **Collection Date:** 10/10/2011 12:29:00 PM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-057A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 03:41 PM
Arsenic	1.1	1.0		mg/Kg	1	10/20/2011 03:41 PM
Barium	89	1.0		mg/Kg	1	10/20/2011 03:41 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Chromium	5.1	1.0		mg/Kg	1	10/20/2011 03:41 PM
Cobalt	5.7	1.0		mg/Kg	1	10/20/2011 03:41 PM
Copper	6.2	2.0		mg/Kg	1	10/20/2011 03:41 PM
Lead	8.4	1.0		mg/Kg	1	10/20/2011 03:41 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Nickel	10	1.0		mg/Kg	1	10/20/2011 03:41 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 03:41 PM
Vanadium	10	1.0		mg/Kg	1	10/20/2011 03:41 PM
Zinc	28	1.0		mg/Kg	1	10/20/2011 03:41 PM
HEXAVALENT CHROMIUM, DISSOLVED						
				EPA 7196A		
RunID: WETCHEM3_111021B	QC Batch: 76400			PrepDate: 10/21/2011		Analyst: **AAG**
Chromium, Hexavalent	ND	0.10		mg/Kg	1	10/21/2011
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	1.4	0.10		mg/Kg	1	10/20/2011 05:32 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB20-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:34:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-058A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	5.1	1.0		mg/Kg	1	10/20/2011 03:44 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB20-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:35:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-059A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	42	1.0		mg/Kg	1	10/20/2011 03:48 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB20-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:36:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-060A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	3.7	1.0		mg/Kg	1	10/20/2011 03:52 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M40-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:56:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-061A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	220	1.0		mg/Kg	1	10/20/2011 03:56 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	44	2.0		mg/Kg	1	10/21/2011 03:27 PM
ORO	180	2.0		mg/Kg	1	10/21/2011 03:27 PM
Surr: p-Terphenyl	90.2	39-123		%REC	1	10/21/2011 03:27 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M40-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:57:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-062A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	7.7	1.0		mg/Kg	1	10/20/2011 03:59 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 04:03 PM
Surr: Bromofluorobenzene (FID)	92.6	69-158		%REC	1	10/19/2011 04:03 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 04:03 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 04:03 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 04:03 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 04:03 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 04:03 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 04:03 PM
Surr: Bromofluorobenzene (PID)	90.7	65-140		%REC	1	10/19/2011 04:03 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M40-2
Lab Order:	120329	**Collection Date:**	10/10/2011 12:58:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-063A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.8	1.0		mg/Kg	1	10/20/2011 04:10 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M39-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:05:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-064A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	170	1.0		mg/Kg	1	10/20/2011 04:13 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M39-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:06:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-065A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 04:17 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Barium	290	1.0		mg/Kg	1	10/20/2011 04:17 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Chromium	40	1.0		mg/Kg	1	10/20/2011 04:17 PM
Cobalt	31	1.0		mg/Kg	1	10/20/2011 04:17 PM
Copper	73	2.0		mg/Kg	1	10/20/2011 04:17 PM
Lead	1.5	1.0		mg/Kg	1	10/20/2011 04:17 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Nickel	41	1.0		mg/Kg	1	10/20/2011 04:17 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 04:17 PM
Vanadium	23	1.0		mg/Kg	1	10/20/2011 04:17 PM
Zinc	76	1.0		mg/Kg	1	10/20/2011 04:17 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:34 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M39-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:07:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-066A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	2.7	1.0		mg/Kg	1	10/20/2011 04:21 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M38-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:11:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-067A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	72	1.0		mg/Kg	1	10/20/2011 04:24 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011	Analyst: **CBR**	
DRO	4.8	1.0		mg/Kg	1	10/21/2011 01:05 PM
ORO	5.0	1.0		mg/Kg	1	10/21/2011 01:05 PM
Surr: p-Terphenyl	91.2	39-123		%REC	1	10/21/2011 01:05 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M38-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:12:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-068A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	4.5	1.0		mg/Kg	1	10/20/2011 04:28 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 04:18 PM
Surr: Bromofluorobenzene (FID)	104	69-158		%REC	1	10/19/2011 04:18 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 04:18 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 04:18 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 04:18 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 04:18 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 04:18 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 04:18 PM
Surr: Bromofluorobenzene (PID)	101	65-140		%REC	1	10/19/2011 04:18 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M38-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:13:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-069A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	6.2	1.0		mg/Kg	1	10/20/2011 04:31 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M37-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:19:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-070A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	110	1.0		mg/Kg	1	10/20/2011 04:34 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M37-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:20:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-071A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	5.3	1.0		mg/Kg	1	10/20/2011 04:38 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M37-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:21:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-072A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020D	QC Batch: 76330			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	12	2.0		mg/Kg	1	10/20/2011 04:42 PM
Arsenic	1.3	1.0		mg/Kg	1	10/20/2011 04:42 PM
Barium	64	1.0		mg/Kg	1	10/20/2011 04:42 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 04:42 PM
Cadmium	1.0	1.0		mg/Kg	1	10/20/2011 04:42 PM
Chromium	700	1.0		mg/Kg	1	10/20/2011 04:42 PM
Cobalt	46	1.0		mg/Kg	1	10/20/2011 04:42 PM
Copper	21	2.0		mg/Kg	1	10/20/2011 04:42 PM
Lead	3.2	1.0		mg/Kg	1	10/20/2011 04:42 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 04:42 PM
Nickel	770	1.0		mg/Kg	1	10/20/2011 04:42 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 04:42 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 04:42 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 04:42 PM
Vanadium	21	1.0		mg/Kg	1	10/20/2011 04:42 PM
Zinc	23	1.0		mg/Kg	1	10/20/2011 04:42 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:36 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M36-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:26:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-073A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 05:09 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Barium	140	1.0		mg/Kg	1	10/20/2011 05:09 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Cadmium	1.0	1.0		mg/Kg	1	10/20/2011 05:09 PM
Chromium	28	1.0		mg/Kg	1	10/20/2011 05:09 PM
Cobalt	19	1.0		mg/Kg	1	10/20/2011 05:09 PM
Copper	50	2.0		mg/Kg	1	10/20/2011 05:09 PM
Lead	65	1.0		mg/Kg	1	10/20/2011 05:09 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Nickel	37	1.0		mg/Kg	1	10/20/2011 05:09 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 05:09 PM
Vanadium	20	1.0		mg/Kg	1	10/20/2011 05:09 PM
Zinc	98	1.0		mg/Kg	1	10/20/2011 05:09 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	7.3	1.0		mg/Kg	1	10/21/2011 02:09 PM
ORO	33	1.0		mg/Kg	1	10/21/2011 02:09 PM
Surr: p-Terphenyl	97.6	39-123		%REC	1	10/21/2011 02:09 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:38 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M36-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:27:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-074A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	5.5	1.0		mg/Kg	1	10/20/2011 05:13 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 04:33 PM
Surr: Bromofluorobenzene (FID)	89.2	69-158		%REC	1	10/19/2011 04:33 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 04:33 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 04:33 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 04:33 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 04:33 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 04:33 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 04:33 PM
Surr: Bromofluorobenzene (PID)	87.5	65-140		%REC	1	10/19/2011 04:33 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M36-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:28:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-075A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.2	1.0		mg/Kg	1	10/20/2011 05:16 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M35-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:33:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-076A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	78	1.0		mg/Kg	1	10/20/2011 05:20 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M35-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:34:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-077A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	1.5	1.0		mg/Kg	1	10/20/2011 05:24 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M35-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:35:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-078A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	ND	1.0		mg/Kg	1	10/20/2011 05:28 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M34-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:42:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-079A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	340	1.0		mg/Kg	1	10/20/2011 05:40 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	17	2.0		mg/Kg	1	10/21/2011 03:05 PM
ORO	110	2.0		mg/Kg	1	10/21/2011 03:05 PM
Surr: p-Terphenyl	113	39-123		%REC	1	10/21/2011 03:05 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M34-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:43:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-080A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	5.8	1.0		mg/Kg	1	10/20/2011 05:43 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 04:49 PM
Surr: Bromofluorobenzene (FID)	87.9	69-158		%REC	1	10/19/2011 04:49 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019A	QC Batch: E11VS361			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 04:49 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 04:49 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 04:49 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 04:49 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 04:49 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 04:49 PM
Surr: Bromofluorobenzene (PID)	85.7	65-140		%REC	1	10/19/2011 04:49 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference
	Results are wet unless otherwise specified
DO	Surrogate Diluted Out

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M34-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:44:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-081A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/21/2011 02:37 AM
Arsenic	3.4	1.0		mg/Kg	1	10/21/2011 02:37 AM
Barium	17	1.0		mg/Kg	1	10/21/2011 02:37 AM
Beryllium	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Cadmium	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Chromium	23	1.0		mg/Kg	1	10/21/2011 02:37 AM
Cobalt	8.7	1.0		mg/Kg	1	10/21/2011 02:37 AM
Copper	11	2.0		mg/Kg	1	10/21/2011 02:37 AM
Lead	4.7	1.0		mg/Kg	1	10/21/2011 02:37 AM
Molybdenum	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Nickel	29	1.0		mg/Kg	1	10/21/2011 02:37 AM
Selenium	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Silver	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Thallium	ND	1.0		mg/Kg	1	10/21/2011 02:37 AM
Vanadium	21	1.0		mg/Kg	1	10/21/2011 02:37 AM
Zinc	35	1.0		mg/Kg	1	10/21/2011 02:37 AM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:40 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M33-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:49:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-082A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 05:50 PM
Arsenic	1.6	1.0		mg/Kg	1	10/20/2011 05:50 PM
Barium	110	1.0		mg/Kg	1	10/20/2011 05:50 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 05:50 PM
Cadmium	1.9	1.0		mg/Kg	1	10/20/2011 05:50 PM
Chromium	34	1.0		mg/Kg	1	10/20/2011 05:50 PM
Cobalt	7.4	1.0		mg/Kg	1	10/20/2011 05:50 PM
Copper	49	2.0		mg/Kg	1	10/20/2011 05:50 PM
Lead	270	1.0		mg/Kg	1	10/20/2011 05:50 PM
Molybdenum	2.1	1.0		mg/Kg	1	10/20/2011 05:50 PM
Nickel	43	1.0		mg/Kg	1	10/20/2011 05:50 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 05:50 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 05:50 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 05:50 PM
Vanadium	19	1.0		mg/Kg	1	10/20/2011 05:50 PM
Zinc	250	1.0		mg/Kg	1	10/20/2011 05:50 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.17	0.10		mg/Kg	1	10/20/2011 05:46 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M33-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:50:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-083A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	5.8	1.0		mg/Kg	1	10/20/2011 05:54 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M33-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:51:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-084A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	12	1.0		mg/Kg	1	10/20/2011 05:58 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M32-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:57:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-085A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	210	1.0		mg/Kg	1	10/20/2011 06:01 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate:	10/19/2011	Analyst: **CBR**
DRO	59	4.0		mg/Kg	1	10/21/2011 03:49 PM
ORO	270	4.0		mg/Kg	1	10/21/2011 03:49 PM
Surr: p-Terphenyl	72.7	39-123		%REC	1	10/21/2011 03:49 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M32-1
Lab Order:	120329	**Collection Date:**	10/10/2011 1:58:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-086A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020E QC Batch: 76331 PrepDate: 10/20/2011 Analyst: **CBB**						
Lead	9.7	1.0		mg/Kg	1	10/20/2011 06:05 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019B QC Batch: E11VS362 PrepDate: Analyst: **TP**						
GRO	ND	1.0		mg/Kg	1	10/19/2011 09:55 PM
Surr: Bromofluorobenzene (FID)	107	69-158		%REC	1	10/19/2011 09:55 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019B QC Batch: E11VS362 PrepDate: Analyst: **TP**						
Benzene	ND	5.0		µg/Kg	1	10/19/2011 09:55 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 09:55 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 09:55 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 09:55 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 09:55 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 09:55 PM
Surr: Bromofluorobenzene (PID)	104	65-140		%REC	1	10/19/2011 09:55 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M32-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:59:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-087A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	12	1.0		mg/Kg	1	10/20/2011 06:08 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M31-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:05:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-088A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	100	1.0		mg/Kg	1	10/20/2011 06:11 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M31-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:06:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-089A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 06:22 PM
Arsenic	4.9	1.0		mg/Kg	1	10/20/2011 06:22 PM
Barium	390	1.0		mg/Kg	1	10/20/2011 06:22 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Chromium	22	1.0		mg/Kg	1	10/20/2011 06:22 PM
Cobalt	11	1.0		mg/Kg	1	10/20/2011 06:22 PM
Copper	32	2.0		mg/Kg	1	10/20/2011 06:22 PM
Lead	9.7	1.0		mg/Kg	1	10/20/2011 06:22 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Nickel	45	1.0		mg/Kg	1	10/20/2011 06:22 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 06:22 PM
Vanadium	21	1.0		mg/Kg	1	10/20/2011 06:22 PM
Zinc	56	1.0		mg/Kg	1	10/20/2011 06:22 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.24	0.10		mg/Kg	1	10/20/2011 05:49 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M31-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:07:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-090A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020E	QC Batch: 76331			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	55	1.0		mg/Kg	1	10/20/2011 06:25 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M30-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:12:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-091A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	61	1.0		mg/Kg	1	10/20/2011 06:29 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	52	4.0		mg/Kg	1	10/21/2011 04:09 PM
ORO	220	4.0		mg/Kg	1	10/21/2011 04:09 PM
Surr: p-Terphenyl	89.1	39-123		%REC	1	10/21/2011 04:09 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M30-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:13:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-092A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020E	QC Batch: 76331			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	7.7	1.0		mg/Kg	1	10/20/2011 06:32 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 10:11 PM
Surr: Bromofluorobenzene (FID)	104	69-158		%REC	1	10/19/2011 10:11 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 10:11 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 10:11 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 10:11 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 10:11 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 10:11 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 10:11 PM
Surr: Bromofluorobenzene (PID)	101	65-140		%REC	1	10/19/2011 10:11 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M30-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:14:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-093A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	1.5	1.0		mg/Kg	1	10/20/2011 06:50 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M29-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:18:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-094A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	130	1.0		mg/Kg	1	10/20/2011 06:53 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M29-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:19:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-095A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	14	1.0		mg/Kg	1	10/20/2011 07:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M29-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:20:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-096A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 07:07 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Barium	140	1.0		mg/Kg	1	10/20/2011 07:07 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Chromium	72	1.0		mg/Kg	1	10/20/2011 07:07 PM
Cobalt	20	1.0		mg/Kg	1	10/20/2011 07:07 PM
Copper	43	2.0		mg/Kg	1	10/20/2011 07:07 PM
Lead	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Nickel	69	1.0		mg/Kg	1	10/20/2011 07:07 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 07:07 PM
Vanadium	49	1.0		mg/Kg	1	10/20/2011 07:07 PM
Zinc	34	1.0		mg/Kg	1	10/20/2011 07:07 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/20/2011 05:51 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M28-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:25:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-097A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 07:11 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Barium	69	1.0		mg/Kg	1	10/20/2011 07:11 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Cadmium	1.0	1.0		mg/Kg	1	10/20/2011 07:11 PM
Chromium	30	1.0		mg/Kg	1	10/20/2011 07:11 PM
Cobalt	10	1.0		mg/Kg	1	10/20/2011 07:11 PM
Copper	51	2.0		mg/Kg	1	10/20/2011 07:11 PM
Lead	98	1.0		mg/Kg	1	10/20/2011 07:11 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Nickel	44	1.0		mg/Kg	1	10/20/2011 07:11 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 07:11 PM
Vanadium	21	1.0		mg/Kg	1	10/20/2011 07:11 PM
Zinc	190	1.0		mg/Kg	1	10/20/2011 07:11 PM
HEXAVALENT CHROMIUM, DISSOLVED						
				EPA 7196A		
RunID: WETCHEM3_111021B	QC Batch: 76400			PrepDate: 10/21/2011		Analyst: **AAG**
Chromium, Hexavalent	ND	0.10		mg/Kg	1	10/21/2011
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	71	4.0		mg/Kg	1	10/21/2011 04:45 PM
ORO	470	4.0		mg/Kg	1	10/21/2011 04:45 PM
Surr: p-Terphenyl	83.0	39-123		%REC	1	10/21/2011 04:45 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011		Analyst: **VV**
Mercury	0.17	0.10		mg/Kg	1	10/20/2011 05:53 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M28-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:26:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-098A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	10	1.0		mg/Kg	1	10/20/2011 07:15 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 10:26 PM
Surr: Bromofluorobenzene (FID)	102	69-158		%REC	1	10/19/2011 10:26 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 10:26 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 10:26 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 10:26 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 10:26 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 10:26 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 10:26 PM
Surr: Bromofluorobenzene (PID)	99.8	65-140		%REC	1	10/19/2011 10:26 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M28-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:27:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-099A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	4.0	1.0		mg/Kg	1	10/20/2011 07:18 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M27-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:33:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-100A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	130	1.0		mg/Kg	1	10/20/2011 07:22 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *31-Oct-11*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M27-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:33:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-101A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	11	1.0		mg/Kg	1	10/20/2011 07:26 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *31-Oct-11*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M27-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:34:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-102A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	4.4	1.0		mg/Kg	1	10/20/2011 07:30 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** M26-0
Lab Order: 120329 **Collection Date:** 10/10/2011 2:42:00 PM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-103A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	270	1.0		mg/Kg	1	10/20/2011 07:33 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	94	4.0		mg/Kg	1	10/21/2011 04:32 PM
ORO	420	4.0		mg/Kg	1	10/21/2011 04:32 PM
Surr: p-Terphenyl	82.6	39-123		%REC	1	10/21/2011 04:32 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** M26-1
Lab Order: 120329 **Collection Date:** 10/10/2011 2:43:00 PM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-104A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 07:37 PM
Arsenic	3.2	1.0		mg/Kg	1	10/20/2011 07:37 PM
Barium	51	1.0		mg/Kg	1	10/20/2011 07:37 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Chromium	17	1.0		mg/Kg	1	10/20/2011 07:37 PM
Cobalt	2.7	1.0		mg/Kg	1	10/20/2011 07:37 PM
Copper	13	2.0		mg/Kg	1	10/20/2011 07:37 PM
Lead	13	1.0		mg/Kg	1	10/20/2011 07:37 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Nickel	10	1.0		mg/Kg	1	10/20/2011 07:37 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 07:37 PM
Vanadium	21	1.0		mg/Kg	1	10/20/2011 07:37 PM
Zinc	23	1.0		mg/Kg	1	10/20/2011 07:37 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 10:41 PM
Surr: Bromofluorobenzene (FID)	109	69-158		%REC	1	10/19/2011 10:41 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 10:41 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 10:41 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 10:41 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 10:41 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 10:41 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 10:41 PM
Surr: Bromofluorobenzene (PID)	107	65-140		%REC	1	10/19/2011 10:41 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference
	Results are wet unless otherwise specified
DO	Surrogate Diluted Out

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M26-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:43:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-104A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
MERCURY BY COLD VAPOR TECHNIQUE						
		EPA 7471A				
RunID: AA5_111020B	QC Batch: 76336			PrepDate: 10/19/2011	Analyst: **VV**	
Mercury	0.18	0.10		mg/Kg	1	10/20/2011 05:03 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M26-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:44:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-105A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	9.2	1.0		mg/Kg	1	10/20/2011 07:48 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M25-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:50:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-106A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	42	1.0		mg/Kg	1	10/20/2011 07:51 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M25-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:51:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-107A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	9.6	1.0		mg/Kg	1	10/20/2011 07:55 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M25-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:52:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-108A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	6.1	1.0		mg/Kg	1	10/20/2011 07:59 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M24-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:56:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-109A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B			**EPA 6010B**			
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	28	1.0		mg/Kg	1	10/20/2011 08:02 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B			**EPA 8015B(M)**			
RunID: GC16_111021C	QC Batch: 76354			PrepDate: 10/19/2011		Analyst: **CBR**
DRO	2.1	1.0		mg/Kg	1	10/21/2011 01:15 PM
ORO	3.3	1.0		mg/Kg	1	10/21/2011 01:15 PM
Surr: p-Terphenyl	77.5	39-123		%REC	1	10/21/2011 01:15 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M24-1
Lab Order:	120329	**Collection Date:**	10/10/2011 2:57:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-110A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Lead	5.8	1.0		mg/Kg	1	10/20/2011 08:06 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/19/2011 10:57 PM
Surr: Bromofluorobenzene (FID)	100	69-158		%REC	1	10/19/2011 10:57 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111019B	QC Batch: E11VS362			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/19/2011 10:57 PM
Ethylbenzene	ND	5.0		µg/Kg	1	10/19/2011 10:57 PM
m,p-Xylene	ND	10		µg/Kg	1	10/19/2011 10:57 PM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/19/2011 10:57 PM
o-Xylene	ND	5.0		µg/Kg	1	10/19/2011 10:57 PM
Toluene	ND	5.0		µg/Kg	1	10/19/2011 10:57 PM
Surr: Bromofluorobenzene (PID)	98.2	65-140		%REC	1	10/19/2011 10:57 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M24-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:58:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-111A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 08:09 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Barium	57	1.0		mg/Kg	1	10/20/2011 08:09 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Chromium	8.4	1.0		mg/Kg	1	10/20/2011 08:09 PM
Cobalt	5.5	1.0		mg/Kg	1	10/20/2011 08:09 PM
Copper	6.0	2.0		mg/Kg	1	10/20/2011 08:09 PM
Lead	5.0	1.0		mg/Kg	1	10/20/2011 08:09 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Nickel	11	1.0		mg/Kg	1	10/20/2011 08:09 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 08:09 PM
Vanadium	13	1.0		mg/Kg	1	10/20/2011 08:09 PM
Zinc	24	1.0		mg/Kg	1	10/20/2011 08:09 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020C	QC Batch: 76369			PrepDate: 10/20/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/21/2011 12:00 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M23-0
Lab Order:	120329	**Collection Date:**	10/10/2011 3:00:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-112A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020F	QC Batch: 76332			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 08:13 PM
Arsenic	2.0	1.0		mg/Kg	1	10/20/2011 08:13 PM
Barium	81	1.0		mg/Kg	1	10/20/2011 08:13 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Chromium	21	1.0		mg/Kg	1	10/20/2011 08:13 PM
Cobalt	8.7	1.0		mg/Kg	1	10/20/2011 08:13 PM
Copper	36	2.0		mg/Kg	1	10/20/2011 08:13 PM
Lead	55	1.0		mg/Kg	1	10/20/2011 08:13 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Nickel	29	1.0		mg/Kg	1	10/20/2011 08:13 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 08:13 PM
Vanadium	24	1.0		mg/Kg	1	10/20/2011 08:13 PM
Zinc	150	1.0		mg/Kg	1	10/20/2011 08:13 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020C	QC Batch: 76369			PrepDate: 10/20/2011		Analyst: **VV**
Mercury	0.15	0.10		mg/Kg	1	10/21/2011 12:02 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M23-1
Lab Order:	120329	**Collection Date:**	10/10/2011 3:01:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-113A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate: 10/20/2011	Analyst: **CBB**	
Lead	33	1.0		mg/Kg	1	10/20/2011 08:37 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

ANALYTICAL RESULTS

Print Date: *31-Oct-11*

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M23-2
Lab Order:	120329	**Collection Date:**	10/10/2011 3:02:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-114A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	5.8	1.0		mg/Kg	1	10/20/2011 08:41 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc. **Client Sample ID:** M22-0
Lab Order: 120329 **Collection Date:** 10/10/2011 3:04:00 PM
Project: Marin-Sonoma Narrows A3, E8469-06-03 **Matrix:** SOIL
Lab ID: 120329-115A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	100	1.0		mg/Kg	1	10/20/2011 08:45 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111021A	QC Batch: 76378			PrepDate:	10/20/2011	Analyst: **CBR**
DRO	73	40		mg/Kg	10	10/22/2011 07:31 AM
ORO	400	40		mg/Kg	10	10/22/2011 07:31 AM
Surr: p-Terphenyl	0	39-123	SDO	%REC	10	10/22/2011 07:31 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M22-1
Lab Order:	120329	**Collection Date:**	10/10/2011 3:05:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-116A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111020G QC Batch: 76333				PrepDate: 10/20/2011		Analyst: **CBB**
Lead	7.1	1.0		mg/Kg	1	10/20/2011 08:49 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111020B QC Batch: E11VS364				PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/21/2011 02:24 AM
Surr: Bromofluorobenzene (FID)	111	69-158		%REC	1	10/21/2011 02:24 AM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111020B QC Batch: E11VS364				PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/21/2011 02:24 AM
Ethylbenzene	ND	5.0		µg/Kg	1	10/21/2011 02:24 AM
m,p-Xylene	ND	10		µg/Kg	1	10/21/2011 02:24 AM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/21/2011 02:24 AM
o-Xylene	ND	5.0		µg/Kg	1	10/21/2011 02:24 AM
Toluene	ND	5.0		µg/Kg	1	10/21/2011 02:24 AM
Surr: Bromofluorobenzene (PID)	110	65-140		%REC	1	10/21/2011 02:24 AM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M22-2
Lab Order:	120329	**Collection Date:**	10/10/2011 3:06:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-117A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	8.6	1.0		mg/Kg	1	10/20/2011 08:52 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M21-0
Lab Order:	120329	**Collection Date:**	10/10/2011 3:09:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-118A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	53	1.0		mg/Kg	1	10/20/2011 08:56 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M21-1
Lab Order:	120329	**Collection Date:**	10/10/2011 3:10:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-119A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate: 10/20/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/20/2011 09:00 PM
Arsenic	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Barium	29	1.0		mg/Kg	1	10/20/2011 09:00 PM
Beryllium	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Cadmium	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Chromium	10	1.0		mg/Kg	1	10/20/2011 09:00 PM
Cobalt	3.6	1.0		mg/Kg	1	10/20/2011 09:00 PM
Copper	5.2	2.0		mg/Kg	1	10/20/2011 09:00 PM
Lead	6.4	1.0		mg/Kg	1	10/20/2011 09:00 PM
Molybdenum	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Nickel	13	1.0		mg/Kg	1	10/20/2011 09:00 PM
Selenium	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Silver	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Thallium	ND	1.0		mg/Kg	1	10/20/2011 09:00 PM
Vanadium	12	1.0		mg/Kg	1	10/20/2011 09:00 PM
Zinc	22	1.0		mg/Kg	1	10/20/2011 09:00 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111020C	QC Batch: 76369			PrepDate: 10/20/2011		Analyst: **VV**
Mercury	0.13	0.10		mg/Kg	1	10/20/2011 06:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M21-2
Lab Order:	120329	**Collection Date:**	10/10/2011 3:11:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-120A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111020G	QC Batch: 76333			PrepDate:	10/20/2011	Analyst: **CBB**
Lead	4.0	1.0		mg/Kg	1	10/20/2011 09:03 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76328** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137679**
Client ID: **PBS** Batch ID: **76328** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261627**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.088	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.047	1.0									
Cobalt	ND	1.0									
Copper	ND	2.0									
Lead	ND	1.0									
Molybdenum	ND	1.0									
Nickel	0.056	1.0									
Selenium	ND	1.0									
Silver	0.023	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76328** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137679**
Client ID: **LCSS** Batch ID: **76328** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261628**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	48.847	2.0	50.00	0.08835	97.5	80	120				
Arsenic	46.358	1.0	50.00	0	92.7	80	120				
Barium	51.349	1.0	50.00	0	103	80	120				
Beryllium	49.918	1.0	50.00	0	99.8	80	120				
Cadmium	48.230	1.0	50.00	0	96.5	80	120				
Chromium	47.327	1.0	50.00	0.04654	94.6	80	120				
Cobalt	49.928	1.0	50.00	0	99.9	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76328** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137679**
Client ID: **LCSS** Batch ID: **76328** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261628**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Copper	49.526	2.0	50.00	0	99.1	80	120				
Lead	49.186	1.0	50.00	0	98.4	80	120				
Molybdenum	50.630	1.0	50.00	0	101	80	120				
Nickel	48.972	1.0	50.00	0.05618	97.8	80	120				
Selenium	45.433	1.0	50.00	0	90.9	80	120				
Silver	49.747	1.0	50.00	0.02284	99.4	80	120				
Thallium	47.075	1.0	50.00	0	94.1	80	120				
Vanadium	50.298	1.0	50.00	0	101	80	120				
Zinc	48.614	1.0	50.00	0	97.2	80	120				

Sample ID: **120329-032A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137679**
Client ID: **NB11-1** Batch ID: **76328** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261649**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	90.284	2.0	125.0	1.814	70.8	44	105				
Arsenic	104.965	1.0	125.0	3.970	80.8	57	103				
Barium	307.043	1.0	125.0	222.9	67.3	36	134				
Beryllium	106.976	1.0	125.0	0	85.6	64	106				
Cadmium	100.357	1.0	125.0	0.8194	79.6	58	102				
Chromium	191.028	1.0	125.0	104.7	69.1	55	105				
Cobalt	118.426	1.0	125.0	16.58	81.5	59	105				
Copper	141.793	2.0	125.0	24.61	93.7	64	117				
Lead	127.382	1.0	125.0	28.65	79.0	46	116				
Molybdenum	105.773	1.0	125.0	0	84.6	59	108				
Nickel	201.598	1.0	125.0	110.5	72.9	52	109				
Selenium	96.118	1.0	125.0	0	76.9	56	100				
Silver	113.445	1.0	125.0	0	90.8	65	107				
Thallium	92.306	1.0	125.0	0	73.8	47	100				
Vanadium	134.236	1.0	125.0	23.51	88.6	64	110				
Zinc	145.160	1.0	125.0	45.37	79.8	37	123				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-032A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137679**
Client ID: **NB11-1** Batch ID: **76328** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261650**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	89.942	2.0	125.0	1.814	70.5	44	105	90.28	0.379	20	
Arsenic	105.529	1.0	125.0	3.970	81.2	57	103	105.0	0.536	20	
Barium	298.476	1.0	125.0	222.9	60.5	36	134	307.0	2.83	20	
Beryllium	108.583	1.0	125.0	0	86.9	64	106	107.0	1.49	20	
Cadmium	101.034	1.0	125.0	0.8194	80.2	58	102	100.4	0.672	20	
Chromium	193.867	1.0	125.0	104.7	71.4	55	105	191.0	1.48	20	
Cobalt	119.553	1.0	125.0	16.58	82.4	59	105	118.4	0.947	20	
Copper	145.732	2.0	125.0	24.61	96.9	64	117	141.8	2.74	20	
Lead	131.698	1.0	125.0	28.65	82.4	46	116	127.4	3.33	20	
Molybdenum	105.760	1.0	125.0	0	84.6	59	108	105.8	0.0123	20	
Nickel	210.907	1.0	125.0	110.5	80.3	52	109	201.6	4.51	20	
Selenium	95.072	1.0	125.0	0	76.1	56	100	96.12	1.09	20	
Silver	114.298	1.0	125.0	0	91.4	65	107	113.4	0.749	20	
Thallium	93.823	1.0	125.0	0	75.1	47	100	92.31	1.63	20	
Vanadium	136.058	1.0	125.0	23.51	90.0	64	110	134.2	1.35	20	
Zinc	145.210	1.0	125.0	45.37	79.9	37	123	145.2	0.0346	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- Calculations are based on raw values

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76329** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137681**
Client ID: **PBS** Batch ID: **76329** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261659**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.276	2.0									
Arsenic	ND	1.0									
Barium	0.319	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.217	1.0									
Cobalt	ND	1.0									
Copper	0.423	2.0									
Lead	0.169	1.0									
Molybdenum	0.044	1.0									
Nickel	0.222	1.0									
Selenium	ND	1.0									
Silver	0.091	1.0									
Thallium	0.096	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76329** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137681**
Client ID: **LCSS** Batch ID: **76329** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261660**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	47.247	2.0	50.00	0.2759	93.9	80	120				
Arsenic	44.482	1.0	50.00	0	89.0	80	120				
Barium	49.413	1.0	50.00	0.3195	98.2	80	120				
Beryllium	48.027	1.0	50.00	0	96.1	80	120				
Cadmium	46.424	1.0	50.00	0	92.8	80	120				
Chromium	45.738	1.0	50.00	0.2171	91.0	80	120				
Cobalt	48.199	1.0	50.00	0	96.4	80	120				
Copper	47.683	2.0	50.00	0.4226	94.5	80	120				
Lead	47.302	1.0	50.00	0.1686	94.3	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76329** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137681**
Client ID: **LCSS** Batch ID: **76329** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261660**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	49.100	1.0	50.00	0.04401	98.1	80	120				
Nickel	47.402	1.0	50.00	0.2223	94.4	80	120				
Selenium	43.632	1.0	50.00	0	87.3	80	120				
Silver	47.878	1.0	50.00	0.09143	95.6	80	120				
Thallium	45.533	1.0	50.00	0.09562	90.9	80	120				
Vanadium	48.742	1.0	50.00	0	97.5	80	120				
Zinc	46.786	1.0	50.00	0	93.6	80	120				

Sample ID: **120329-052A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137681**
Client ID: **NB18-0** Batch ID: **76329** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261681**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	86.902	2.0	125.0	0.1623	69.4	44	105				
Arsenic	96.591	1.0	125.0	0.7835	76.6	57	103				
Barium	168.676	1.0	125.0	68.51	80.1	36	134				
Beryllium	99.984	1.0	125.0	0	80.0	64	106				
Cadmium	92.522	1.0	125.0	0.7195	73.4	58	102				
Chromium	107.239	1.0	125.0	10.34	77.5	55	105				
Cobalt	111.200	1.0	125.0	12.78	78.7	59	105				
Copper	136.131	2.0	125.0	16.46	95.7	64	117				
Lead	97.114	1.0	125.0	1.389	76.6	46	116				
Molybdenum	97.299	1.0	125.0	0	77.8	59	108				
Nickel	130.901	1.0	125.0	30.48	80.3	52	109				
Selenium	89.639	1.0	125.0	0	71.7	56	100				
Silver	106.197	1.0	125.0	0	85.0	65	107				
Thallium	87.935	1.0	125.0	0	70.3	47	100				
Vanadium	167.601	1.0	125.0	41.51	101	64	110				
Zinc	117.383	1.0	125.0	21.98	76.3	37	123				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-052A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137681**
Client ID: **NB18-0** Batch ID: **76329** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261682**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	82.900	2.0	125.0	0.1623	66.2	44	105	86.90	4.71	20	
Arsenic	89.195	1.0	125.0	0.7835	70.7	57	103	96.59	7.96	20	
Barium	178.986	1.0	125.0	68.51	88.4	36	134	168.7	5.93	20	
Beryllium	95.188	1.0	125.0	0	76.2	64	106	99.98	4.91	20	
Cadmium	88.058	1.0	125.0	0.7195	69.9	58	102	92.52	4.94	20	
Chromium	99.261	1.0	125.0	10.34	71.1	55	105	107.2	7.73	20	
Cobalt	104.502	1.0	125.0	12.78	73.4	59	105	111.2	6.21	20	
Copper	130.093	2.0	125.0	16.46	90.9	64	117	136.1	4.54	20	
Lead	91.374	1.0	125.0	1.389	72.0	46	116	97.11	6.09	20	
Molybdenum	92.007	1.0	125.0	0	73.6	59	108	97.30	5.59	20	
Nickel	127.478	1.0	125.0	30.48	77.6	52	109	130.9	2.65	20	
Selenium	83.231	1.0	125.0	0	66.6	56	100	89.64	7.41	20	
Silver	99.833	1.0	125.0	0	79.9	65	107	106.2	6.18	20	
Thallium	84.058	1.0	125.0	0	67.2	47	100	87.94	4.51	20	
Vanadium	150.061	1.0	125.0	41.51	86.8	64	110	167.6	11.0	20	
Zinc	110.044	1.0	125.0	21.98	70.4	37	123	117.4	6.45	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76330** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137688**
Client ID: **PBS** Batch ID: **76330** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261739**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.267	2.0									
Arsenic	0.055	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.043	1.0									
Cobalt	ND	1.0									
Copper	0.238	2.0									
Lead	ND	1.0									
Molybdenum	0.054	1.0									
Nickel	0.067	1.0									
Selenium	ND	1.0									
Silver	0.069	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76330** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137688**
Client ID: **LCSS** Batch ID: **76330** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261740**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	44.673	2.0	50.00	0.2668	88.8	80	120				
Arsenic	42.155	1.0	50.00	0.05486	84.2	80	120				
Barium	46.632	1.0	50.00	0	93.3	80	120				
Beryllium	45.576	1.0	50.00	0	91.2	80	120				
Cadmium	43.869	1.0	50.00	0	87.7	80	120				
Chromium	43.210	1.0	50.00	0.04331	86.3	80	120				
Cobalt	45.634	1.0	50.00	0	91.3	80	120				
Copper	44.902	2.0	50.00	0.2376	89.3	80	120				
Lead	45.073	1.0	50.00	0	90.1	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76330** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137688**
Client ID: **LCSS** Batch ID: **76330** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261740**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	46.501	1.0	50.00	0.05410	92.9	80	120				
Nickel	45.033	1.0	50.00	0.06742	89.9	80	120				
Selenium	41.325	1.0	50.00	0	82.6	80	120				
Silver	45.441	1.0	50.00	0.06850	90.7	80	120				
Thallium	43.285	1.0	50.00	0	86.6	80	120				
Vanadium	46.522	1.0	50.00	0	93.0	80	120				
Zinc	44.163	1.0	50.00	0	88.3	80	120				

Sample ID: **120329-072A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137688**
Client ID: **M37-2** Batch ID: **76330** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261761**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	88.239	2.0	125.0	11.57	61.3	44	105				
Arsenic	105.853	1.0	125.0	1.298	83.6	57	103				
Barium	207.064	1.0	125.0	64.21	114	36	134				
Beryllium	106.962	1.0	125.0	0	85.6	64	106				
Cadmium	97.191	1.0	125.0	1.025	76.9	58	102				
Chromium	726.300	1.0	125.0	704.4	17.5	55	105				S
Cobalt	141.188	1.0	125.0	46.39	75.8	59	105				
Copper	144.680	2.0	125.0	21.04	98.9	64	117				
Lead	100.303	1.0	125.0	3.168	77.7	46	116				
Molybdenum	98.051	1.0	125.0	0	78.4	59	108				
Nickel	812.867	1.0	125.0	773.4	31.6	52	109				S
Selenium	97.774	1.0	125.0	0	78.2	56	100				
Silver	117.513	1.0	125.0	0	94.0	65	107				
Thallium	93.869	1.0	125.0	0	75.1	47	100				
Vanadium	129.217	1.0	125.0	21.27	86.4	64	110				
Zinc	115.533	1.0	125.0	23.41	73.7	37	123				

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- Calculations are based on raw values

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-072A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137688**
Client ID: **M37-2** Batch ID: **76330** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261762**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	90.109	2.0	125.0	11.57	62.8	44	105	88.24	2.10	20	
Arsenic	106.899	1.0	125.0	1.298	84.5	57	103	105.9	0.983	20	
Barium	216.042	1.0	125.0	64.21	121	36	134	207.1	4.24	20	
Beryllium	108.796	1.0	125.0	0	87.0	64	106	107.0	1.70	20	
Cadmium	98.419	1.0	125.0	1.025	77.9	58	102	97.19	1.25	20	
Chromium	760.125	1.0	125.0	704.4	44.6	55	105	726.3	4.55	20	S
Cobalt	149.601	1.0	125.0	46.39	82.6	59	105	141.2	5.79	20	
Copper	147.175	2.0	125.0	21.04	101	64	117	144.7	1.71	20	
Lead	101.036	1.0	125.0	3.168	78.3	46	116	100.3	0.728	20	
Molybdenum	100.483	1.0	125.0	0	80.4	59	108	98.05	2.45	20	
Nickel	856.129	1.0	125.0	773.4	66.2	52	109	812.9	5.18	20	
Selenium	98.659	1.0	125.0	0	78.9	56	100	97.77	0.901	20	
Silver	123.788	1.0	125.0	0	99.0	65	107	117.5	5.20	20	
Thallium	94.469	1.0	125.0	0	75.6	47	100	93.87	0.637	20	
Vanadium	131.809	1.0	125.0	21.27	88.4	64	110	129.2	1.99	20	
Zinc	116.909	1.0	125.0	23.41	74.8	37	123	115.5	1.18	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76331** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137689**
Client ID: **PBS** Batch ID: **76331** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261763**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.215	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.062	1.0									
Cobalt	ND	1.0									
Copper	0.276	2.0									
Lead	0.115	1.0									
Molybdenum	0.061	1.0									
Nickel	0.073	1.0									
Selenium	ND	1.0									
Silver	0.055	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76331** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137689**
Client ID: **LCSS** Batch ID: **76331** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261764**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	45.578	2.0	50.00	0.2145	90.7	80	120				
Arsenic	42.996	1.0	50.00	0	86.0	80	120				
Barium	47.673	1.0	50.00	0	95.3	80	120				
Beryllium	45.754	1.0	50.00	0	91.5	80	120				
Cadmium	44.946	1.0	50.00	0	89.9	80	120				
Chromium	44.267	1.0	50.00	0.06223	88.4	80	120				
Cobalt	46.801	1.0	50.00	0	93.6	80	120				
Copper	45.811	2.0	50.00	0.2758	91.1	80	120				
Lead	45.785	1.0	50.00	0.1150	91.3	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76331** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137689**
Client ID: **LCSS** Batch ID: **76331** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261764**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	47.747	1.0	50.00	0.06077	95.4	80	120				
Nickel	46.204	1.0	50.00	0.07326	92.3	80	120				
Selenium	42.135	1.0	50.00	0	84.3	80	120				
Silver	46.829	1.0	50.00	0.05533	93.5	80	120				
Thallium	44.067	1.0	50.00	0	88.1	80	120				
Vanadium	47.583	1.0	50.00	0	95.2	80	120				
Zinc	45.122	1.0	50.00	0	90.2	80	120				

Sample ID: **120329-092A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137689**
Client ID: **M30-1** Batch ID: **76331** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261785**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	83.271	2.0	125.0	0.2784	66.4	44	105				
Arsenic	104.812	1.0	125.0	0	83.8	57	103				
Barium	177.347	1.0	125.0	75.62	81.4	36	134				
Beryllium	102.597	1.0	125.0	0	82.1	64	106				
Cadmium	94.616	1.0	125.0	0.3796	75.4	58	102				
Chromium	118.922	1.0	125.0	18.69	80.2	55	105				
Cobalt	112.834	1.0	125.0	7.116	84.6	59	105				
Copper	165.334	2.0	125.0	15.50	120	64	117				S
Lead	106.084	1.0	125.0	7.745	78.7	46	116				
Molybdenum	102.760	1.0	125.0	0	82.2	59	108				
Nickel	128.252	1.0	125.0	20.40	86.3	52	109				
Selenium	92.766	1.0	125.0	0	74.2	56	100				
Silver	110.985	1.0	125.0	0	88.8	65	107				
Thallium	89.616	1.0	125.0	0	71.7	47	100				
Vanadium	133.790	1.0	125.0	20.38	90.7	64	110				
Zinc	118.561	1.0	125.0	25.88	74.1	37	123				

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-092A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137689**
Client ID: **M30-1** Batch ID: **76331** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261786**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	76.219	2.0	125.0	0.2784	60.8	44	105	83.27	8.84	20	
Arsenic	92.535	1.0	125.0	0	74.0	57	103	104.8	12.4	20	
Barium	191.214	1.0	125.0	75.62	92.5	36	134	177.3	7.52	20	
Beryllium	99.359	1.0	125.0	0	79.5	64	106	102.6	3.21	20	
Cadmium	91.071	1.0	125.0	0.3796	72.6	58	102	94.62	3.82	20	
Chromium	115.549	1.0	125.0	18.69	77.5	55	105	118.9	2.88	20	
Cobalt	103.796	1.0	125.0	7.116	77.3	59	105	112.8	8.34	20	
Copper	130.101	2.0	125.0	15.50	91.7	64	117	165.3	23.9	20	R
Lead	101.161	1.0	125.0	7.745	74.7	46	116	106.1	4.75	20	
Molybdenum	97.570	1.0	125.0	0	78.1	59	108	102.8	5.18	20	
Nickel	116.045	1.0	125.0	20.40	76.5	52	109	128.3	9.99	20	
Selenium	88.795	1.0	125.0	0	71.0	56	100	92.77	4.37	20	
Silver	108.815	1.0	125.0	0	87.1	65	107	111.0	1.97	20	
Thallium	83.844	1.0	125.0	0	67.1	47	100	89.62	6.65	20	
Vanadium	128.578	1.0	125.0	20.38	86.6	64	110	133.8	3.97	20	
Zinc	118.171	1.0	125.0	25.88	73.8	37	123	118.6	0.329	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76332** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137690**
Client ID: **PBS** Batch ID: **76332** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261792**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.233	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.055	1.0									
Cobalt	ND	1.0									
Copper	0.473	2.0									
Lead	0.117	1.0									
Molybdenum	0.075	1.0									
Nickel	0.065	1.0									
Selenium	ND	1.0									
Silver	0.078	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **120329-112A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137690**
Client ID: **M23-0** Batch ID: **76332** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261814**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	89.436	2.0	125.0	0.9383	70.8	44	105				
Arsenic	96.341	1.0	125.0	2.006	75.5	57	103				
Barium	170.481	1.0	125.0	80.69	71.8	36	134				
Beryllium	100.190	1.0	125.0	0	80.2	64	106				
Cadmium	93.547	1.0	125.0	0.8014	74.2	58	102				
Chromium	112.118	1.0	125.0	21.28	72.7	55	105				
Cobalt	104.422	1.0	125.0	8.707	76.6	59	105				
Copper	141.698	2.0	125.0	36.22	84.4	64	117				
Lead	145.800	1.0	125.0	54.81	72.8	46	116				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-112A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137690**
Client ID: **M23-0** Batch ID: **76332** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261814**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	97.819	1.0	125.0	0.4330	77.9	59	108				
Nickel	119.180	1.0	125.0	28.51	72.5	52	109				
Selenium	91.356	1.0	125.0	0	73.1	56	100				
Silver	103.871	1.0	125.0	0	83.1	65	107				
Thallium	89.825	1.0	125.0	0	71.9	47	100				
Vanadium	123.400	1.0	125.0	23.92	79.6	64	110				
Zinc	216.132	1.0	125.0	146.1	56.1	37	123				

Sample ID: **120329-112A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137690**
Client ID: **M23-0** Batch ID: **76332** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261815**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	96.022	2.0	125.0	0.9383	76.1	44	105	89.44	7.10	20	
Arsenic	104.251	1.0	125.0	2.006	81.8	57	103	96.34	7.89	20	
Barium	185.937	1.0	125.0	80.69	84.2	36	134	170.5	8.67	20	
Beryllium	107.827	1.0	125.0	0	86.3	64	106	100.2	7.34	20	
Cadmium	101.256	1.0	125.0	0.8014	80.4	58	102	93.55	7.91	20	
Chromium	119.558	1.0	125.0	21.28	78.6	55	105	112.1	6.42	20	
Cobalt	112.910	1.0	125.0	8.707	83.4	59	105	104.4	7.81	20	
Copper	154.720	2.0	125.0	36.22	94.8	64	117	141.7	8.79	20	
Lead	163.294	1.0	125.0	54.81	86.8	46	116	145.8	11.3	20	
Molybdenum	106.296	1.0	125.0	0.4330	84.7	59	108	97.82	8.31	20	
Nickel	128.312	1.0	125.0	28.51	79.8	52	109	119.2	7.38	20	
Selenium	100.364	1.0	125.0	0	80.3	56	100	91.36	9.40	20	
Silver	112.682	1.0	125.0	0	90.1	65	107	103.9	8.14	20	
Thallium	97.470	1.0	125.0	0	78.0	47	100	89.83	8.16	20	
Vanadium	133.441	1.0	125.0	23.92	87.6	64	110	123.4	7.82	20	
Zinc	235.852	1.0	125.0	146.1	71.8	37	123	216.1	8.73	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76332** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137690**
Client ID: **LCSS** Batch ID: **76332** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/21/2011** SeqNo: **2261825**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	47.582	2.0	50.00	0.2326	94.7	80	120				
Arsenic	44.423	1.0	50.00	0	88.8	80	120				
Barium	49.193	1.0	50.00	0	98.4	80	120				
Beryllium	47.857	1.0	50.00	0	95.7	80	120				
Cadmium	46.221	1.0	50.00	0	92.4	80	120				
Chromium	45.542	1.0	50.00	0.05468	91.0	80	120				
Cobalt	47.925	1.0	50.00	0	95.8	80	120				
Copper	47.626	2.0	50.00	0.4730	94.3	80	120				
Lead	47.175	1.0	50.00	0.1175	94.1	80	120				
Molybdenum	48.857	1.0	50.00	0.07544	97.6	80	120				
Nickel	47.289	1.0	50.00	0.06466	94.4	80	120				
Selenium	43.403	1.0	50.00	0	86.8	80	120				
Silver	48.820	1.0	50.00	0.07837	97.5	80	120				
Thallium	45.529	1.0	50.00	0	91.1	80	120				
Vanadium	48.423	1.0	50.00	0	96.8	80	120				
Zinc	46.592	1.0	50.00	0	93.2	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76333** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137692**
Client ID: **PBS** Batch ID: **76333** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261829**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.043	1.0									
Cobalt	ND	1.0									
Copper	ND	2.0									
Lead	0.079	1.0									
Molybdenum	0.049	1.0									
Nickel	0.056	1.0									
Selenium	ND	1.0									
Silver	0.035	1.0									
Thallium	ND	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76333** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137692**
Client ID: **LCSS** Batch ID: **76333** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261830**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	47.688	2.0	50.00	0	95.4	80	120				
Arsenic	44.280	1.0	50.00	0	88.6	80	120				
Barium	50.015	1.0	50.00	0	100	80	120				
Beryllium	48.624	1.0	50.00	0	97.2	80	120				
Cadmium	46.606	1.0	50.00	0	93.2	80	120				
Chromium	46.090	1.0	50.00	0.04300	92.1	80	120				
Cobalt	48.495	1.0	50.00	0	97.0	80	120				
Copper	48.405	2.0	50.00	0	96.8	80	120				
Lead	47.017	1.0	50.00	0.07911	93.9	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76333** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137692**
Client ID: **LCSS** Batch ID: **76333** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261830**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	49.514	1.0	50.00	0.04897	98.9	80	120				
Nickel	47.552	1.0	50.00	0.05580	95.0	80	120				
Selenium	43.409	1.0	50.00	0	86.8	80	120				
Silver	49.281	1.0	50.00	0.03513	98.5	80	120				
Thallium	45.475	1.0	50.00	0	91.0	80	120				
Vanadium	49.116	1.0	50.00	0	98.2	80	120				
Zinc	46.785	1.0	50.00	0	93.6	80	120				

Sample ID: **120329-120A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137692**
Client ID: **M21-2** Batch ID: **76333** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261839**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	94.662	2.0	125.0	0.5642	75.3	44	105				
Arsenic	103.350	1.0	125.0	6.962	77.1	57	103				
Barium	221.732	1.0	125.0	48.04	139	36	134				S
Beryllium	107.335	1.0	125.0	0.4087	85.5	64	106				
Cadmium	100.971	1.0	125.0	0.5797	80.3	58	102				
Chromium	113.699	1.0	125.0	19.23	75.6	55	105				
Cobalt	111.647	1.0	125.0	7.221	83.5	59	105				
Copper	135.607	2.0	125.0	25.27	88.3	64	117				
Lead	106.271	1.0	125.0	3.987	81.8	46	116				
Molybdenum	102.937	1.0	125.0	0	82.3	59	108				
Nickel	122.930	1.0	125.0	21.65	81.0	52	109				
Selenium	93.679	1.0	125.0	0	74.9	56	100				
Silver	111.614	1.0	125.0	0	89.3	65	107				
Thallium	97.914	1.0	125.0	0	78.3	47	100				
Vanadium	124.786	1.0	125.0	22.09	82.2	64	110				
Zinc	139.421	1.0	125.0	48.24	72.9	37	123				

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- Calculations are based on raw values

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-120A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137692**
Client ID: **M21-2** Batch ID: **76333** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/20/2011** SeqNo: **2261840**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	96.475	2.0	125.0	0.5642	76.7	44	105	94.66	1.90	20	
Arsenic	107.664	1.0	125.0	6.962	80.6	57	103	103.4	4.09	20	
Barium	129.617	1.0	125.0	48.04	65.3	36	134	221.7	52.4	20	R
Beryllium	109.023	1.0	125.0	0.4087	86.9	64	106	107.3	1.56	20	
Cadmium	101.947	1.0	125.0	0.5797	81.1	58	102	101.0	0.962	20	
Chromium	118.786	1.0	125.0	19.23	79.6	55	105	113.7	4.38	20	
Cobalt	108.454	1.0	125.0	7.221	81.0	59	105	111.6	2.90	20	
Copper	142.903	2.0	125.0	25.27	94.1	64	117	135.6	5.24	20	
Lead	105.336	1.0	125.0	3.987	81.1	46	116	106.3	0.884	20	
Molybdenum	104.661	1.0	125.0	0	83.7	59	108	102.9	1.66	20	
Nickel	120.233	1.0	125.0	21.65	78.9	52	109	122.9	2.22	20	
Selenium	93.582	1.0	125.0	0	74.9	56	100	93.68	0.104	20	
Silver	113.074	1.0	125.0	0	90.5	65	107	111.6	1.30	20	
Thallium	99.964	1.0	125.0	0	80.0	47	100	97.91	2.07	20	
Vanadium	131.013	1.0	125.0	22.09	87.1	64	110	124.8	4.87	20	
Zinc	147.947	1.0	125.0	48.24	79.8	37	123	139.4	5.93	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76409** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137808**
Client ID: **PBS** Batch ID: **76409** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/24/2011** SeqNo: **2263790**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.282	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Cobalt	ND	1.0									
Copper	ND	2.0									
Lead	0.117	1.0									
Molybdenum	0.079	1.0									
Nickel	ND	1.0									
Selenium	ND	1.0									
Silver	0.025	1.0									
Thallium	0.089	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76409** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137808**
Client ID: **LCSS** Batch ID: **76409** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/24/2011** SeqNo: **2263791**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	46.238	2.0	50.00	0.2820	91.9	80	120				
Arsenic	43.841	1.0	50.00	0	87.7	80	120				
Barium	47.874	1.0	50.00	0	95.7	80	120				
Beryllium	47.870	1.0	50.00	0	95.7	80	120				
Cadmium	44.882	1.0	50.00	0	89.8	80	120				
Chromium	45.077	1.0	50.00	0	90.2	80	120				
Cobalt	46.771	1.0	50.00	0	93.5	80	120				
Copper	47.456	2.0	50.00	0	94.9	80	120				
Lead	46.894	1.0	50.00	0.1168	93.6	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76409** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137808**
Client ID: **LCSS** Batch ID: **76409** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/24/2011** SeqNo: **2263791**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	47.501	1.0	50.00	0.07891	94.8	80	120				
Nickel	46.358	1.0	50.00	0	92.7	80	120				
Selenium	43.755	1.0	50.00	0	87.5	80	120				
Silver	44.589	1.0	50.00	0.02490	89.1	80	120				
Thallium	44.925	1.0	50.00	0.08869	89.7	80	120				
Vanadium	48.374	1.0	50.00	0	96.7	80	120				
Zinc	45.193	1.0	50.00	0	90.4	80	120				

Sample ID: **120329-012A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137808**
Client ID: **NB4-2** Batch ID: **76409** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263812**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	94.383	2.0	125.0	1.418	74.4	44	105				
Arsenic	99.144	1.0	125.0	1.313	78.3	57	103				
Barium	223.577	1.0	125.0	129.2	75.5	36	134				
Beryllium	111.729	1.0	125.0	0	89.4	64	106				
Cadmium	101.694	1.0	125.0	0.6407	80.8	58	102				
Chromium	269.177	1.0	125.0	77.23	154	55	105				S
Cobalt	127.303	1.0	125.0	17.48	87.9	59	105				
Copper	140.252	2.0	125.0	27.62	90.1	64	117				
Lead	110.915	1.0	125.0	5.614	84.2	46	116				
Molybdenum	101.827	1.0	125.0	0	81.5	59	108				
Nickel	260.257	1.0	125.0	80.23	144	52	109				S
Selenium	93.798	1.0	125.0	0	75.0	56	100				
Silver	112.585	1.0	125.0	0	90.1	65	107				
Thallium	97.815	1.0	125.0	0	78.3	47	100				
Vanadium	145.254	1.0	125.0	31.80	90.8	64	110				
Zinc	136.164	1.0	125.0	37.58	78.9	37	123				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-012A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137808**
Client ID: **NB4-2** Batch ID: **76409** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263813**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	92.237	2.0	125.0	1.418	72.7	44	105	94.38	2.30	20	
Arsenic	97.302	1.0	125.0	1.313	76.8	57	103	99.14	1.88	20	
Barium	239.276	1.0	125.0	129.2	88.1	36	134	223.6	6.78	20	
Beryllium	109.193	1.0	125.0	0	87.4	64	106	111.7	2.30	20	
Cadmium	100.224	1.0	125.0	0.6407	79.7	58	102	101.7	1.46	20	
Chromium	178.579	1.0	125.0	77.23	81.1	55	105	269.2	40.5	20	R
Cobalt	121.315	1.0	125.0	17.48	83.1	59	105	127.3	4.82	20	
Copper	142.574	2.0	125.0	27.62	92.0	64	117	140.3	1.64	20	
Lead	108.384	1.0	125.0	5.614	82.2	46	116	110.9	2.31	20	
Molybdenum	98.371	1.0	125.0	0	78.7	59	108	101.8	3.45	20	
Nickel	182.294	1.0	125.0	80.23	81.7	52	109	260.3	35.2	20	R
Selenium	91.556	1.0	125.0	0	73.2	56	100	93.80	2.42	20	
Silver	108.518	1.0	125.0	0	86.8	65	107	112.6	3.68	20	
Thallium	95.601	1.0	125.0	0	76.5	47	100	97.81	2.29	20	
Vanadium	141.229	1.0	125.0	31.80	87.5	64	110	145.3	2.81	20	
Zinc	143.732	1.0	125.0	37.58	84.9	37	123	136.2	5.41	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76411** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137810**
Client ID: **PBS** Batch ID: **76411** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263955**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.243	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Cobalt	ND	1.0									
Copper	ND	2.0									
Lead	0.169	1.0									
Molybdenum	ND	1.0									
Nickel	ND	1.0									
Selenium	ND	1.0									
Silver	ND	1.0									
Thallium	0.129	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76411** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137810**
Client ID: **LCSS** Batch ID: **76411** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263956**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	45.456	2.0	50.00	0.2432	90.4	80	120				
Arsenic	43.829	1.0	50.00	0	87.7	80	120				
Barium	47.204	1.0	50.00	0	94.4	80	120				
Beryllium	48.043	1.0	50.00	0	96.1	80	120				
Cadmium	44.473	1.0	50.00	0	88.9	80	120				
Chromium	45.066	1.0	50.00	0	90.1	80	120				
Cobalt	46.780	1.0	50.00	0	93.6	80	120				
Copper	47.110	2.0	50.00	0	94.2	80	120				
Lead	47.049	1.0	50.00	0.1690	93.8	80	120				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76411** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137810**
Client ID: **LCSS** Batch ID: **76411** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263956**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	46.535	1.0	50.00	0	93.1	80	120				
Nickel	46.376	1.0	50.00	0	92.8	80	120				
Selenium	43.217	1.0	50.00	0	86.4	80	120				
Silver	44.093	1.0	50.00	0	88.2	80	120				
Thallium	45.205	1.0	50.00	0.1289	90.2	80	120				
Vanadium	48.620	1.0	50.00	0	97.2	80	120				
Zinc	44.941	1.0	50.00	0	89.9	80	120				

Sample ID: **120329-119A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137810**
Client ID: **M21-1** Batch ID: **76411** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263960**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	91.335	2.0	125.0	0	73.1	44	105				
Arsenic	94.329	1.0	125.0	0	75.5	57	103				
Barium	137.897	1.0	125.0	38.37	79.6	36	134				
Beryllium	102.974	1.0	125.0	0	82.4	64	106				
Cadmium	95.069	1.0	125.0	0.3272	75.8	58	102				
Chromium	109.671	1.0	125.0	14.36	76.2	55	105				
Cobalt	104.361	1.0	125.0	5.400	79.2	59	105				
Copper	114.774	2.0	125.0	6.324	86.8	64	117				
Lead	109.879	1.0	125.0	13.67	77.0	46	116				
Molybdenum	96.866	1.0	125.0	0	77.5	59	108				
Nickel	114.928	1.0	125.0	18.80	76.9	52	109				
Selenium	92.071	1.0	125.0	0	73.7	56	100				
Silver	104.373	1.0	125.0	0	83.5	65	107				
Thallium	86.695	1.0	125.0	0	69.4	47	100				
Vanadium	123.632	1.0	125.0	19.37	83.4	64	110				
Zinc	125.037	1.0	125.0	30.85	75.3	37	123				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120329-119A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/24/2011** RunNo: **137810**
Client ID: **M21-1** Batch ID: **76411** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/25/2011** SeqNo: **2263961**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	93.321	2.0	125.0	0	74.7	44	105	91.34	2.15	20	
Arsenic	95.827	1.0	125.0	0	76.7	57	103	94.33	1.58	20	
Barium	138.729	1.0	125.0	38.37	80.3	36	134	137.9	0.601	20	
Beryllium	105.419	1.0	125.0	0	84.3	64	106	103.0	2.35	20	
Cadmium	96.623	1.0	125.0	0.3272	77.0	58	102	95.07	1.62	20	
Chromium	109.580	1.0	125.0	14.36	76.2	55	105	109.7	0.0832	20	
Cobalt	105.655	1.0	125.0	5.400	80.2	59	105	104.4	1.23	20	
Copper	116.203	2.0	125.0	6.324	87.9	64	117	114.8	1.24	20	
Lead	112.839	1.0	125.0	13.67	79.3	46	116	109.9	2.66	20	
Molybdenum	98.303	1.0	125.0	0	78.6	59	108	96.87	1.47	20	
Nickel	113.824	1.0	125.0	18.80	76.0	52	109	114.9	0.965	20	
Selenium	92.796	1.0	125.0	0	74.2	56	100	92.07	0.784	20	
Silver	105.840	1.0	125.0	0	84.7	65	107	104.4	1.40	20	
Thallium	89.103	1.0	125.0	0	71.3	47	100	86.70	2.74	20	
Vanadium	123.737	1.0	125.0	19.37	83.5	64	110	123.6	0.0855	20	
Zinc	125.449	1.0	125.0	30.85	75.7	37	123	125.0	0.329	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out
- Calculations are based on raw values

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7196_S

Sample ID: **120328-098A-MS**	SampType: **MS**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **10/21/2011**	RunNo: **137725**
Client ID: **ZZZZZZ**	Batch ID: **76400**	TestNo: **EPA 7196A**		Analysis Date: **10/21/2011**	SeqNo: **2262465**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	3.360	0.10	5.000	0	67.2	85	115				S

Sample ID: **120328-098A-MSD**	SampType: **MSD**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **10/21/2011**	RunNo: **137725**
Client ID: **ZZZZZZ**	Batch ID: **76400**	TestNo: **EPA 7196A**		Analysis Date: **10/21/2011**	SeqNo: **2262466**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	3.030	0.10	5.000	0	60.6	85	115	3.360	10.3	20	S

Sample ID: **LCS-76400**	SampType: **LCS**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **10/21/2011**	RunNo: **137725**
Client ID: **LCSS**	Batch ID: **76400**	TestNo: **EPA 7196A**		Analysis Date: **10/21/2011**	SeqNo: **2262472**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	4.600	0.10	5.000	0	92.0	85	115				

Sample ID: **MB-76400**	SampType: **MBLK**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **10/21/2011**	RunNo: **137725**
Client ID: **PBS**	Batch ID: **76400**	TestNo: **EPA 7196A**		Analysis Date: **10/21/2011**	SeqNo: **2262473**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.10									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **MB-76335**	SampType: **MBLK**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137701**
Client ID: **PBS**	Batch ID: **76335**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2261951**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Sample ID: **LCS-76335**	SampType: **LCS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137701**
Client ID: **LCSS**	Batch ID: **76335**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2261952**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.892	0.10	0.8300	0	107	80	120				

Sample ID: **120329-002A-MS**	SampType: **MS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137701**
Client ID: **NB1-1**	Batch ID: **76335**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2261953**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.896	0.10	0.8300	0.04457	103	70	130				

Sample ID: **120329-002A-MSD**	SampType: **MSD**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137701**
Client ID: **NB1-1**	Batch ID: **76335**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2261965**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.762	0.10	0.8300	0.04457	86.4	70	130	0.8955	16.1	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **MB-76336**	SampType: **MBLK**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137708**
Client ID: **PBS**	Batch ID: **76336**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262227**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Sample ID: **LCS-76336**	SampType: **LCS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137708**
Client ID: **LCSS**	Batch ID: **76336**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262228**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.969	0.10	0.8300	0	117	80	120				

Sample ID: **120329-104A-MS**	SampType: **MS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137708**
Client ID: **M26-1**	Batch ID: **76336**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262229**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.876	0.10	0.8300	0.1787	84.0	70	130				

Sample ID: **120329-104A-MSD**	SampType: **MSD**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137708**
Client ID: **M26-1**	Batch ID: **76336**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262230**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.895	0.10	0.8300	0.1787	86.3	70	130	0.8756	2.23	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **MB-76369**	SampType: **MBLK**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/20/2011**	RunNo: **137709**
Client ID: **PBS**	Batch ID: **76369**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262251**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Sample ID: **LCS-76369**	SampType: **LCS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/20/2011**	RunNo: **137709**
Client ID: **LCSS**	Batch ID: **76369**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262252**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.722	0.10	0.8300	0	86.9	80	120				

Sample ID: **120329-119A-MS**	SampType: **MS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/20/2011**	RunNo: **137709**
Client ID: **M21-1**	Batch ID: **76369**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262253**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.731	0.10	0.8300	0.1310	72.2	70	130				

Sample ID: **120329-119A-MSD**	SampType: **MSD**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/20/2011**	RunNo: **137709**
Client ID: **M21-1**	Batch ID: **76369**	TestNo: **EPA 7471A**		Analysis Date: **10/20/2011**	SeqNo: **2262254**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.732	0.10	0.8300	0.1310	72.4	70	130	0.7306	0.212	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_DM LL

Sample ID: **MB-76354**	SampType: **MBLK**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137746**
Client ID: **PBS**	Batch ID: **76354**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/21/2011**	SeqNo: **2262882**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	1.0									
ORO	ND	1.0									
Surr: p-Terphenyl	2.245		2.670		84.1	39	123				

Sample ID: **LCS-76354**	SampType: **LCS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137746**
Client ID: **LCSS**	Batch ID: **76354**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/21/2011**	SeqNo: **2262883**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	25.583	1.0	33.00	0	77.5	37	109				
Surr: p-Terphenyl	2.668		2.670		99.9	39	123				

Sample ID: **120329-001AMS**	SampType: **MS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137746**
Client ID: **NB1-0**	Batch ID: **76354**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/21/2011**	SeqNo: **2262887**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	25.396	1.0	33.00	3.040	67.7	29	107				
Surr: p-Terphenyl	2.313		2.670		86.6	39	123				

Sample ID: **120329-001AMSD**	SampType: **MSD**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/19/2011**	RunNo: **137746**
Client ID: **NB1-0**	Batch ID: **76354**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/21/2011**	SeqNo: **2262888**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	22.666	1.0	33.00	3.040	59.5	29	107	25.40	11.4	20	
Surr: p-Terphenyl	2.164		2.670		81.1	39	123		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_DM LL

Sample ID: **MB-76378** SampType: **MBLK** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137714**
Client ID: **PBS** Batch ID: **76378** TestNo: **EPA 8015B(M** **EPA 3550B** Analysis Date: **10/21/2011** SeqNo: **2262296**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	1.0									
ORO	ND	1.0									
Surr: p-Terphenyl	2.418		2.670		90.5	39	123				

Sample ID: **LCS-76378** SampType: **LCS** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137714**
Client ID: **LCSS** Batch ID: **76378** TestNo: **EPA 8015B(M** **EPA 3550B** Analysis Date: **10/21/2011** SeqNo: **2262297**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	15.583	1.0	33.00	0	47.2	37	109				
Surr: p-Terphenyl	2.743		2.670		103	39	123				

Sample ID: **120402-001AMS** SampType: **MS** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137714**
Client ID: **ZZZZZZ** Batch ID: **76378** TestNo: **EPA 8015B(M** **EPA 3550B** Analysis Date: **10/21/2011** SeqNo: **2262298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	20.235	1.0	33.00	0	61.3	29	107				
Surr: p-Terphenyl	2.295		2.670		85.9	39	123				

Sample ID: **120402-001AMSD** SampType: **MSD** TestCode: **8015_S_DM L** Units: **mg/Kg** Prep Date: **10/20/2011** RunNo: **137714**
Client ID: **ZZZZZZ** Batch ID: **76378** TestNo: **EPA 8015B(M** **EPA 3550B** Analysis Date: **10/21/2011** SeqNo: **2262299**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	17.600	1.0	33.00	0	53.3	29	107	20.23	13.9	20	
Surr: p-Terphenyl	2.129		2.670		79.8	39	123		0	0	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **E111019LC1** SampType: **LCS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137665**
Client ID: **LCSS** Batch ID: **E11VS361** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261314**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.883	1.0	5.000	0	97.7	70	130				
Surr: Bromofluorobenzene (FID)	123.700		100.0		124	69	158				

Sample ID: **E111019MB1MS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261317**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.945	1.0	5.000	0	98.9	46	135				
Surr: Bromofluorobenzene (FID)	122.546		100.0		123	69	158				

Sample ID: **E111019MB1MSD** SampType: **MSD** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261318**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.963	1.0	5.000	0	99.3	46	135	4.945	0.363	20	
Surr: Bromofluorobenzene (FID)	125.371		100.0		125	69	158		0	0	

Sample ID: **E111019MB1** SampType: **MBLK** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137665**
Client ID: **PBS** Batch ID: **E11VS361** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261319**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	ND	1.0									
Surr: Bromofluorobenzene (FID)	86.779		100.0		86.8	69	158				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **E111019LC3** SampType: **LCS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **LCSS** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261545**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	5.298	1.0	5.000	0	106	70	130				
Surr: Bromofluorobenzene (FID)	122.854		100.0		123	69	158				

Sample ID: **E111019MB2MS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **ZZZZZZ** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261546**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	5.075	1.0	5.000	0	102	46	135				
Surr: Bromofluorobenzene (FID)	121.272		100.0		121	69	158				

Sample ID: **E111019MB2MSD** SampType: **MSD** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **ZZZZZZ** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261547**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	5.115	1.0	5.000	0	102	46	135	5.075	0.785	20	
Surr: Bromofluorobenzene (FID)	119.078		100.0		119	69	158		0	0	

Sample ID: **E111019MB2** SampType: **MBLK** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **PBS** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/19/2011** SeqNo: **2261548**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	ND	1.0									
Surr: Bromofluorobenzene (FID)	88.625		100.0		88.6	69	158				

Sample ID: **120329-110AMS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **M24-1** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/20/2011** SeqNo: **2261569**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.262	1.0	5.000	0	85.2	46	135				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **120329-110AMS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **M24-1** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/20/2011** SeqNo: **2261569**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (FID)	125.457		100.0		125	69	158				

Sample ID: **120329-110AMSD** SampType: **MSD** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137672**
Client ID: **M24-1** Batch ID: **E11VS362** TestNo: **EPA 8015B(M** Analysis Date: **10/20/2011** SeqNo: **2261570**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.540	1.0	5.000	0	90.8	46	135	4.262	6.32	20	
Surr: Bromofluorobenzene (FID)	127.349		100.0		127	69	158		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **E111020LC3**	SampType: **LCS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137704**
Client ID: **LCSS**	Batch ID: **E11VS364**	TestNo: **EPA 8015B(M**		Analysis Date: **10/20/2011**	SeqNo: **2262058**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.822	1.0	5.000	0	96.4	70	130				
Surr: Bromofluorobenzene (FID)	100.439		100.0		100	69	158				

Sample ID: **E111020MB2MS**	SampType: **MS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137704**
Client ID: **ZZZZZZ**	Batch ID: **E11VS364**	TestNo: **EPA 8015B(M**		Analysis Date: **10/20/2011**	SeqNo: **2262059**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.881	1.0	5.000	0	97.6	46	135				
Surr: Bromofluorobenzene (FID)	118.850		100.0		119	69	158				

Sample ID: **E111020MB2MSD**	SampType: **MSD**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137704**
Client ID: **ZZZZZZ**	Batch ID: **E11VS364**	TestNo: **EPA 8015B(M**		Analysis Date: **10/20/2011**	SeqNo: **2262060**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.871	1.0	5.000	0	97.4	46	135	4.881	0.205	20	
Surr: Bromofluorobenzene (FID)	117.889		100.0		118	69	158		0	0	

Sample ID: **E111020MB2**	SampType: **MBLK**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137704**
Client ID: **PBS**	Batch ID: **E11VS364**	TestNo: **EPA 8015B(M**		Analysis Date: **10/20/2011**	SeqNo: **2262061**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	ND	1.0									
Surr: Bromofluorobenzene (FID)	94.184		100.0		94.2	69	158				

Sample ID: **120328-097AMS**	SampType: **MS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137704**
Client ID: **ZZZZZZ**	Batch ID: **E11VS364**	TestNo: **EPA 8015B(M**		Analysis Date: **10/21/2011**	SeqNo: **2262092**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	3.050	1.0	5.000	0	61.0	46	135				

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **120328-097AMS** SampType: **MS** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8015B(M** Analysis Date: **10/21/2011** SeqNo: **2262092**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (FID)	125.388		100.0		125	69	158				

Sample ID: **120328-097AMSD** SampType: **MSD** TestCode: **8015_S_GAS** Units: **mg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8015B(M** Analysis Date: **10/21/2011** SeqNo: **2262093**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	3.943	1.0	5.000	0	78.9	46	135	3.050	25.5	20	R
Surr: Bromofluorobenzene (FID)	123.775		100.0		124	69	158		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111019LC2** SampType: **LCS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **LCSS** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261291**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	97.457	5.0	100.0	0	97.5	70	130				
Ethylbenzene	101.548	5.0	100.0	0	102	70	130				
m,p-Xylene	206.725	10	200.0	0	103	70	130				
Methyl tert-butyl ether	88.481	5.0	100.0	0	88.5	70	130				
o-Xylene	103.262	5.0	100.0	0	103	70	130				
Toluene	100.789	5.0	100.0	0	101	70	130				
Surr: Bromofluorobenzene (PID)	90.631		100.0		90.6	65	140				

Sample ID: **E111019LC2** SampType: **LCSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **LCSS02** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261292**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	98.057	5.0	100.0	0	98.1	70	130	97.46	0.614	20	
Ethylbenzene	100.969	5.0	100.0	0	101	70	130	101.5	0.572	20	
m,p-Xylene	205.997	10	200.0	0	103	70	130	206.7	0.353	20	
Methyl tert-butyl ether	90.345	5.0	100.0	0	90.3	70	130	88.48	2.08	20	
o-Xylene	103.940	5.0	100.0	0	104	70	130	103.3	0.654	20	
Toluene	100.728	5.0	100.0	0	101	70	130	100.8	0.0605	20	
Surr: Bromofluorobenzene (PID)	93.224		100.0		93.2	65	140		0	0	

Sample ID: **E111019MB1MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261293**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	34.614	5.0	22.15	0	156	69	264				
Ethylbenzene	56.172	5.0	42.30	0	133	37	161				
m,p-Xylene	193.322	10	180.2	0	107	30	149				
Methyl tert-butyl ether	366.280	5.0	578.9	0	63.3	39	121				
o-Xylene	71.929	5.0	64.80	0	111	31	166				
Toluene	175.843	5.0	172.6	0	102	44	150				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111019MB1MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261293**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (PID)	95.526		100.0		95.5	65	140				

Sample ID: **E111019MB1MSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261294**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	35.278	5.0	22.15	0	159	69	264	34.61	1.90	20	
Ethylbenzene	57.112	5.0	42.30	0	135	37	161	56.17	1.66	20	
m,p-Xylene	196.424	10	180.2	0	109	30	149	193.3	1.59	20	
Methyl tert-butyl ether	370.366	5.0	578.9	0	64.0	39	121	366.3	1.11	20	
o-Xylene	73.555	5.0	64.80	0	114	31	166	71.93	2.24	20	
Toluene	179.177	5.0	172.6	0	104	44	150	175.8	1.88	20	
Surr: Bromofluorobenzene (PID)	97.994		100.0		98.0	65	140		0	20	

Sample ID: **E111019MB1** SampType: **MBLK** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **PBS** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261295**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	5.0									
Ethylbenzene	ND	5.0									
m,p-Xylene	ND	10									
Methyl tert-butyl ether	ND	5.0									
o-Xylene	ND	5.0									
Toluene	ND	5.0									
Surr: Bromofluorobenzene (PID)	84.595		100.0		84.6	65	140				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **120373-005AMS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	25.393	5.0	22.15	0	115	69	264				
Ethylbenzene	21.424	5.0	42.30	0	50.6	37	161				
m,p-Xylene	76.397	10	180.2	0	42.4	30	149				
Methyl tert-butyl ether	341.643	5.0	578.9	0	59.0	39	121				
o-Xylene	28.543	5.0	64.80	0	44.0	31	166				
Toluene	101.457	5.0	172.6	0	58.8	44	150				
Surr: Bromofluorobenzene (PID)	83.315		100.0		83.3	65	140				

Sample ID: **120373-005AMSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137665**
Client ID: **ZZZZZZ** Batch ID: **E11VS361** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261299**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	25.441	5.0	22.15	0	115	69	264	25.39	0.189	20	
Ethylbenzene	22.589	5.0	42.30	0	53.4	37	161	21.42	5.29	20	
m,p-Xylene	80.992	10	180.2	0	44.9	30	149	76.40	5.84	20	
Methyl tert-butyl ether	338.733	5.0	578.9	0	58.5	39	121	341.6	0.855	20	
o-Xylene	30.586	5.0	64.80	0	47.2	31	166	28.54	6.91	20	
Toluene	104.168	5.0	172.6	0	60.3	44	150	101.5	2.64	20	
Surr: Bromofluorobenzene (PID)	80.271		100.0		80.3	65	140		0	20	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111019LC4** SampType: **LCS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **LCSS** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261571**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	108.094	5.0	100.0	0	108	70	130				
Ethylbenzene	110.352	5.0	100.0	0	110	70	130				
m,p-Xylene	225.517	10	200.0	0	113	70	130				
Methyl tert-butyl ether	106.182	5.0	100.0	0	106	70	130				
o-Xylene	115.486	5.0	100.0	0	115	70	130				
Toluene	110.597	5.0	100.0	0	111	70	130				
Surr: Bromofluorobenzene (PID)	108.221		100.0		108	65	140				

Sample ID: **E111019LC4** SampType: **LCSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **LCSS02** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261572**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	108.940	5.0	100.0	0	109	70	130	108.1	0.780	20	
Ethylbenzene	112.004	5.0	100.0	0	112	70	130	110.4	1.49	20	
m,p-Xylene	228.480	10	200.0	0	114	70	130	225.5	1.31	20	
Methyl tert-butyl ether	103.305	5.0	100.0	0	103	70	130	106.2	2.75	20	
o-Xylene	115.958	5.0	100.0	0	116	70	130	115.5	0.408	20	
Toluene	111.730	5.0	100.0	0	112	70	130	110.6	1.02	20	
Surr: Bromofluorobenzene (PID)	104.849		100.0		105	65	140		0	0	

Sample ID: **E111019MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **ZZZZZZ** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261573**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	37.236	5.0	22.15	0	168	69	264				
Ethylbenzene	59.333	5.0	42.30	0	140	37	161				
m,p-Xylene	206.159	10	180.2	0	114	30	149				
Methyl tert-butyl ether	400.638	5.0	578.9	0	69.2	39	121				
o-Xylene	78.298	5.0	64.80	0	121	31	166				
Toluene	189.337	5.0	172.6	0	110	44	150				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111019MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **ZZZZZZ** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261573**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (PID)	107.370		100.0		107	65	140				

Sample ID: **E111019MB2MSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **ZZZZZZ** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261574**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	37.120	5.0	22.15	0	168	69	264	37.24	0.312	20	
Ethylbenzene	59.608	5.0	42.30	0	141	37	161	59.33	0.462	20	
m,p-Xylene	205.791	10	180.2	0	114	30	149	206.2	0.179	20	
Methyl tert-butyl ether	404.684	5.0	578.9	0	69.9	39	121	400.6	1.00	20	
o-Xylene	77.778	5.0	64.80	0	120	31	166	78.30	0.666	20	
Toluene	188.643	5.0	172.6	0	109	44	150	189.3	0.367	20	
Surr: Bromofluorobenzene (PID)	103.662		100.0		104	65	140		0	20	

Sample ID: **E111019MB2** SampType: **MBLK** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **PBS** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/19/2011** SeqNo: **2261575**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	5.0									
Ethylbenzene	ND	5.0									
m,p-Xylene	ND	10									
Methyl tert-butyl ether	ND	5.0									
o-Xylene	ND	5.0									
Toluene	ND	5.0									
Surr: Bromofluorobenzene (PID)	87.358		100.0		87.4	65	140				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **120329-110AMS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **M24-1** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2261596**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	30.524	5.0	22.15	0	138	69	264				
Ethylbenzene	49.404	5.0	42.30	0	117	37	161				
m,p-Xylene	171.800	10	180.2	0	95.3	30	149				
Methyl tert-butyl ether	310.416	5.0	578.9	0	53.6	39	121				
o-Xylene	65.411	5.0	64.80	0	101	31	166				
Toluene	155.930	5.0	172.6	0	90.3	44	150				
Xylenes, Total	237.211	15	245.0	0	96.8	30	149				
Surr: Bromofluorobenzene (PID)	111.727		100.0		112	65	140				

Sample ID: **120329-110AMSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137672**
Client ID: **M24-1** Batch ID: **E11VS362** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2261597**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	31.632	5.0	22.15	0	143	69	264	30.52	3.57	20	
Ethylbenzene	52.111	5.0	42.30	0	123	37	161	49.40	5.33	20	
m,p-Xylene	180.915	10	180.2	0	100	30	149	171.8	5.17	20	
Methyl tert-butyl ether	342.891	5.0	578.9	0	59.2	39	121	310.4	9.94	20	
o-Xylene	69.062	5.0	64.80	0	107	31	166	65.41	5.43	20	
Toluene	162.343	5.0	172.6	0	94.0	44	150	155.9	4.03	20	
Xylenes, Total	249.977	15	245.0	0	102	30	149	237.2	5.24	20	
Surr: Bromofluorobenzene (PID)	112.005		100.0		112	65	140		0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111020LC4** SampType: **LCS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **LCSS** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262094**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	98.786	5.0	100.0	0	98.8	70	130				
Ethylbenzene	101.485	5.0	100.0	0	101	70	130				
m,p-Xylene	207.052	10	200.0	0	104	70	130				
Methyl tert-butyl ether	97.543	5.0	100.0	0	97.5	70	130				
o-Xylene	105.325	5.0	100.0	0	105	70	130				
Toluene	101.672	5.0	100.0	0	102	70	130				
Surr: Bromofluorobenzene (PID)	97.537		100.0		97.5	65	140				

Sample ID: **E111020LC4** SampType: **LCSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **LCSS02** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262095**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	100.897	5.0	100.0	0	101	70	130	98.79	2.11	20	
Ethylbenzene	102.848	5.0	100.0	0	103	70	130	101.5	1.33	20	
m,p-Xylene	209.652	10	200.0	0	105	70	130	207.1	1.25	20	
Methyl tert-butyl ether	98.496	5.0	100.0	0	98.5	70	130	97.54	0.972	20	
o-Xylene	107.143	5.0	100.0	0	107	70	130	105.3	1.71	20	
Toluene	103.574	5.0	100.0	0	104	70	130	101.7	1.85	20	
Surr: Bromofluorobenzene (PID)	98.091		100.0		98.1	65	140		0	0	

Sample ID: **E111020MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262096**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	36.322	5.0	22.15	0	164	69	264				
Ethylbenzene	58.083	5.0	42.30	0	137	37	161				
m,p-Xylene	200.873	10	180.2	0	111	30	149				
Methyl tert-butyl ether	407.178	5.0	578.9	0	70.3	39	121				
o-Xylene	76.408	5.0	64.80	0	118	31	166				
Toluene	184.188	5.0	172.6	0	107	44	150				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111020MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262096**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (PID)	106.117		100.0		106	65	140				

Sample ID: **E111020MB2MSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262097**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	35.966	5.0	22.15	0	162	69	264	36.32	0.985	20	
Ethylbenzene	57.388	5.0	42.30	0	136	37	161	58.08	1.20	20	
m,p-Xylene	198.098	10	180.2	0	110	30	149	200.9	1.39	20	
Methyl tert-butyl ether	428.253	5.0	578.9	0	74.0	39	121	407.2	5.05	20	
o-Xylene	75.297	5.0	64.80	0	116	31	166	76.41	1.46	20	
Toluene	181.918	5.0	172.6	0	105	44	150	184.2	1.24	20	
Surr: Bromofluorobenzene (PID)	103.883		100.0		104	65	140		0	20	

Sample ID: **E111020MB2** SampType: **MBLK** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **PBS** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/20/2011** SeqNo: **2262098**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	5.0									
Ethylbenzene	ND	5.0									
m,p-Xylene	ND	10									
Methyl tert-butyl ether	ND	5.0									
o-Xylene	ND	5.0									
Toluene	ND	5.0									
Surr: Bromofluorobenzene (PID)	92.879		100.0		92.9	65	140				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **120328-097AMS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/21/2011** SeqNo: **2262105**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	29.796	5.0	22.15	0	135	69	264				
Ethylbenzene	32.894	5.0	42.30	0	77.8	37	161				
m,p-Xylene	112.673	10	180.2	0	62.5	30	149				
Methyl tert-butyl ether	449.284	5.0	578.9	0	77.6	39	121				
o-Xylene	43.417	5.0	64.80	0	67.0	31	166				
Toluene	129.529	5.0	172.6	0	75.0	44	150				
Surr: Bromofluorobenzene (PID)	124.613		100.0		125	65	140				

Sample ID: **120328-097AMSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137704**
Client ID: **ZZZZZZ** Batch ID: **E11VS364** TestNo: **EPA 8021B** Analysis Date: **10/21/2011** SeqNo: **2262106**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	33.105	5.0	22.15	0	149	69	264	29.80	10.5	20	
Ethylbenzene	43.903	5.0	42.30	0	104	37	161	32.89	28.7	20	R
m,p-Xylene	150.662	10	180.2	0	83.6	30	149	112.7	28.9	20	R
Methyl tert-butyl ether	445.654	5.0	578.9	0	77.0	39	121	449.3	0.811	20	
o-Xylene	57.863	5.0	64.80	0	89.3	31	166	43.42	28.5	20	R
Toluene	153.826	5.0	172.6	0	89.1	44	150	129.5	17.1	20	
Surr: Bromofluorobenzene (PID)	121.244		100.0		121	65	140		0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CHAIN OF CUSTODY RECORD

1 OF 12

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt
1. CHILLED 5.3, 13.4, 12.2 Y ☒ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / Josh Ewert Date: 10/13/11 Time: 1500
Received by: (Signature and Printed Name) ONTRAC Date: 10/13/11 Time: 1500

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) FEDEX Date: 10/14/11 Time: 0900

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/11/11
Print Name Date
Signature

Send Report To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Bill To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

Q A / Q C
RTNE ☑ CT ☐
SWRCB Logcode _____
OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120329-1	NB1-0	10/10/11	0842									X		X		X					E	1	P, T	C	
	2	NB1-1		0843								X		X												
	3	NB1-2		0844											X											
	4	NB2-0		0852											X											
	5	NB2-1		0853											X											
	6	NB2-2		0854											X											
	7	NB3-0		0902								X	X													
	8	NB3-1		0903										X	X											
	9	NB3-2		0904											X											
	10	NB4-0		0913											X											

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives:
H=HCl N=HNO_3 S=H_2SO_4 C=4°C
Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name)	Date	Time	Received by: (Signature and Printed Name)	Date	Time
Mike O'Brien / Josh Ewert	10/13/11	1500	ONTRAC	10/13/11	1500
				10/14/11	0900

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/14/11 (Print Name / Date)
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA/QC: RTNE ☑ CT ☐ SWRCB ☐ Logcode_____ OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120329-11	NB4-1	10/10/11	0914											X		X					E	1	P T	C	
	12	NB4-2		0915									X													
	13	NB5-0		0922										X		X										
	14	NB5-1		0923											X	X										
	15	NB5-2		0924												X										
	16	NB6-0		0928												X										
	17	NB6-1		0929									X													
	18	NB6-2		0930												X										
	19	NB7-0		0934										X		X										
	20	NB7-1	↓	0935											X	X	↓					↓	↓	↓	↓	

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C $Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Address: 6671 Brisa Street
Tel: 925.371.5900
Attention: Rick Day
City: Livermore State: CA Zip Code: 94550
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name)	Date	Time	Received by: (Signature and Printed Name)	Date	Time
Mike O'Brien / Josh Ewert	10/13/11	1500	ONTRAC	10/13/11	1500
				10/14/11	0900

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/14/11
Print Name Date
Signature

Send Report To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Bill To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / 8020 (BTEX); 8015B (DRO); 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000); TPHd/TPHmo (8015); TPHg/BTEX/MTBE (8015/8021B); Lead (6010B)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER; CARBON

PRESERVATION

QA/QC: RTNE ☑ CT ☐ SWRCB Logcode _____ OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	TAT	Container(s) #	Container(s) Type	REMARKS
	120329-21	NB7-0 (DUP) 2	10/10/11	0936	E	1	P T	C
	22	NB8-0		0943				
	23	NB8-1		0944				
	24	NB8-2		0945				
	25	NB9-0		0950				
	26	NB9-1		0951				
	27	NB9-2		0952				
	28	NB10-0		0957				
	29	NB10-1		0958				
	30	NB10-2		0959				

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Address: 6671 Brisa Street
Tel: 925.371.5900
Attention: Rick Day
City: Livermore State: CA Zip Code: 94550
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Eweart (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien Josh Eweart Date: 10/13/11 Time: 1500
Received by: (Signature and Printed Name) GNTRAC Date: 10/13/11 Time: 1500
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: 10/14/11 Time: 0900
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Eweart 10/11/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA/QC
RTNE ☑
CT ☐
SWRCB ☐ Logcode_____
OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	REMARKS
	20374-31	NB11-0	10/10/11	1006								X		X			X					E	7	P T	C
	32	NB11-1		1007								X		X											
	33	NB11-2		1008										X											
	34	NB12-0		1014										X											
	35	NB12-1		1015										X											
	36	NB12-2		1016										X											
	37	NB13-0		1023								X		X											
	38	NB13-1		1024										X		X									
	39	NB13-2		1025												X									
	40	NB14-0		1031												X									

■ TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs B = Emergency Next Workday C = Critical 2 Workdays D = Urgent 3 Workdays E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives:
H=HCl N=HNO_3 S=H_2SO_4 C=4°C
Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / JOSH EWERT (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / JOSH EWERT Date: 10/13/11 Time: 1500
Received by: (Signature and Printed Name) GNTRAC Date: 10/13/11 Time: 1500

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: 10/14/11 Time: 0900

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: JOSH EWERT 10/11/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA / QC
RTNE ☑
CT ☐
SWRCB ☐ Logcode_____
OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120329-41	NB14-1	10/10/11	1032												X	X						E	1	P	T	C	
	42	NB14-2		1033									X															
	43	NB15-0		1158											X	X												
	44	NB15-1		1159											X	X												
	45	NB15-2 (FD)		1200												X												
	46	NB16-0		1207												X												
	47	NB16-1		1208									X															
	48	NB16-2 (FD)		1209												X												
	49	NB17-0		1213											X	X												
	50	NB17-1		1214												X	X											

■ TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs B = Emergency Next Workday C = Critical 2 Workdays D = Urgent 3 Workdays E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives:
H=HCl N=HNO_3 S=H_2SO_4 C=4°C
Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / JOSH EWERT (Signature)

Relinquished by: (Signature and Printed Name)	Date	Time	Received by: (Signature and Printed Name)	Date	Time
Mike O'Brien / JOSH EWERT	10/13/11	1500	ONTRAC	10/13/11	1500
				10/14/11	0900

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: JOSH EWERT 10/14/11
Print Name Date
Signature

Send Report To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Bill To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / 8020 (BTEX); 8015B (DRO); 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000); TPHd/TPHmo (8015); TPHg/BTEX/MTBE (8015/8021B); Lead (6010B)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER; CARBON

PRESERVATION

QA / QC: RTNE ☑ CT ☐ SWRCB ☐ Logcode_____ OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	TAT	Container(s) #	Type	REMARKS
	120329-J1	NB17-2	10/12/11	1215	E	1	P T	C
	J2	NB18-0		1221				
	J3	NB18-1		1222				
	J4	NB18-2		1223				
	J5	NB19-0		1227				
	J6	NB19-1		1229				
	J7	NB19-2		1229				
	J8	NB20-0		1234				
	J9	NB20-1		1235				
	J10	NB20-2		1236				

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / JOSH EWERT (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / JOSH EWERT Date: 10/13/11 Time: 1500
Received by: (Signature and Printed Name) ONTRAC Date: 10/13/11 Time: 1500
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: 10/14/11 Time: 0900
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: JOSH EWERT 10/11/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA/QC: RTNE ☑ CT ☐ SWRCB ☐ Logcode_____ OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120329-M9	M40-0	10/10/11	1256									X		X		X					E	7	P T	C	
	62	M40-1		1257										X	X											
	63	M40-2		1258											X											
	64	M39-0		1305											X											
	65	M39-1		1306								X														
	66	M39-2		1307											X											
	67	M38-0		1311									X		X											
	68	M38-1		1312										X	X											
	69	M38-2		1313											X											
	70	M37-0		1319											X											

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs B = Emergency Next Workday C = Critical 2 Workdays D = Urgent 3 Workdays E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C $Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / Josh Ewert	Date: 10/13/11	Time: 1540	Received by: (Signature and Printed Name) ONTRAC	Date: 10/13/11	Time: 1500
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date: 10/14/11	Time: 0900
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/11/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA/QC
RTNE ☑ CT ☐
SWRCB ☐ Logcode_____
OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120329-71	M37-1	10/10/11	1320										X			X					E	1	P	T	C	
	72	M37-2		1321									X														
	73	M36-0		1326									X	X													
	74	M36-1		1327											X	X											
	75	M36-2		1328												X											
	76	M35-0		1333												X											
	77	M35-1		1334												X											
	78	M35-2		1335												X											
	79	M34-0		1342									X			X											
	80	M34-1		1343											X	X											

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs B = Emergency Next Workday C = Critical 2 Workdays D = Urgent 3 Workdays E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives:
H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C
$Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt: 1. CHILLED Y ☐ N ☐ | 2. HEADSPACE (VOA) Y ☐ N ☐ | 3. CONTAINER INTACT Y ☐ N ☐ | 4. SEALED Y ☐ N ☐ | 5. # OF SPLS MATCH COC Y ☐ N ☐ | 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Mike O'Brien / Josh Ewert	10/12/11	1500	ONTRAC	10/13/11	1500
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
				10/14/11	0900
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/11/11
Print Name Date
Signature

Send Report To: Attn: _____ Co: SAME AS ABOVE Addr: _____ City: _____ State: _____ Zip: _____

Bill To: Attn: _____ Co: SAME AS ABOVE Addr: _____ City: _____ State: _____ Zip: _____

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides) | 8082 (PCB) | 8260B (Volatiles) | 8270C (BNA) | 6010B (Total Metal) | 8015B (GRO) / 8020 (BTEX) | 8015B (DRO) | 8021 (BTEX) | TITLE 22 / CAM 17 (6010 / 7000) | TPHd/TPHmo (8015) | TPHg/BTEX/MTBE (8015/8021B) | Lead (6010B)

SPECIFY APPROPRIATE MATRIX: SOIL | WATER | GROUND WATER | WASTEWATER | CARBON

PRESERVATION: QA/QC RTNE ☑ CT ☐ | SWRCB Logcode _____ ☐ | OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	TAT	Container(s) #	Container(s) Type	REMARKS
	12n 92q-4	M34-2	10/10/11	1344	E	1	P T	C
	81	M33-0		1349				
	83	M33-1		1350				
	84	M33-2		1351				
	85	M32-0		1357				
	86	M32-1		1358				
	87	~~M32-2~~ M32-2		1359				
	88	M31-0		1405				
	89	M31-1		1406				
	90	M31-2		1407				

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs | B = Emergency Next Workday | C = Critical 2 Workdays | D = Urgent 3 Workdays | E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C $Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / Josh Ewert	Date: 10/13/11	Time: 1500	Received by: (Signature and Printed Name) ONTRAC	Date: 10/13/11	Time: 1500
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date: 10/14/11	Time: 0900
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/14/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFY APPROPRIATE MATRIX

PRESERVATION

QA/QC
RTNE ☑ CT ☐
SWRCB ☐ Logcode_____
OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (BNA)	6010B (Total Metal)	8015B (GRO) / 8020 (BTEX)	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17 (6010 / 7000)	TPHd/TPHmo (8015)	TPHg/BTEX/MTBE (8015/8021B)	Lead (6010B)	SOIL	WATER	GROUND WATER	WASTEWATER	CARBON	TAT	Container(s) #	Container(s) Type	REMARKS
	120929-91	M30-0	10/10/11	1412									X		X		X					E	1	P T	C
	92	M30-1		1413										X	X										
	93	M30-2		1414											X										
	94	M29-0		1418											X										
	95	M29-1		1419											X										
	96	M29-2		1420								X													
	97	M28-0		1425								X	X												
	98	M28-1		1426										X	X										
	99	M28-2		1427											X										
	100	M27-0		1433											X										

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs B = Emergency Next Workday C = Critical 2 Workdays D = Urgent 3 Workdays E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives:
H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C
$Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt: 1. CHILLED Y ☐ N ☐ 2. HEADSPACE (VOA) Y ☐ N ☐ 3. CONTAINER INTACT Y ☐ N ☐ 4. SEALED Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name) Mike O'Brien / Josh Ewert Date: 10/13/11 Time: 1500
Received by: (Signature and Printed Name) ONSITE Date: 10/13/11 Time: 1500
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: 10/14/11 Time: 0900
Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/13/11
Print Name Date
Signature

Send Report To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Bill To:
Attn:
Co: SAME AS ABOVE
Addr:
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / 8020 (BTEX); 8015B (DRO); 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000); TPHd/TPHmo (8015); TPHg/BTEX/MTBE (8015/8021B); Lead (6010B)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER; CARBON

PRESERVATION

QA / QC: RTNE ☑ CT ☐ SWRCB Logcode _____ OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	TAT	Container(s): #	Type	REMARKS
	120329-101	M27-1	10/10/11	1433	E	1	P T	C
	102	M27-2		1434				
	103	M26-0		1442				
	104	M26-1		1443				
	105	M26-2		1444				
	106	M25-0		1450				
	107	M25-1		1451				
	108	M25-2		1452				
	109	M24-0		1456				
	110	M24-1		1457				

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl $N=HNO_3$ $S=H_2SO_4$ C=4°C $Z=Zn(AC)_2$ O=NaOH $T=Na_2S_2O_3$

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

FOR LABORATORY USE ONLY

P.O. #: _____
Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FedEx ☐ Other: _____

Sample Condition Upon Receipt:
1. CHILLED Y ☐ N ☐ 4. SEALED Y ☐ N ☐
2. HEADSPACE (VOA) Y ☐ N ☐ 5. # OF SPLS MATCH COC Y ☐ N ☐
3. CONTAINER INTACT Y ☐ N ☐ 6. PRESERVED Y ☐ N ☐

Client: GEOCON Consultants, Inc
Attention: Rick Day
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
Tel: 925.371.5900
Fax: 925.371.5915

Project Name: Marin-Sonoma Narrows A3
Project #: E8469-06-03
Sampler: (Printed Name) Mike O'Brien / Josh Ewert (Signature)

Relinquished by: (Signature and Printed Name)	Date	Time	Received by: (Signature and Printed Name)	Date	Time
Mike O'Brien / Josh Ewert	10/13/11	1500	ONTRAC	10/13/11	1500
				10/14/11	0900

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: Josh Ewert 10/11/11
Print Name Date
Signature

Send Report To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Bill To:
Attn: _____
Co: SAME AS ABOVE
Addr: _____
City: State: Zip:

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample :$2.00 / sample /mo (after 45 days)
- Records: $1 /ATL workorder /mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / 8020 (BTEX); 8015B (DRO); 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000); TPHd/TPHmo (8015); TPHg/BTEX/MTBE (8015/8021B); Lead (6010B)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER; CARBON

PRESERVATION

Q A / Q C: RTNE ☑ CT ☐; SWRCB ☐ Logcode_____; OTHER _____

ITEM	LAB USE ONLY: Lab No.	Sample Description: Sample ID / Location	Date	Time	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	[20]379-11	M24-2	10/10/11	1458	E	1	P T	C	
	112	M23-0		1500					
	113	M23-1		1501					
	114	M23-2		1502					
	115	M22-0		1504					
	116	M22-1		1505					
	117	M22-2		1506					
	118	M21-0		1509					
	119	M21-1		1510					
	120	M21-2		1511					

- TAT starts 8AM the following day if samples received after 3 PM

TAT: A = Overnight ≤ 24 hrs; B = Emergency Next Workday; C = Critical 2 Workdays; D = Urgent 3 Workdays; E = Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

Diane Galvan

From: Rebecca Silva [silva@geoconinc.com]
Sent: Thursday, October 13, 2011 2:02 PM
To: Diane Galvan
Subject: Marin-Sonoma Narrows A3

Hi Diane -

For the samples you will receive tomorrow morning for the Marin-Sonoma Narrows **A3** project (E8469-06-03), please also analyze the following 3 samples for CrVI on standard TAT.

Thanks!
Rebecca

NB6-1
NB19-2
M28-0

Rebecca Silva | *Senior Project Scientist*
Geocon Consultants, Inc.
3160 Gold Valley Drive Suite 800, Rancho Cordova, CA 95742
Tel 916.852.9118 Fax 916.852.9132 Cell 916.508.1910
www.geoconinc.com

November 11, 2011

Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120329

RE: Marin-Sonoma Narrows A3, E8469-06-03

Attention: Rick Day

Enclosed are the results for sample(s) received on October 14, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

This is an addendum report. Please incorporate with documentation previously submitted.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

CLIENT: Geocon Consultants, Inc.
Project: Marin-Sonoma Narrows A3, E8469-06-03
Lab Order: 120329

CASE NARRATIVE

Analytical Comments for WET / EPA 6010B

Dilution was necessary for samples 120329-002A, 120329-012A, 120329-027A, 120329-032A, and 120329-096A due to sample matrix.

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for sample 120597-008A-MS; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB1-1
Lab Order:	120329	**Collection Date:**	10/10/2011 8:43:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-002A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 02:53 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB4-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:15:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-012A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 02:57 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB9-2
Lab Order:	120329	**Collection Date:**	10/10/2011 9:52:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-027A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 03:00 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB11-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:07:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-032A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 03:03 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB11-2
Lab Order:	120329	**Collection Date:**	10/10/2011 10:08:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-033A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	8.9	1.0		mg/L	2	11/7/2011 12:49 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB14-1
Lab Order:	120329	**Collection Date:**	10/10/2011 10:32:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-041A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	9.8	1.0		mg/L	2	11/7/2011 12:50 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB15-0
Lab Order:	120329	**Collection Date:**	10/10/2011 11:58:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-043A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	ND	0.50		mg/L	1	11/7/2011 12:51 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB15-1
Lab Order:	120329	**Collection Date:**	10/10/2011 11:59:00 AM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-044A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	3.4	0.50		mg/L	1	11/7/2011 12:51 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	NB19-1
Lab Order:	120329	**Collection Date:**	10/10/2011 12:28:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-056A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	35	2.5		mg/L	5	11/7/2011 12:52 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M40-0
Lab Order:	120329	**Collection Date:**	10/10/2011 12:56:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-061A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	5.5	0.50		mg/L	1	11/7/2011 12:52 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M39-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:05:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-064A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	5.2	0.50		mg/L	1	11/7/2011 12:53 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M38-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:11:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-067A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	2.5	0.50		mg/L	1	11/7/2011 12:53 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M37-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:19:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-070A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	3.4	0.50		mg/L	1	11/7/2011 12:54 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M37-2
Lab Order:	120329	**Collection Date:**	10/10/2011 1:21:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-072A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
			WET/ EPA 6010B			
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 03:07 PM
Nickel	5.5	1.0		mg/L	20	11/7/2011 03:07 PM
HEXAVALENT CHROMIUM, DISSOLVED						
			EPA 7196A			
RunID: WETCHEM3_111107B	QC Batch: 76814			PrepDate:	11/9/2011	Analyst: **AAG**
Chromium, Hexavalent	ND	0.10		mg/Kg	1	11/7/2011

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M36-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:26:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-073A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	0.54	0.50		mg/L	1	11/7/2011 12:55 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M35-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:33:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-076A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	1.2	0.50		mg/L	1	11/7/2011 12:55 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M34-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:42:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-079A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	2.0	0.50		mg/L	1	11/7/2011 12:55 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M33-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:49:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-082A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	19	2.0		mg/L	4	11/7/2011 12:56 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M32-0
Lab Order:	120329	**Collection Date:**	10/10/2011 1:57:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-085A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	29	2.5		mg/L	5	11/7/2011 12:57 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M31-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:05:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-088A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	9.8	1.0		mg/L	2	11/7/2011 12:58 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M31-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:07:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-090A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate:	11/3/2011	Analyst: **VV**
Lead	1.1	0.50		mg/L	1	11/7/2011 12:58 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M30-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:12:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-091A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	13	1.0		mg/L	2	11/7/2011 01:00 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M29-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:18:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-094A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	8.5	0.50		mg/L	1	11/7/2011 01:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M29-2
Lab Order:	120329	**Collection Date:**	10/10/2011 2:20:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-096A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111107B	QC Batch: R138197			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/7/2011 03:10 PM

Qualifiers:				
	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M27-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:33:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-100A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	7.0	0.50		mg/L	1	11/7/2011 01:06 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M26-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:42:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-103A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107B	QC Batch: 76702			PrepDate: 11/3/2011		Analyst: **VV**
Lead	22	2.0		mg/L	4	11/7/2011 01:12 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M23-0
Lab Order:	120329	**Collection Date:**	10/10/2011 3:00:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-112A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107B	QC Batch: 76702			PrepDate:	11/3/2011	Analyst: **VV**
Lead	7.9	0.50		mg/L	1	11/7/2011 01:12 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M22-0
Lab Order:	120329	**Collection Date:**	10/10/2011 3:04:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-115A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107B	QC Batch: 76702			PrepDate:	11/3/2011	Analyst: **VV**
Lead	2.6	0.50		mg/L	1	11/7/2011 01:13 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M21-0
Lab Order:	120329	**Collection Date:**	10/10/2011 3:09:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-118A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107B	QC Batch: 76702			PrepDate:	11/3/2011	Analyst: **VV**
Lead	2.1	0.50		mg/L	1	11/7/2011 01:13 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_ST

Sample ID: **MB-76756A** SampType: **MBLK** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **PBS** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271885**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	0.003	1.0									
Nickel	0.045	1.0									

Sample ID: **LCS-76756A** SampType: **LCS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **LCSS** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271886**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.151	1.0	2.000	0.003399	107	85	115				
Nickel	2.292	1.0	2.000	0.04489	112	85	115				

Sample ID: **120597-008A-MS** SampType: **MS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **ZZZZZZ** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271891**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.744	1.0	2.500	0.09264	106	74	103				S
Nickel	2.680	1.0	2.500	0.1676	101	71	105				

Sample ID: **MB-76756B** SampType: **MBLK** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **PBS** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271897**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	ND	1.0									
Nickel	0.039	1.0									

Sample ID: **120583-004A-MS** SampType: **MS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **ZZZZZZ** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271903**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_ST

Sample ID: **120583-004A-MS** SampType: **MS** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **ZZZZZZ** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271903**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	3.058	1.0	2.500	0.4947	103	74	103				
Nickel	2.936	1.0	2.500	0.3859	102	71	105				

Sample ID: **120583-004A-MSD** SampType: **MSD** TestCode: **6010_ST** Units: **mg/L** Prep Date: RunNo: **138197**
Client ID: **ZZZZZZ** Batch ID: **R138197** TestNo: **WET/ EPA 60** Analysis Date: **11/7/2011** SeqNo: **2271904**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	3.039	1.0	2.500	0.4947	102	74	103	3.058	0.625	20	
Nickel	2.913	1.0	2.500	0.3859	101	71	105	2.936	0.760	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7196_S

Sample ID: **120329-072A-MS**	SampType: **MS**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **11/9/2011**	RunNo: **138233**
Client ID: **M37-2**	Batch ID: **76814**	TestNo: **EPA 7196A**		Analysis Date: **11/7/2011**	SeqNo: **2272473**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	4.600	0.10	5.000	0	92.0	85	115				

Sample ID: **120329-072A-MSD**	SampType: **MSD**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **11/9/2011**	RunNo: **138233**
Client ID: **M37-2**	Batch ID: **76814**	TestNo: **EPA 7196A**		Analysis Date: **11/7/2011**	SeqNo: **2272474**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	4.630	0.10	5.000	0	92.6	85	115	4.600	0.650	20	

Sample ID: **LCS-76814**	SampType: **LCS**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **11/9/2011**	RunNo: **138233**
Client ID: **LCSS**	Batch ID: **76814**	TestNo: **EPA 7196A**		Analysis Date: **11/7/2011**	SeqNo: **2272475**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	4.410	0.10	5.000	0	88.2	85	115				

Sample ID: **MB-76814**	SampType: **MBLK**	TestCode: **7196_S**	Units: **mg/Kg**	Prep Date: **11/9/2011**	RunNo: **138233**
Client ID: **PBS**	Batch ID: **76814**	TestNo: **EPA 7196A**		Analysis Date: **11/7/2011**	SeqNo: **2272476**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.10									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-76701A**	SampType: **MBLK**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **PBS**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271800**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.114	0.50									

Sample ID: **LCS-76701**	SampType: **LCS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **LCSS**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271801**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.898	0.50	5.000	0.1142	95.7	80	120				

Sample ID: **120329-100A-MS**	SampType: **MS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **M27-0**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271822**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	12.462	1.0	5.000	7.002	109	80	120				

Sample ID: **120329-100A-MSD**	SampType: **MSD**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **M27-0**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271823**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	12.038	1.0	5.000	7.002	101	80	120	12.46	3.47	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-76702A**	SampType: **MBLK**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138191**
Client ID: **PBS**	Batch ID: **76702**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271824**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.163	0.50									

Sample ID: **LCS-76702**	SampType: **LCS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138191**
Client ID: **LCSS**	Batch ID: **76702**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271825**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	5.278	0.50	5.000	0.1630	102	80	120				

Sample ID: **120329-118A-MS**	SampType: **MS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138191**
Client ID: **M21-0**	Batch ID: **76702**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271830**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.215	0.50	5.000	2.061	103	80	120				

Sample ID: **120329-118A-MSD**	SampType: **MSD**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138191**
Client ID: **M21-0**	Batch ID: **76702**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271831**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	7.437	0.50	5.000	2.061	108	80	120	7.215	3.03	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Diane Galvan

From: Luann Beadle [beadle@geoconinc.com]
Sent: Tuesday, November 01, 2011 3:45 PM
To: Diane Galvan
Subject: RE: E8469-06-03 MSN A3

Hi again,
One of the samples came back with Total Chromium at 700 mg/kg. If the sample is still within the hold time, could you please run it for Hexavalent Chromium? It's our number M37-2. We'll ask for several WET chromium analyses here too shortly, but I'm still going over the data.
Thanks,
Luann

From: Luann Beadle [mailto:beadle@geoconinc.com]
Sent: Tuesday, November 01, 2011 3:19 PM
To: Diane Galvan
Subject: E8469-06-03 MSN A3

Hello Diane,

Please run WET lead analysis on the following samples associated with Work Order Number 120329 that contained Total Lead ≥ 50mg/kg:

M21-0
M31-2
M23-0
M30-0
NB15-1
M36-0
M38-0
M35-0
NB14-1
M28-0
M31-0
M22-0
M37-0
M29-0
M27-0
NB15-0
NB11-2
M39-0
M32-0
M40-0
M33-0
M26-0
M34-0
NB19-1

Regular TAT,

Thanks,

Luann

Luann Beadle | *Senior Staff Scientist*
Geocon Consultants, Inc.
6671 Brisa Street, Livermore, California 94550
Tel 925.371.5900 Fax 925.371.5915
www.geoconinc.com

Diane Galvan

From: Luann Beadle [beadle@geoconinc.com]
Sent: Tuesday, November 01, 2011 5:05 PM
To: Diane Galvan
Subject: E8469-06-03 MSN A3 (Lab Order 120329)

Hello Again,

Please run WET Chromium on all of the samples with ≥ 50 mg/kg Total Chromium (I counted 6). Also, please run WET Nickel on M37-2.

Regular TAT. Thank you,

Luann

Luann Beadle | *Senior Staff Scientist*
Geocon Consultants, Inc.
6671 Brisa Street, Livermore, California 94550
Tel 925.371.5900 Fax 925.371.5915
www.geoconinc.com

November 15, 2011

Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120329

RE: Marin-Sonoma Narrows A3, E8469-06-03

Attention: Rick Day

Enclosed are the results for sample(s) received on October 14, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

This is an addendum report. Please incorporate with documentation previously submitted.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	M28-0
Lab Order:	120329	**Collection Date:**	10/10/2011 2:25:00 PM
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120329-097A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
LEAD BY ATOMIC ABSORPTION (STLC)						
WET				**WET/ EPA 7420**		
RunID: AA2_111107A	QC Batch: 76701			PrepDate: 11/3/2011		Analyst: **VV**
Lead	5.6	0.50		mg/L	1	11/7/2011 01:06 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-76701A**	SampType: **MBLK**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **PBS**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271800**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.114	0.50									

Sample ID: **LCS-76701**	SampType: **LCS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **LCSS**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271801**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.898	0.50	5.000	0.1142	95.7	80	120				

Sample ID: **120329-100A-MS**	SampType: **MS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **M27-0**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271822**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	12.462	1.0	5.000	7.002	109	80	120				

Sample ID: **120329-100A-MSD**	SampType: **MSD**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/3/2011**	RunNo: **138190**
Client ID: **M27-0**	Batch ID: **76701**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/7/2011**	SeqNo: **2271823**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	12.038	1.0	5.000	7.002	101	80	120	12.46	3.47	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Rachelle Arada

From: Luann Beadle [beadle@geoconinc.com]
Sent: Monday, November 14, 2011 6:18 PM
To: Rachelle Arada
Cc: day@geoconinc.com
Subject: RE: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Hi Rachelle,
Did M28-0 get run for WET lead? It was ordered, but I don't see it.
Thanks,
L

From: Rachelle Arada [mailto:rachelle@atlglobal.com]
Sent: Monday, November 14, 2011 4:59 PM
To: beadle@geoconinc.com
Cc: Rick Day
Subject: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Hi Luann,

Enclosed are the results for the above project.

Thanks,

Rachelle Arada
Project Manager

Advanced Technology Laboratories
www.atlglobal.com
Tel: (562) 989-4045 ext. 237
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Nevada and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

This message is intended for the use of the individual or entity to which it is addressed. This may contain information that is privileged, confidential, and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone and delete the original message. Thank you.

November 22, 2011

Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120329

RE: Marin-Sonoma Narrows A3, E8469-06-03

Attention: Rick Day

Enclosed are the results for sample(s) received on October 14, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

This is an addendum report. Please incorporate with documentation previously submitted.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

CLIENT: Geocon Consultants, Inc.
Project: Marin-Sonoma Narrows A3, E8469-06-03
Lab Order: 120329

CASE NARRATIVE

Analytical Comments for Method 7420

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for sample 120329-100AMS; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

Advanced Technology Laboratories

Date: 11/22/2011

ANALYTICAL RESULTS

LEAD BY ATOMIC ABSORPTION (STLC)
WET/ EPA 7420

CLIENT:	Geocon Consultants, Inc.	**Lab Order:**	120329
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Date Received:**	10/14/2011 6:06:08 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	VV

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
120329-043A	NB15-0	1.0	mg/L	76885	0.50	1	10/10/2011	11/21/2011

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

Advanced Technology Laboratories

Date: 11/22/2011

ANALYTICAL RESULTS

LEAD BY ATOMIC ABSORPTION
WET DI/ EPA 7420

CLIENT:	Geocon Consultants, Inc.	**Lab Order:**	120329
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Date Received:**	10/14/2011 6:06:08 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	VV

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
120329-033A	NB11-2	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-041A	NB14-1	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-043A	NB15-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-056A	NB19-1	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-061A	M40-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-064A	M39-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-082A	M33-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-085A	M32-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-088A	M31-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-091A	M30-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-094A	M29-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-097A	M28-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-100A	M27-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-103A	M26-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011
120329-112A	M23-0	ND	mg/L	76883	0.50	1	10/10/2011	11/21/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

Date: 11/22/2011

ANALYTICAL RESULTS

LEAD BY ATOMIC ABSORPTION (TCLP)
EPA 1311/ 7420

CLIENT:	Geocon Consultants, Inc.	**Lab Order:**	120329
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Date Received:**	10/14/2011 6:06:08 PM
Project No:		**Matrix:**	Soil
Analyte:	Lead	**Analyst:**	VV

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
120329-033A	NB11-2	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-043A	NB15-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-056A	NB19-1	0.54	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-061A	M40-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-064A	M39-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-082A	M33-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-085A	M32-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-088A	M31-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-094A	M29-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-100A	M27-0	ND	mg/L	76890	0.50	1	10/10/2011	11/21/2011
120329-103A	M26-0	0.80	mg/L	76890	0.50	1	10/10/2011	11/21/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

Advanced Technology Laboratories

Date: 11/22/2011

ANALYTICAL RESULTS

pH
EPA 9045C

CLIENT:	Geocon Consultants, Inc.	**Lab Order:**	120329
Project:	Marin-Sonoma Narrows A3, E8469-06-03	**Date Received**	10/14/2011 6:06:08 PM
Project No:		**Matrix:**	Soil
Analyte:	pH	**Analyst:**	PT

Laboratory ID	Client Sample ID	Results	Units	QC Batch	PQL	DF	Date Collected	Date Analyzed
120329-033A	NB11-2	7.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-041A	NB14-1	8.2	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-043A	NB15-0	8.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-056A	NB19-1	8.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-061A	M40-0	6.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-064A	M39-0	6.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-082A	M33-0	6.7	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-085A	M32-0	5.9	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-088A	M31-0	6.6	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-091A	M30-0	7.5	pH Units	R138358	0.10	1	10/10/2011	11/21/2011
120329-094A	M29-0	7.1	pH Units	R138359	0.10	1	10/10/2011	11/21/2011
120329-097A	M28-0	7.1	pH Units	R138359	0.10	1	10/10/2011	11/21/2011
120329-100A	M27-0	6.9	pH Units	R138359	0.10	1	10/10/2011	11/21/2011
120329-103A	M26-0	6.8	pH Units	R138359	0.10	1	10/10/2011	11/21/2011
120329-112A	M23-0	6.8	pH Units	R138359	0.10	1	10/10/2011	11/21/2011

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_DI

Sample ID: **MB-76883A** SampType: **MBLK** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **PBS** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274073**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Sample ID: **LCS-76883** SampType: **LCS** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **LCSS** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274074**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.825	0.50	5.000	0	96.5	80	120				

Sample ID: **120329-091A-MS** SampType: **MS** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **M30-0** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274086**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.956	0.50	5.000	0	99.1	70	130				

Sample ID: **MB-76883B** SampType: **MBLK** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **PBS** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274087**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Sample ID: **120329-112A-MS** SampType: **MS** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **M23-0** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274094**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.919	0.50	5.000	0	98.4	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_DI

Sample ID: **120329-112A-MSD** SampType: **MSD** TestCode: **7420_DI** Units: **mg/L** Prep Date: **11/19/2011** RunNo: **138363**
Client ID: **M23-0** Batch ID: **76883** TestNo: **WET DI/ EPA WET** Analysis Date: **11/21/2011** SeqNo: **2274095**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.933	0.50	5.000	0	98.7	70	130	4.919	0.270	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_ST

Sample ID: **MB-76885A**	SampType: **MBLK**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/19/2011**	RunNo: **138365**
Client ID: **PBS**	Batch ID: **76885**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/21/2011**	SeqNo: **2274117**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.122	0.50									

Sample ID: **LCS-76885**	SampType: **LCS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/19/2011**	RunNo: **138365**
Client ID: **LCSS**	Batch ID: **76885**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/21/2011**	SeqNo: **2274118**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	4.924	0.50	5.000	0.1215	96.0	80	120				

Sample ID: **120329-112A-MS**	SampType: **MS**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/19/2011**	RunNo: **138365**
Client ID: **M23-0**	Batch ID: **76885**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/21/2011**	SeqNo: **2274125**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	8.083	0.50	5.000	2.911	103	80	120				

Sample ID: **120329-112A-MSD**	SampType: **MSD**	TestCode: **7420_ST**	Units: **mg/L**	Prep Date: **11/19/2011**	RunNo: **138365**
Client ID: **M23-0**	Batch ID: **76885**	TestNo: **WET/ EPA 74**	**WET**	Analysis Date: **11/21/2011**	SeqNo: **2274126**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	8.023	0.50	5.000	2.911	102	80	120	8.083	0.740	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **MB-76890A**	SampType: **MBLK**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **PBS**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274139**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Sample ID: **MB-76887A TCLP**	SampType: **MBLK**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **PBS**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274140**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Sample ID: **LCS-76890**	SampType: **LCS**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **LCSS**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274141**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	1.059	0.50	1.000	0	106	80	120				

Sample ID: **120329-100A-MS**	SampType: **MS**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **M27-0**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274153**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.528	0.50	2.500	0	141	70	130				S

Sample ID: **MB-76890B**	SampType: **MBLK**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **PBS**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274154**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7420_TC

Sample ID: **MB-76887B TCLP**	SampType: **MBLK**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **PBS**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274155**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	0.50									

Sample ID: **120329-103A-MS**	SampType: **MS**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **M26-0**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274158**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.704	0.50	2.500	0.8028	116	70	130				

Sample ID: **120329-103A-MSD**	SampType: **MSD**	TestCode: **7420_TC**	Units: **mg/L**	Prep Date: **11/21/2011**	RunNo: **138367**
Client ID: **M26-0**	Batch ID: **76890**	TestNo: **EPA 1311/ 74**	**EPA3010A**	Analysis Date: **11/21/2011**	SeqNo: **2274159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	3.667	0.50	2.500	0.8028	115	70	130	3.704	0.991	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **120329-056ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **138358**
Client ID: **NB19-1** Batch ID: **R138358** TestNo: **EPA 9045C** Analysis Date: **11/21/2011** SeqNo: **2274060**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.610	0.10						8.580	0.349	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120329
Project: Marin-Sonoma Narrows A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 9045_S

Sample ID: **120329-103ADUP** SampType: **DUP** TestCode: **9045_S** Units: **pH Units** Prep Date: RunNo: **138359**
Client ID: **M26-0** Batch ID: **R138359** TestNo: **EPA 9045C** Analysis Date: **11/21/2011** SeqNo: **2274071**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	6.720	0.10						6.790	1.04	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Rachelle Arada

From: Rick Day [day@geoconinc.com]
Sent: Wednesday, November 16, 2011 11:57 AM
To: Rachelle Arada; 'Luann Beadle'
Cc: Diane Galvan
Subject: RE: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Please also run pH on those sample being analyzed for DI-WET lead.

Richard Day, CEG, CHG | *Senior Geologist / Vice President*
Geocon Consultants, Inc.
6671 Brisa Street, Livermore, California 94550
Tel 925.371.5900 Fax 925.371.5915 Cell 925.872.5860
www.geoconinc.com

From: Rick Day [mailto:day@geoconinc.com]
Sent: Tuesday, November 15, 2011 5:28 PM
To: 'Rachelle Arada'; 'Luann Beadle'
Cc: Diane Galvan
Subject: RE: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Hi Rachelle –

1) Please re-run sample NB15-0 for WET Lead – previous ND for WET does not make sense as the total lead was reported at 140 mg/kg.

2) Please run the following samples for DI-WET Lead:

NB11-2
NB14-1
NB15-0
NB19-1
M23-0
M26-0
M27-0
M28-0
M29-0
M30-0
M31-0
M32-0
M33-0
M39-0
M40-0

3) Please run the following samples for TCLP Lead:

NB11-2
NB15-0
NB19-1
M26-0
M27-0
M29-0
M31-0
M32-0
M33-0
M39-0
M40-0

Need to have final results by COB next Monday, November 21.

Thanks,
Rick.

Richard Day, CEG, CHG | *Senior Geologist / Vice President*
Geocon Consultants, Inc.
6671 Brisa Street, Livermore, California 94550
Tel 925.371.5900 Fax 925.371.5915 Cell 925.872.5860
www.geoconinc.com

From: Rachelle Arada [mailto:rachelle@atlglobal.com]
Sent: Tuesday, November 15, 2011 10:50 AM
To: Luann Beadle
Cc: day@geoconinc.com
Subject: RE: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Please see attached.

From: Luann Beadle [mailto:beadle@geoconinc.com]
Sent: Monday, November 14, 2011 6:18 PM
To: Rachelle Arada
Cc: day@geoconinc.com
Subject: RE: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Hi Rachelle,
Did M28-0 get run for WET lead? It was ordered, but I don't see it.
Thanks,
L

From: Rachelle Arada [mailto:rachelle@atlglobal.com]
Sent: Monday, November 14, 2011 4:59 PM
To: beadle@geoconinc.com
Cc: Rick Day
Subject: Addendum report for Marin-Sonoma Narrows A3, E8469-06-03 (120329)

Hi Luann,

Enclosed are the results for the above project.

Thanks,

Rachelle Arada
Project Manager

Advanced Technology Laboratories
www.atlglobal.com
Tel: (562) 989-4045 ext. 237
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Nevada and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

This message is intended for the use of the individual or entity to which it is addressed. This may contain information that is privileged, confidential, and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone and delete the original message. Thank you.

November 07, 2011

Luann Beadle
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120415

RE: M&N - 193, E8469-06-03

Attention: Luann Beadle

Enclosed are the results for sample(s) received on October 20, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

CLIENT: Geocon Consultants, Inc.
Project: M&N - 193, E8469-06-03
Lab Order: 120415

CASE NARRATIVE

Analytical Comments for Method 6010

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 120415-002A-MSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8015 (DRO)

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 120381-048A-MSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8015 (GRO)

RPD for Matrix Spike (MS)/Matrix Spike Duplicate (MSD) is outside criteria for sample 120361-012A-MSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Analytical Comments for Method 8021

Sample 120415-006B was analyzed passed hold time due to instrument problems.

Matrix Spike (MS) and /or Matrix Spike Duplicate (MSD) are/is outside recovery criteria for samples 120467-001A-MS and 120467-001A-MSD; however, the analytical batch was validated by the Laboratory Control Sample (LCS).

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-001A

Client Sample ID: GB1-1
Collection Date: 10/19/2011 10:29:00 AM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111027F	QC Batch: 76519			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/27/2011 09:55 PM
Arsenic	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Barium	280	1.0		mg/Kg	1	10/27/2011 09:55 PM
Beryllium	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Cadmium	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Chromium	71	1.0		mg/Kg	1	10/27/2011 09:55 PM
Cobalt	19	1.0		mg/Kg	1	10/27/2011 09:55 PM
Copper	60	2.0		mg/Kg	1	10/27/2011 09:55 PM
Lead	8.8	1.0		mg/Kg	1	10/27/2011 09:55 PM
Molybdenum	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Nickel	75	1.0		mg/Kg	1	10/27/2011 09:55 PM
Selenium	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Silver	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Thallium	ND	1.0		mg/Kg	1	10/27/2011 09:55 PM
Vanadium	31	1.0		mg/Kg	1	10/27/2011 09:55 PM
Zinc	63	1.0		mg/Kg	1	10/27/2011 09:55 PM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111026A	QC Batch: 76475			PrepDate: 10/25/2011		Analyst: **CBR**
DRO	11	1.0		mg/Kg	1	10/26/2011 01:32 PM
ORO	32	1.0		mg/Kg	1	10/26/2011 01:32 PM
Surr: p-Terphenyl	78.1	39-123		%REC	1	10/26/2011 01:32 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7471A		
RunID: AA5_111027C	QC Batch: 76526			PrepDate: 10/27/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/27/2011 03:04 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1-3
Lab Order:	120415	**Collection Date:**	10/19/2011 10:34:00 AM
Project:	M&N - 193, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120415-002A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B				**EPA 6010B**		
RunID: ICP8_111027A	QC Batch: 76520			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/27/2011 11:28 AM
Arsenic	4.4	1.0		mg/Kg	1	10/27/2011 11:28 AM
Barium	75	1.0		mg/Kg	1	10/27/2011 11:28 AM
Beryllium	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Cadmium	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Chromium	50	1.0		mg/Kg	1	10/27/2011 11:28 AM
Cobalt	11	1.0		mg/Kg	1	10/27/2011 11:28 AM
Copper	17	2.0		mg/Kg	1	10/27/2011 11:28 AM
Lead	7.0	1.0		mg/Kg	1	10/27/2011 11:28 AM
Molybdenum	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Nickel	58	1.0		mg/Kg	1	10/27/2011 11:28 AM
Selenium	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Silver	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Thallium	ND	1.0		mg/Kg	1	10/27/2011 11:28 AM
Vanadium	17	1.0		mg/Kg	1	10/27/2011 11:28 AM
Zinc	41	1.0		mg/Kg	1	10/27/2011 11:28 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B				**EPA 8015B(M)**		
RunID: GC16_111026C	QC Batch: 76512			PrepDate: 10/26/2011		Analyst: **CBR**
DRO	14	1.0		mg/Kg	1	10/26/2011 06:34 PM
ORO	14	1.0		mg/Kg	1	10/26/2011 06:34 PM
Surr: p-Terphenyl	60.1	39-123		%REC	1	10/26/2011 06:34 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/26/2011 06:28 AM
Surr: Bromofluorobenzene (FID)	117	69-158		%REC	1	10/26/2011 06:28 AM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/26/2011 06:28 AM
Ethylbenzene	ND	5.0		µg/Kg	1	10/26/2011 06:28 AM
m,p-Xylene	ND	10		µg/Kg	1	10/26/2011 06:28 AM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-002A

Client Sample ID: GB1-3
Collection Date: 10/19/2011 10:34:00 AM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
VOLATILE ORGANIC COMPOUNDS BY GC/PID				**EPA 8021B**		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/26/2011 06:28 AM
o-Xylene	ND	5.0		µg/Kg	1	10/26/2011 06:28 AM
Toluene	ND	5.0		µg/Kg	1	10/26/2011 06:28 AM
Surr: Bromofluorobenzene (PID)	118	65-140		%REC	1	10/26/2011 06:28 AM
MERCURY BY COLD VAPOR TECHNIQUE				**EPA 7471A**		
RunID: AA5_111027A	QC Batch: 76527			PrepDate: 10/27/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/27/2011 12:52 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1-5
Lab Order:	120415	**Collection Date:**	10/19/2011 10:39:00 AM
Project:	M&N - 193, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120415-003A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111027A	QC Batch: 76520			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/27/2011 11:46 AM
Arsenic	10	1.0		mg/Kg	1	10/27/2011 11:46 AM
Barium	110	1.0		mg/Kg	1	10/27/2011 11:46 AM
Beryllium	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Cadmium	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Chromium	57	1.0		mg/Kg	1	10/27/2011 11:46 AM
Cobalt	18	1.0		mg/Kg	1	10/27/2011 11:46 AM
Copper	26	2.0		mg/Kg	1	10/27/2011 11:46 AM
Lead	11	1.0		mg/Kg	1	10/27/2011 11:46 AM
Molybdenum	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Nickel	69	1.0		mg/Kg	1	10/27/2011 11:46 AM
Selenium	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Silver	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Thallium	ND	1.0		mg/Kg	1	10/27/2011 11:46 AM
Vanadium	20	1.0		mg/Kg	1	10/27/2011 11:46 AM
Zinc	52	1.0		mg/Kg	1	10/27/2011 11:46 AM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/26/2011 06:44 AM
Surr: Bromofluorobenzene (FID)	113	69-158		%REC	1	10/26/2011 06:44 AM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/26/2011 06:44 AM
Ethylbenzene	ND	5.0		µg/Kg	1	10/26/2011 06:44 AM
m,p-Xylene	ND	10		µg/Kg	1	10/26/2011 06:44 AM
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/26/2011 06:44 AM
o-Xylene	ND	5.0		µg/Kg	1	10/26/2011 06:44 AM
Toluene	ND	5.0		µg/Kg	1	10/26/2011 06:44 AM
Surr: Bromofluorobenzene (PID)	113	65-140		%REC	1	10/26/2011 06:44 AM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1-5
Lab Order:	120415	**Collection Date:**	10/19/2011 10:39:00 AM
Project:	M&N - 193, E8469-06-03	**Matrix:**	SOIL
Lab ID:	120415-003A		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
MERCURY BY COLD VAPOR TECHNIQUE						
		EPA 7471A				
RunID: AA5_111027A	QC Batch: 76527			PrepDate: 10/27/2011		Analyst: **VV**
Mercury	0.13	0.10		mg/Kg	1	10/27/2011 12:54 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-004A

Client Sample ID: GB1A-4
Collection Date: 10/19/2011 11:27:00 AM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3050B			**EPA 6010B**		
RunID: ICP8_111027A	QC Batch: 76520			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/27/2011 11:49 AM
Arsenic	3.1	1.0		mg/Kg	1	10/27/2011 11:49 AM
Barium	42	1.0		mg/Kg	1	10/27/2011 11:49 AM
Beryllium	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Cadmium	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Chromium	46	1.0		mg/Kg	1	10/27/2011 11:49 AM
Cobalt	5.7	1.0		mg/Kg	1	10/27/2011 11:49 AM
Copper	18	2.0		mg/Kg	1	10/27/2011 11:49 AM
Lead	28	1.0		mg/Kg	1	10/27/2011 11:49 AM
Molybdenum	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Nickel	55	1.0		mg/Kg	1	10/27/2011 11:49 AM
Selenium	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Silver	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Thallium	ND	1.0		mg/Kg	1	10/27/2011 11:49 AM
Vanadium	33	1.0		mg/Kg	1	10/27/2011 11:49 AM
Zinc	40	1.0		mg/Kg	1	10/27/2011 11:49 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
	EPA 3550B			**EPA 8015B(M)**		
RunID: GC16_111026C	QC Batch: 76512			PrepDate: 10/26/2011		Analyst: **CBR**
DRO	2.4	1.0		mg/Kg	1	10/26/2011 07:54 PM
ORO	8.0	1.0		mg/Kg	1	10/26/2011 07:54 PM
Surr: p-Terphenyl	69.6	39-123		%REC	1	10/26/2011 07:54 PM
GASOLINE RANGE ORGANICS BY GC/FID						
				EPA 8015B(M)		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/26/2011 06:59 AM
Surr: Bromofluorobenzene (FID)	112	69-158		%REC	1	10/26/2011 06:59 AM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
				EPA 8021B		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/26/2011 06:59 AM
Ethylbenzene	ND	5.0		µg/Kg	1	10/26/2011 06:59 AM
m,p-Xylene	ND	10		µg/Kg	1	10/26/2011 06:59 AM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-004A

Client Sample ID: GB1A-4
Collection Date: 10/19/2011 11:27:00 AM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
VOLATILE ORGANIC COMPOUNDS BY GC/PID				**EPA 8021B**		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/26/2011 06:59 AM
o-Xylene	ND	5.0		µg/Kg	1	10/26/2011 06:59 AM
Toluene	ND	5.0		µg/Kg	1	10/26/2011 06:59 AM
Surr: Bromofluorobenzene (PID)	114	65-140		%REC	1	10/26/2011 06:59 AM
MERCURY BY COLD VAPOR TECHNIQUE				**EPA 7471A**		
RunID: AA5_111027A	QC Batch: 76527			PrepDate: 10/27/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/27/2011 12:56 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-005A

Client Sample ID: GB1A-6.5 (GW1)
Collection Date: 10/19/2011 12:01:00 PM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
EPA 3050B / **EPA 6010B**						
RunID: ICP8_111027A	QC Batch: 76520			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	ND	2.0		mg/Kg	1	10/27/2011 11:52 AM
Arsenic	3.9	1.0		mg/Kg	1	10/27/2011 11:52 AM
Barium	190	1.0		mg/Kg	1	10/27/2011 11:52 AM
Beryllium	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Cadmium	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Chromium	45	1.0		mg/Kg	1	10/27/2011 11:52 AM
Cobalt	12	1.0		mg/Kg	1	10/27/2011 11:52 AM
Copper	14	2.0		mg/Kg	1	10/27/2011 11:52 AM
Lead	5.5	1.0		mg/Kg	1	10/27/2011 11:52 AM
Molybdenum	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Nickel	47	1.0		mg/Kg	1	10/27/2011 11:52 AM
Selenium	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Silver	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Thallium	ND	1.0		mg/Kg	1	10/27/2011 11:52 AM
Vanadium	38	1.0		mg/Kg	1	10/27/2011 11:52 AM
Zinc	25	1.0		mg/Kg	1	10/27/2011 11:52 AM
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3550B / **EPA 8015B(M)**						
RunID: GC16_111026C	QC Batch: 76512			PrepDate: 10/26/2011		Analyst: **CBR**
DRO	ND	1.0		mg/Kg	1	10/26/2011 06:44 PM
ORO	ND	1.0		mg/Kg	1	10/26/2011 06:44 PM
Surr: p-Terphenyl	71.0	39-123		%REC	1	10/26/2011 06:44 PM
GASOLINE RANGE ORGANICS BY GC/FID						
EPA 8015B(M)						
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
GRO	ND	1.0		mg/Kg	1	10/26/2011 07:14 AM
Surr: Bromofluorobenzene (FID)	123	69-158		%REC	1	10/26/2011 07:14 AM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
EPA 8021B						
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Benzene	ND	5.0		µg/Kg	1	10/26/2011 07:14 AM
Ethylbenzene	ND	5.0		µg/Kg	1	10/26/2011 07:14 AM
m,p-Xylene	ND	10		µg/Kg	1	10/26/2011 07:14 AM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT: Geocon Consultants, Inc.
Lab Order: 120415
Project: M&N - 193, E8469-06-03
Lab ID: 120415-005A

Client Sample ID: GB1A-6.5 (GW1)
Collection Date: 10/19/2011 12:01:00 PM
Matrix: SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
VOLATILE ORGANIC COMPOUNDS BY GC/PID				**EPA 8021B**		
RunID: GC2_111025B	QC Batch: E11VS369			PrepDate:		Analyst: **TP**
Methyl tert-butyl ether	ND	5.0		µg/Kg	1	10/26/2011 07:14 AM
o-Xylene	ND	5.0		µg/Kg	1	10/26/2011 07:14 AM
Toluene	ND	5.0		µg/Kg	1	10/26/2011 07:14 AM
Surr: Bromofluorobenzene (PID)	123	65-140		%REC	1	10/26/2011 07:14 AM
MERCURY BY COLD VAPOR TECHNIQUE				**EPA 7471A**		
RunID: AA5_111027A	QC Batch: 76527			PrepDate: 10/27/2011		Analyst: **VV**
Mercury	ND	0.10		mg/Kg	1	10/27/2011 12:58 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1A-GW
Lab Order:	120415	**Collection Date:**	10/19/2011 12:51:00 PM
Project:	M&N - 193, E8469-06-03	**Matrix:**	GROUNDWATER
Lab ID:	120415-006A		

VOLATILE ORGANIC COMPOUNDS BY GC/MS

EPA 8260B

RunID: MS11_111026A QC Batch: A11VW208 PrepDate: Analyst: **BD**

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1,1-Trichloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1,2-Trichloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1-Dichloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1-Dichloroethene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,1-Dichloropropene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2,3-Trichloropropane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2-Dibromoethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2-Dichlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2-Dichloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,2-Dichloropropane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,3-Dichlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,3-Dichloropropane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
1,4-Dichlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
2,2-Dichloropropane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
2-Chlorotoluene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
4-Chlorotoluene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
4-Isopropyltoluene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Benzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Bromobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Bromodichloromethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Bromoform	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Bromomethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Carbon tetrachloride	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Chlorobenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Chloroethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Chloroform	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Chloromethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
cis-1,2-Dichloroethene	ND	0.50		µg/L	1	10/26/2011 04:17 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference
	Results are wet unless otherwise specified
DO	Surrogate Diluted Out

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1A-GW
Lab Order:	120415	**Collection Date:**	10/19/2011 12:51:00 PM
Project:	M&N - 193, E8469-06-03	**Matrix:**	GROUNDWATER
Lab ID:	120415-006A		

VOLATILE ORGANIC COMPOUNDS BY GC/MS

EPA 8260B

RunID: MS11_111026A QC Batch: A11VW208 PrepDate: Analyst: **BD**

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Dibromochloromethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Dibromomethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Dichlorodifluoromethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Ethylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Hexachlorobutadiene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Isopropylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
m,p-Xylene	ND	1.0		µg/L	1	10/26/2011 04:17 PM
Methylene chloride	ND	1.0		µg/L	1	10/26/2011 04:17 PM
n-Butylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
n-Propylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Naphthalene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
o-Xylene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
sec-Butylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Styrene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
tert-Butylbenzene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Tetrachloroethene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Toluene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
trans-1,2-Dichloroethene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Trichloroethene	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Trichlorofluoromethane	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Vinyl chloride	ND	0.50		µg/L	1	10/26/2011 04:17 PM
Surr: 1,2-Dichloroethane-d4	96.6	70-130		%REC	1	10/26/2011 04:17 PM
Surr: 4-Bromofluorobenzene	99.8	70-130		%REC	1	10/26/2011 04:17 PM
Surr: Dibromofluoromethane	98.4	70-130		%REC	1	10/26/2011 04:17 PM
Surr: Toluene-d8	104	70-130		%REC	1	10/26/2011 04:17 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out
E	Value above quantitation range
ND	Not Detected at the Reporting Limit
	Results are wet unless otherwise specified

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1A-GW
Lab Order:	120415	**Collection Date:**	10/19/2011 12:51:00 PM
Project:	M&N - 193, E8469-06-03	**Matrix:**	GROUNDWATER
Lab ID:	120415-006B		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
GASOLINE RANGE ORGANICS BY GC/FID						
		EPA 8015B(M)				
RunID: GC6_111102A	QC Batch: I11VW022			PrepDate:		Analyst: **DMP**
GRO	0.053	0.050		mg/L	1	11/2/2011 04:27 PM
Surr: Bromofluorobenzene (FID)	102	70-130		%REC	1	11/2/2011 04:27 PM
VOLATILE ORGANIC COMPOUNDS BY GC/PID						
		EPA 8021B				
RunID: GC6_111104A	QC Batch: I11VW025			PrepDate:		Analyst: **DMP**
Benzene	ND	0.50	H	µg/L	1	11/4/2011 06:07 PM
Ethylbenzene	ND	0.50	H	µg/L	1	11/4/2011 06:07 PM
m,p-Xylene	ND	1.0	H	µg/L	1	11/4/2011 06:07 PM
Methyl tert-butyl ether	ND	0.50	H	µg/L	1	11/4/2011 06:07 PM
o-Xylene	ND	0.50	H	µg/L	1	11/4/2011 06:07 PM
Toluene	ND	0.50	H	µg/L	1	11/4/2011 06:07 PM
Surr: Bromofluorobenzene (PID)	102	70-130	H	%REC	1	11/4/2011 06:07 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1A-GW
Lab Order:	120415	**Collection Date:**	10/19/2011 12:51:00 PM
Project:	M&N - 193, E8469-06-03	**Matrix:**	GROUNDWATER
Lab ID:	120415-006C		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
DIESEL & MOTOR OIL RANGE ORGANICS BY GC/FID						
EPA 3510C				**EPA 8015B(M)**		
RunID: GC16_111025D	QC Batch: 76458			PrepDate: 10/25/2011		Analyst: **CBR**
DRO	ND	0.062		mg/L	1	10/25/2011 08:57 PM
ORO	ND	0.062		mg/L	1	10/25/2011 08:57 PM
Surr: p-Terphenyl	59.5	48-124		%REC	1	10/25/2011 08:57 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
	S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
	DO	Surrogate Diluted Out		

CLIENT:	Geocon Consultants, Inc.	**Client Sample ID:**	GB1A-GW
Lab Order:	120415	**Collection Date:**	10/19/2011 12:51:00 PM
Project:	M&N - 193, E8469-06-03	**Matrix:**	GROUNDWATER
Lab ID:	120415-006D		

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	EPA 3010A			**EPA 6010B**		
RunID: ICP8_111026F	QC Batch: 76503			PrepDate: 10/26/2011		Analyst: **CBB**
Antimony	0.021	0.0050		mg/L	1	10/26/2011 07:20 PM
Arsenic	0.11	0.010		mg/L	1	10/26/2011 07:20 PM
Barium	3.2	0.0030		mg/L	1	10/26/2011 07:20 PM
Beryllium	0.0032	0.0030		mg/L	1	10/26/2011 07:20 PM
Cadmium	0.020	0.0030		mg/L	1	10/26/2011 07:20 PM
Chromium	2.1	0.0030		mg/L	1	10/26/2011 07:20 PM
Cobalt	0.42	0.0030		mg/L	1	10/26/2011 07:20 PM
Copper	0.82	0.0050		mg/L	1	10/26/2011 07:20 PM
Lead	0.25	0.0050		mg/L	1	10/26/2011 07:20 PM
Molybdenum	ND	0.0050		mg/L	1	10/26/2011 07:20 PM
Nickel	2.8	0.0050		mg/L	1	10/26/2011 07:20 PM
Selenium	ND	0.010		mg/L	1	10/26/2011 07:20 PM
Silver	ND	0.0030		mg/L	1	10/26/2011 07:20 PM
Thallium	ND	0.015		mg/L	1	10/26/2011 07:20 PM
Vanadium	1.5	0.0030		mg/L	1	10/26/2011 07:20 PM
Zinc	1.2	0.010		mg/L	1	10/26/2011 07:20 PM
MERCURY BY COLD VAPOR TECHNIQUE						
				EPA 7470A		
RunID: AA1_111027C	QC Batch: 76528			PrepDate: 10/26/2011		Analyst: **VV**
Mercury	1.8	0.20		µg/L	1	10/27/2011 01:47 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76519** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137924**
Client ID: **PBS** Batch ID: **76519** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265769**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.161	2.0									
Arsenic	ND	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	0.022	1.0									
Cobalt	ND	1.0									
Copper	0.504	2.0									
Lead	ND	1.0									
Molybdenum	0.112	1.0									
Nickel	ND	1.0									
Selenium	ND	1.0									
Silver	0.221	1.0									
Thallium	0.121	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76519** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137924**
Client ID: **LCSS** Batch ID: **76519** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265770**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	44.022	2.0	50.00	0.1606	87.7	80	120				
Arsenic	41.848	1.0	50.00	0	83.7	80	120				
Barium	46.833	1.0	50.00	0	93.7	80	120				
Beryllium	48.601	1.0	50.00	0	97.2	80	120				
Cadmium	43.642	1.0	50.00	0	87.3	80	120				
Chromium	43.974	1.0	50.00	0.02245	87.9	80	120				
Cobalt	45.432	1.0	50.00	0	90.9	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76519** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137924**
Client ID: **LCSS** Batch ID: **76519** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265770**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Copper	45.824	2.0	50.00	0.5041	90.6	80	120				
Lead	45.015	1.0	50.00	0	90.0	80	120				
Molybdenum	46.111	1.0	50.00	0.1118	92.0	80	120				
Nickel	45.100	1.0	50.00	0	90.2	80	120				
Selenium	41.444	1.0	50.00	0	82.9	80	120				
Silver	43.809	1.0	50.00	0.2213	87.2	80	120				
Thallium	43.375	1.0	50.00	0.1209	86.5	80	120				
Vanadium	46.762	1.0	50.00	0	93.5	80	120				
Zinc	43.951	1.0	50.00	0	87.9	80	120				

Sample ID: **120413-053A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137924**
Client ID: **ZZZZZZ** Batch ID: **76519** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265773**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	77.567	2.0	125.0	0.7171	61.5	44	105				
Arsenic	85.357	1.0	125.0	1.447	67.1	57	103				
Barium	237.071	1.0	125.0	147.2	71.9	36	134				
Beryllium	98.508	1.0	125.0	0	78.8	64	106				
Cadmium	84.352	1.0	125.0	0.7806	66.9	58	102				
Chromium	122.761	1.0	125.0	34.73	70.4	55	105				
Cobalt	102.020	1.0	125.0	13.88	70.5	59	105				
Copper	135.146	2.0	125.0	28.24	85.5	64	117				
Lead	90.707	1.0	125.0	5.166	68.4	46	116				
Molybdenum	86.369	1.0	125.0	0	69.1	59	108				
Nickel	127.730	1.0	125.0	41.03	69.4	52	109				
Selenium	79.934	1.0	125.0	0	63.9	56	100				
Silver	95.654	1.0	125.0	0	76.5	65	107				
Thallium	77.691	1.0	125.0	0	62.2	47	100				
Vanadium	154.677	1.0	125.0	57.21	78.0	64	110				
Zinc	128.413	1.0	125.0	46.63	65.4	37	123				

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120413-053A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137924**
Client ID: **ZZZZZZ** Batch ID: **76519** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265774**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	78.020	2.0	125.0	0.7171	61.8	44	105	77.57	0.583	20	
Arsenic	84.825	1.0	125.0	1.447	66.7	57	103	85.36	0.625	20	
Barium	239.402	1.0	125.0	147.2	73.8	36	134	237.1	0.979	20	
Beryllium	95.789	1.0	125.0	0	76.6	64	106	98.51	2.80	20	
Cadmium	84.176	1.0	125.0	0.7806	66.7	58	102	84.35	0.209	20	
Chromium	123.528	1.0	125.0	34.73	71.0	55	105	122.8	0.623	20	
Cobalt	101.853	1.0	125.0	13.88	70.4	59	105	102.0	0.164	20	
Copper	135.217	2.0	125.0	28.24	85.6	64	117	135.1	0.0531	20	
Lead	90.389	1.0	125.0	5.166	68.2	46	116	90.71	0.351	20	
Molybdenum	86.175	1.0	125.0	0	68.9	59	108	86.37	0.225	20	
Nickel	128.854	1.0	125.0	41.03	70.3	52	109	127.7	0.876	20	
Selenium	79.040	1.0	125.0	0	63.2	56	100	79.93	1.12	20	
Silver	92.857	1.0	125.0	0	74.3	65	107	95.65	2.97	20	
Thallium	77.760	1.0	125.0	0	62.2	47	100	77.69	0.0892	20	
Vanadium	154.904	1.0	125.0	57.21	78.2	64	110	154.7	0.146	20	
Zinc	129.205	1.0	125.0	46.63	66.1	37	123	128.4	0.615	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **MB-76520** SampType: **MBLK** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137883**
Client ID: **PBS** Batch ID: **76520** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265094**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.133	2.0									
Arsenic	0.146	1.0									
Barium	ND	1.0									
Beryllium	ND	1.0									
Cadmium	ND	1.0									
Chromium	ND	1.0									
Cobalt	ND	1.0									
Copper	0.390	2.0									
Lead	ND	1.0									
Molybdenum	ND	1.0									
Nickel	0.067	1.0									
Selenium	ND	1.0									
Silver	ND	1.0									
Thallium	0.119	1.0									
Vanadium	ND	1.0									
Zinc	ND	1.0									

Sample ID: **LCS-76520** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137883**
Client ID: **LCSS** Batch ID: **76520** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265095**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	48.285	2.0	50.00	0.1329	96.3	80	120				
Arsenic	45.084	1.0	50.00	0.1459	89.9	80	120				
Barium	48.547	1.0	50.00	0	97.1	80	120				
Beryllium	48.673	1.0	50.00	0	97.3	80	120				
Cadmium	46.774	1.0	50.00	0	93.5	80	120				
Chromium	44.641	1.0	50.00	0	89.3	80	120				
Cobalt	47.102	1.0	50.00	0	94.2	80	120				
Copper	47.172	2.0	50.00	0.3902	93.6	80	120				
Lead	47.196	1.0	50.00	0	94.4	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **LCS-76520** SampType: **LCS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137883**
Client ID: **LCSS** Batch ID: **76520** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265095**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	48.937	1.0	50.00	0	97.9	80	120				
Nickel	46.045	1.0	50.00	0.06673	92.0	80	120				
Selenium	45.169	1.0	50.00	0	90.3	80	120				
Silver	44.804	1.0	50.00	0	89.6	80	120				
Thallium	46.480	1.0	50.00	0.1189	92.7	80	120				
Vanadium	47.901	1.0	50.00	0	95.8	80	120				
Zinc	47.259	1.0	50.00	0	94.5	80	120				

Sample ID: **120415-002A-MS** SampType: **MS** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137883**
Client ID: **GB1-3** Batch ID: **76520** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265097**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	93.125	2.0	125.0	0.9942	73.7	44	105				
Arsenic	104.994	1.0	125.0	4.370	80.5	57	103				
Barium	229.861	1.0	125.0	75.36	124	36	134				
Beryllium	104.751	1.0	125.0	0	83.8	64	106				
Cadmium	101.558	1.0	125.0	0.6252	80.7	58	102				
Chromium	160.904	1.0	125.0	49.91	88.8	55	105				
Cobalt	112.579	1.0	125.0	10.95	81.3	59	105				
Copper	131.113	2.0	125.0	17.32	91.0	64	117				
Lead	106.947	1.0	125.0	7.014	79.9	46	116				
Molybdenum	101.460	1.0	125.0	0	81.2	59	108				
Nickel	164.859	1.0	125.0	58.07	85.4	52	109				
Selenium	97.502	1.0	125.0	0	78.0	56	100				
Silver	105.208	1.0	125.0	0	84.2	65	107				
Thallium	93.663	1.0	125.0	0	74.9	47	100				
Vanadium	126.669	1.0	125.0	16.67	88.0	64	110				
Zinc	146.137	1.0	125.0	40.69	84.4	37	123				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_S

Sample ID: **120415-002A-MSD** SampType: **MSD** TestCode: **6010_S** Units: **mg/Kg** Prep Date: **10/26/2011** RunNo: **137883**
Client ID: **GB1-3** Batch ID: **76520** TestNo: **EPA 6010B** **EPA 3050B** Analysis Date: **10/27/2011** SeqNo: **2265098**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	86.216	2.0	125.0	0.9942	68.2	44	105	93.13	7.70	20	
Arsenic	97.557	1.0	125.0	4.370	74.5	57	103	105.0	7.34	20	
Barium	174.827	1.0	125.0	75.36	79.6	36	134	229.9	27.2	20	R
Beryllium	95.822	1.0	125.0	0	76.7	64	106	104.8	8.90	20	
Cadmium	93.125	1.0	125.0	0.6252	74.0	58	102	101.6	8.66	20	
Chromium	143.415	1.0	125.0	49.91	74.8	55	105	160.9	11.5	20	
Cobalt	102.304	1.0	125.0	10.95	73.1	59	105	112.6	9.56	20	
Copper	116.561	2.0	125.0	17.32	79.4	64	117	131.1	11.8	20	
Lead	98.839	1.0	125.0	7.014	73.5	46	116	106.9	7.88	20	
Molybdenum	94.473	1.0	125.0	0	75.6	59	108	101.5	7.13	20	
Nickel	146.059	1.0	125.0	58.07	70.4	52	109	164.9	12.1	20	
Selenium	90.602	1.0	125.0	0	72.5	56	100	97.50	7.34	20	
Silver	96.582	1.0	125.0	0	77.3	65	107	105.2	8.55	20	
Thallium	87.035	1.0	125.0	0	69.6	47	100	93.66	7.34	20	
Vanadium	114.749	1.0	125.0	16.67	78.5	64	110	126.7	9.87	20	
Zinc	133.115	1.0	125.0	40.69	73.9	37	123	146.1	9.33	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_W

Sample ID: **MB-76503** SampType: **MBLK** TestCode: **6010_W** Units: **mg/L** Prep Date: **10/26/2011** RunNo: **137859**
Client ID: **PBW** Batch ID: **76503** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **10/27/2011** SeqNo: **2264725**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.010									
Arsenic	0.001	0.010									
Barium	0.000123	0.0030									
Beryllium	0.000331	0.0030									
Cadmium	ND	0.0030									
Chromium	ND	0.0030									
Cobalt	0.000147	0.0030									
Copper	0.002	0.0050									
Lead	ND	0.0050									
Molybdenum	ND	0.0050									
Nickel	0.000555	0.0050									
Selenium	ND	0.010									
Silver	0.000591	0.0030									
Thallium	0.001	0.015									
Vanadium	ND	0.0030									
Zinc	0.009	0.010									

Sample ID: **LCS-76503** SampType: **LCS** TestCode: **6010_W** Units: **mg/L** Prep Date: **10/26/2011** RunNo: **137859**
Client ID: **LCSW** Batch ID: **76503** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **10/26/2011** SeqNo: **2264727**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	0.982	0.010	1.000	0	98.2	85	115				
Arsenic	0.932	0.010	1.000	0.001353	93.1	85	115				
Barium	0.981	0.0030	1.000	0.0001228	98.0	85	115				
Beryllium	1.043	0.0030	1.000	0.0003310	104	85	115				
Cadmium	0.940	0.0030	1.000	0	94.0	85	115				
Chromium	0.912	0.0030	1.000	0	91.2	85	115				
Cobalt	0.964	0.0030	1.000	0.0001471	96.4	85	115				
Copper	0.979	0.0050	1.000	0.002478	97.7	85	115				
Lead	0.974	0.0050	1.000	0	97.4	85	115				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_W

Sample ID: **LCS-76503** SampType: **LCS** TestCode: **6010_W** Units: **mg/L** Prep Date: **10/26/2011** RunNo: **137859**
Client ID: **LCSW** Batch ID: **76503** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **10/26/2011** SeqNo: **2264727**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Molybdenum	0.953	0.0050	1.000	0	95.3	85	115				
Nickel	0.956	0.0050	1.000	0.0005554	95.5	85	115				
Selenium	0.944	0.010	1.000	0	94.4	85	115				
Silver	0.982	0.0030	1.000	0.0005907	98.1	85	115				
Thallium	0.947	0.015	1.000	0.001250	94.5	85	115				
Vanadium	0.981	0.0030	1.000	0	98.1	85	115				
Zinc	0.952	0.010	1.000	0.009175	94.2	85	115				

Sample ID: **120417-006D-MS** SampType: **MS** TestCode: **6010_W** Units: **mg/L** Prep Date: **10/26/2011** RunNo: **137859**
Client ID: **ZZZZZZ** Batch ID: **76503** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **10/26/2011** SeqNo: **2264736**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	2.460	0.010	2.500	0	98.4	77	123				
Arsenic	2.370	0.010	2.500	0.004886	94.6	80	118				
Barium	2.486	0.0030	2.500	0.1774	92.3	78	120				
Beryllium	2.439	0.0030	2.500	0	97.6	81	120				
Cadmium	2.177	0.0030	2.500	0.0003683	87.1	76	117				
Chromium	2.181	0.0030	2.500	0.04054	85.6	75	110				
Cobalt	2.294	0.0030	2.500	0.01108	91.3	76	118				
Copper	2.552	0.0050	2.500	0.02297	101	78	123				
Lead	2.251	0.0050	2.500	0.008934	89.7	78	117				
Molybdenum	2.266	0.0050	2.500	0.003603	90.5	81	115				
Nickel	2.242	0.0050	2.500	0.03697	88.2	75	118				
Selenium	2.294	0.010	2.500	0	91.8	78	116				
Silver	2.520	0.0030	2.500	0	101	80	122				
Thallium	2.212	0.015	2.500	0	88.5	69	122				
Vanadium	2.472	0.0030	2.500	0.03809	97.3	77	120				
Zinc	2.260	0.010	2.500	0.07290	87.5	73	119				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_W

Sample ID: **120417-006D-MSD** SampType: **MSD** TestCode: **6010_W** Units: **mg/L** Prep Date: **10/26/2011** RunNo: **137859**
Client ID: **ZZZZZZ** Batch ID: **76503** TestNo: **EPA 6010B** **EPA 3010A** Analysis Date: **10/26/2011** SeqNo: **2264737**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	2.428	0.010	2.500	0	97.1	77	123	2.460	1.31	20	
Arsenic	2.350	0.010	2.500	0.004886	93.8	80	118	2.370	0.843	20	
Barium	2.493	0.0030	2.500	0.1774	92.6	78	120	2.486	0.263	20	
Beryllium	2.457	0.0030	2.500	0	98.3	81	120	2.439	0.739	20	
Cadmium	2.161	0.0030	2.500	0.0003683	86.4	76	117	2.177	0.719	20	
Chromium	2.184	0.0030	2.500	0.04054	85.7	75	110	2.181	0.147	20	
Cobalt	2.285	0.0030	2.500	0.01108	91.0	76	118	2.294	0.393	20	
Copper	2.559	0.0050	2.500	0.02297	101	78	123	2.552	0.258	20	
Lead	2.236	0.0050	2.500	0.008934	89.1	78	117	2.251	0.670	20	
Molybdenum	2.270	0.0050	2.500	0.003603	90.6	81	115	2.266	0.166	20	
Nickel	2.237	0.0050	2.500	0.03697	88.0	75	118	2.242	0.184	20	
Selenium	2.269	0.010	2.500	0	90.8	78	116	2.294	1.10	20	
Silver	2.519	0.0030	2.500	0	101	80	122	2.520	0.00243	20	
Thallium	2.175	0.015	2.500	0	87.0	69	122	2.212	1.67	20	
Vanadium	2.479	0.0030	2.500	0.03809	97.6	77	120	2.472	0.272	20	
Zinc	2.255	0.010	2.500	0.07290	87.3	73	119	2.260	0.195	20	

Qualifiers:

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike/Surrogate outside of limits due to matrix interference
- DO Surrogate Diluted Out

Calculations are based on raw values

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7470_W

Sample ID: **MB-76528**	SampType: **MBLK**	TestCode: **7470_W**	Units: **µg/L**	Prep Date: **10/26/2011**	RunNo: **137889**
Client ID: **PBW**	Batch ID: **76528**	TestNo: **EPA 7470A**		Analysis Date: **10/27/2011**	SeqNo: **2265166**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.20									

Sample ID: **LCS-76528**	SampType: **LCS**	TestCode: **7470_W**	Units: **µg/L**	Prep Date: **10/26/2011**	RunNo: **137889**
Client ID: **LCSW**	Batch ID: **76528**	TestNo: **EPA 7470A**		Analysis Date: **10/27/2011**	SeqNo: **2265167**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	9.394	0.20	10.00	0	93.9	85	115				

Sample ID: **120399-001C-MS**	SampType: **MS**	TestCode: **7470_W**	Units: **µg/L**	Prep Date: **10/26/2011**	RunNo: **137889**
Client ID: **ZZZZZZ**	Batch ID: **76528**	TestNo: **EPA 7470A**		Analysis Date: **10/27/2011**	SeqNo: **2265168**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	9.264	0.20	10.00	0	92.6	70	130				

Sample ID: **120399-001C-MSD**	SampType: **MSD**	TestCode: **7470_W**	Units: **µg/L**	Prep Date: **10/26/2011**	RunNo: **137889**
Client ID: **ZZZZZZ**	Batch ID: **76528**	TestNo: **EPA 7470A**		Analysis Date: **10/27/2011**	SeqNo: **2265169**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	9.384	0.20	10.00	0	93.8	70	130	9.264	1.29	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **MB-76526**	SampType: **MBLK**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137908**
Client ID: **PBS**	Batch ID: **76526**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265582**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Sample ID: **LCS-76526**	SampType: **LCS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137908**
Client ID: **LCSS**	Batch ID: **76526**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265583**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.841	0.10	0.8300	0	101	80	120				

Sample ID: **120415-001A-MS**	SampType: **MS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137908**
Client ID: **GB1-1**	Batch ID: **76526**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265584**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	1.038	0.10	0.8300	0.06003	118	70	130				

Sample ID: **120415-001A-MSD**	SampType: **MSD**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137908**
Client ID: **GB1-1**	Batch ID: **76526**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265585**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	1.033	0.10	0.8300	0.06003	117	70	130	1.038	0.423	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 7471_S

Sample ID: **MB-76527**	SampType: **MBLK**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137880**
Client ID: **PBS**	Batch ID: **76527**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265017**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.10									

Sample ID: **LCS-76527**	SampType: **LCS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137880**
Client ID: **LCSS**	Batch ID: **76527**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265018**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.910	0.10	0.8300	0	110	80	120				

Sample ID: **120416-001A-MS**	SampType: **MS**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137880**
Client ID: **ZZZZZZ**	Batch ID: **76527**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265019**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.947	0.10	0.8300	0.03048	110	70	130				

Sample ID: **120416-001A-MSD**	SampType: **MSD**	TestCode: **7471_S**	Units: **mg/Kg**	Prep Date: **10/27/2011**	RunNo: **137880**
Client ID: **ZZZZZZ**	Batch ID: **76527**	TestNo: **EPA 7471A**		Analysis Date: **10/27/2011**	SeqNo: **2265020**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.888	0.10	0.8300	0.03048	103	70	130	0.9469	6.43	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_DM LL

Sample ID: **MB-76475**	SampType: **MBLK**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/25/2011**	RunNo: **137868**
Client ID: **PBS**	Batch ID: **76475**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264847**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	1.0									
ORO	ND	1.0									
Surr: p-Terphenyl	2.176		2.670		81.5	39	123				

Sample ID: **LCS-76475**	SampType: **LCS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/25/2011**	RunNo: **137868**
Client ID: **LCSS**	Batch ID: **76475**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264848**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	21.055	1.0	33.00	0	63.8	37	109				
Surr: p-Terphenyl	2.186		2.670		81.9	39	123				

Sample ID: **120464-001AMS**	SampType: **MS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/25/2011**	RunNo: **137868**
Client ID: **ZZZZZZ**	Batch ID: **76475**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264859**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	23.070	1.0	33.00	4.247	57.0	29	107				
Surr: p-Terphenyl	2.326		2.670		87.1	39	123				

Sample ID: **120464-001AMSD**	SampType: **MSD**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/25/2011**	RunNo: **137868**
Client ID: **ZZZZZZ**	Batch ID: **76475**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264860**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	20.318	1.0	33.00	4.247	48.7	29	107	23.07	12.7	20	
Surr: p-Terphenyl	1.527		2.670		57.2	39	123		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_DM LL

Sample ID: **MB-76512**	SampType: **MBLK**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/26/2011**	RunNo: **137878**
Client ID: **PBS**	Batch ID: **76512**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264973**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	1.0									
ORO	ND	1.0									
Surr: p-Terphenyl	2.364		2.670		88.5	39	123				

Sample ID: **LCS-76512**	SampType: **LCS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/26/2011**	RunNo: **137878**
Client ID: **LCSS**	Batch ID: **76512**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264974**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	21.900	1.0	33.00	0	66.4	37	109				
Surr: p-Terphenyl	2.287		2.670		85.7	39	123				

Sample ID: **120381-048AMS**	SampType: **MS**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/26/2011**	RunNo: **137878**
Client ID: **ZZZZZZ**	Batch ID: **76512**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264977**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	21.118	1.0	33.00	2.350	56.9	29	107				
Surr: p-Terphenyl	2.237		2.670		83.8	39	123				

Sample ID: **120381-048AMSD**	SampType: **MSD**	TestCode: **8015_S_DM L**	Units: **mg/Kg**	Prep Date: **10/26/2011**	RunNo: **137878**
Client ID: **ZZZZZZ**	Batch ID: **76512**	TestNo: **EPA 8015B(M**	**EPA 3550B**	Analysis Date: **10/26/2011**	SeqNo: **2264978**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	16.650	1.0	33.00	2.350	43.3	29	107	21.12	23.7	20	R
Surr: p-Terphenyl	1.659		2.670		62.1	39	123		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **E111025LC3**	SampType: **LCS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **LCSS**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265471**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	5.004	1.0	5.000	0.2220	95.6	70	130				
Surr: Bromofluorobenzene (FID)	136.079		100.0		136	69	158				

Sample ID: **E111025MB2MS**	SampType: **MS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **ZZZZZZ**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265472**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.821	1.0	5.000	0.2220	92.0	46	135				
Surr: Bromofluorobenzene (FID)	108.496		100.0		108	69	158				

Sample ID: **E111025MB2MSD**	SampType: **MSD**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **ZZZZZZ**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265473**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.903	1.0	5.000	0.2220	93.6	46	135	4.821	1.69	20	
Surr: Bromofluorobenzene (FID)	129.726		100.0		130	69	158		0	0	

Sample ID: **E111025MB2**	SampType: **MBLK**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **PBS**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265474**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	0.222	1.0									
Surr: Bromofluorobenzene (FID)	93.705		100.0		93.7	69	158				

Sample ID: **120381-048AMS**	SampType: **MS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **ZZZZZZ**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265992**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.313	1.0	5.000	0	86.3	46	135				

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_S_GAS

Sample ID: **120381-048AMS**	SampType: **MS**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **ZZZZZZ**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265992**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (FID)	122.951		100.0		123	69	158				

Sample ID: **120381-048AMSD**	SampType: **MSD**	TestCode: **8015_S_GAS**	Units: **mg/Kg**	Prep Date:	RunNo: **137903**
Client ID: **ZZZZZZ**	Batch ID: **E11VS369**	TestNo: **EPA 8015B(M**		Analysis Date: **10/26/2011**	SeqNo: **2265993**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	4.519	1.0	5.000	0	90.4	46	135	4.313	4.66	20	
Surr: Bromofluorobenzene (FID)	123.424		100.0		123	69	158		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_W_DM_LL

Sample ID: **MB-76458**	SampType: **MBLK**	TestCode: **8015_W_DM_**	Units: **mg/L**	Prep Date: **10/25/2011**	RunNo: **137837**
Client ID: **PBW**	Batch ID: **76458**	TestNo: **EPA 8015B(M**	**EPA 3510C**	Analysis Date: **10/25/2011**	SeqNo: **2264395**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	ND	0.050									
ORO	ND	0.050									
Surr: p-Terphenyl	0.058		0.08000		72.5	48	124				

Sample ID: **LCS-76458**	SampType: **LCS**	TestCode: **8015_W_DM_**	Units: **mg/L**	Prep Date: **10/25/2011**	RunNo: **137837**
Client ID: **LCSW**	Batch ID: **76458**	TestNo: **EPA 8015B(M**	**EPA 3510C**	Analysis Date: **10/25/2011**	SeqNo: **2264396**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	0.769	0.050	1.000	0	76.9	45	109				
Surr: p-Terphenyl	0.066		0.08000		82.4	48	124				

Sample ID: **MB-76458MS**	SampType: **MS**	TestCode: **8015_W_DM_**	Units: **mg/L**	Prep Date: **10/25/2011**	RunNo: **137837**
Client ID: **ZZZZZZ**	Batch ID: **76458**	TestNo: **EPA 8015B(M**	**EPA 3510C**	Analysis Date: **10/25/2011**	SeqNo: **2264397**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	0.724	0.050	1.000	0	72.4	45	109				
Surr: p-Terphenyl	0.064		0.08000		79.8	48	124				

Sample ID: **MB-76458MSD**	SampType: **MSD**	TestCode: **8015_W_DM_**	Units: **mg/L**	Prep Date: **10/25/2011**	RunNo: **137837**
Client ID: **ZZZZZZ**	Batch ID: **76458**	TestNo: **EPA 8015B(M**	**EPA 3510C**	Analysis Date: **10/25/2011**	SeqNo: **2264398**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
DRO	0.799	0.050	1.000	0	79.9	45	109	0.7238	9.91	20	
Surr: p-Terphenyl	0.068		0.08000		84.6	48	124		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_W_GP LL

Sample ID: **I111102LCS1** SampType: **LCS** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138123**
Client ID: **LCSW** Batch ID: **I11VW022** TestNo: **EPA 8015B(M** Analysis Date: **11/2/2011** SeqNo: **2270340**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	0.943	0.050	1.000	0.04300	90.0	70	130				
Surr: Bromofluorobenzene (FID)	99.623		100.0		99.6	70	130				

Sample ID: **I111102MB1** SampType: **MBLK** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138123**
Client ID: **PBW** Batch ID: **I11VW022** TestNo: **EPA 8015B(M** Analysis Date: **11/2/2011** SeqNo: **2270365**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	0.043	0.050									
Surr: Bromofluorobenzene (FID)	97.638		100.0		97.6	70	130				

Sample ID: **I111102LCSD1** SampType: **LCSD** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138123**
Client ID: **LCSS02** Batch ID: **I11VW022** TestNo: **EPA 8015B(M** Analysis Date: **11/2/2011** SeqNo: **2271795**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	0.878	0.050	1.000	0.04300	83.5	70	130	0.9430	7.14	20	
Surr: Bromofluorobenzene (FID)	105.061		100.0		105	70	130		0	0	

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_W_GP LL

Sample ID: **I111104LCS2** SampType: **LCS** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **LCSW** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271772**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	1.059	0.050	1.000	0	106	70	130				
Surr: Bromofluorobenzene (FID)	104.888		100.0		105	70	130				

Sample ID: **I111104LCSD2** SampType: **LCSD** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **LCSS02** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271773**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	1.038	0.050	1.000	0	104	70	130	1.059	2.00	20	
Surr: Bromofluorobenzene (FID)	101.716		100.0		102	70	130		0	0	

Sample ID: **I111104MB2** SampType: **MBLK** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **PBW** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271774**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	0.044	0.050									
Surr: Bromofluorobenzene (FID)	101.539		100.0		102	70	130				

Sample ID: **120361-012A-MS** SampType: **MS** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **ZZZZZZ** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271786**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	24.400	0.50	10.00	16.46	79.4	70	130				H
Surr: Bromofluorobenzene (FID)	1167.210		1000		117	70	130				H

Sample ID: **120361-012A-MSD** SampType: **MSD** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **ZZZZZZ** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271787**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
GRO	29.590	0.50	10.00	16.46	131	70	130	24.40	19.2	20	SH

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8015_W_GP LL

Sample ID: **120361-012A-MSD** SampType: **MSD** TestCode: **8015_W_GP** Units: **mg/L** Prep Date: RunNo: **138163**
Client ID: **ZZZZZZ** Batch ID: **I11VW025** TestNo: **EPA 8015B(M** Analysis Date: **11/4/2011** SeqNo: **2271787**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (FID)	1213.200		1000		121	70	130		0	0	H

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111025LC4** SampType: **LCS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **LCSS** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265480**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	100.176	5.0	100.0	0	100	70	130				
Ethylbenzene	100.939	5.0	100.0	0	101	70	130				
m,p-Xylene	204.617	10	200.0	0	102	70	130				
Methyl tert-butyl ether	101.065	5.0	100.0	0	101	70	130				
o-Xylene	104.176	5.0	100.0	0	104	70	130				
Toluene	102.889	5.0	100.0	0	103	70	130				
Surr: Bromofluorobenzene (PID)	107.724		100.0		108	65	140				

Sample ID: **E111025LC4** SampType: **LCSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **LCSS02** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265481**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	97.578	5.0	100.0	0	97.6	70	130	100.2	2.63	20	
Ethylbenzene	98.746	5.0	100.0	0	98.7	70	130	100.9	2.20	20	
m,p-Xylene	199.364	10	200.0	0	99.7	70	130	204.6	2.60	20	
Methyl tert-butyl ether	94.354	5.0	100.0	0	94.4	70	130	101.1	6.87	20	
o-Xylene	100.318	5.0	100.0	0	100	70	130	104.2	3.77	20	
Toluene	100.330	5.0	100.0	0	100	70	130	102.9	2.52	20	
Surr: Bromofluorobenzene (PID)	96.669		100.0		96.7	65	140		0	0	

Sample ID: **E111025MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **ZZZZZZ** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265482**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	38.653	5.0	22.15	0	175	69	264				
Ethylbenzene	58.680	5.0	42.30	0	139	37	161				
m,p-Xylene	202.889	10	180.2	0	113	30	149				
Methyl tert-butyl ether	434.033	5.0	578.9	0	75.0	39	121				
o-Xylene	76.487	5.0	64.80	0	118	31	166				
Toluene	191.688	5.0	172.6	0	111	44	150				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **E111025MB2MS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **ZZZZZZ** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265482**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (PID)	110.807		100.0		111	65	140				

Sample ID: **E111025MB2MSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **ZZZZZZ** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265483**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	38.519	5.0	22.15	0	174	69	264	38.65	0.347	20	
Ethylbenzene	59.980	5.0	42.30	0	142	37	161	58.68	2.19	20	
m,p-Xylene	207.121	10	180.2	0	115	30	149	202.9	2.06	20	
Methyl tert-butyl ether	431.103	5.0	578.9	0	74.5	39	121	434.0	0.677	20	
o-Xylene	78.541	5.0	64.80	0	121	31	166	76.49	2.65	20	
Toluene	192.490	5.0	172.6	0	111	44	150	191.7	0.418	20	
Surr: Bromofluorobenzene (PID)	106.578		100.0		107	65	140		0	20	

Sample ID: **E111025MB2** SampType: **MBLK** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **PBS** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2265484**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	5.0									
Ethylbenzene	ND	5.0									
m,p-Xylene	ND	10									
Methyl tert-butyl ether	ND	5.0									
o-Xylene	ND	5.0									
Toluene	ND	5.0									
Surr: Bromofluorobenzene (PID)	94.076		100.0		94.1	65	140				

Qualifiers:

B Analyte detected in the associated Method Blank
ND Not Detected at the Reporting Limit
DO Surrogate Diluted Out
E Value above quantitation range
R RPD outside accepted recovery limits
Calculations are based on raw values
H Holding times for preparation or analysis exceeded
S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_S_BTEX

Sample ID: **120381-048AMS** SampType: **MS** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **ZZZZZZ** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2266025**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	35.373	5.0	22.15	0	160	69	264				
Ethylbenzene	51.000	5.0	42.30	0	121	37	161				
m,p-Xylene	173.080	10	180.2	0	96.0	30	149				
Methyl tert-butyl ether	411.058	5.0	578.9	0	71.0	39	121				
o-Xylene	64.763	5.0	64.80	0	99.9	31	166				
Toluene	168.872	5.0	172.6	0	97.8	44	150				
Surr: Bromofluorobenzene (PID)	125.123		100.0		125	65	140				

Sample ID: **120381-048AMSD** SampType: **MSD** TestCode: **8021_S_BTE** Units: **µg/Kg** Prep Date: RunNo: **137903**
Client ID: **ZZZZZZ** Batch ID: **E11VS369** TestNo: **EPA 8021B** Analysis Date: **10/26/2011** SeqNo: **2266026**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	36.650	5.0	22.15	0	165	69	264	35.37	3.55	20	
Ethylbenzene	53.044	5.0	42.30	0	125	37	161	51.00	3.93	20	
m,p-Xylene	180.425	10	180.2	0	100	30	149	173.1	4.16	20	
Methyl tert-butyl ether	410.935	5.0	578.9	0	71.0	39	121	411.1	0.0299	20	
o-Xylene	67.156	5.0	64.80	0	104	31	166	64.76	3.63	20	
Toluene	175.871	5.0	172.6	0	102	44	150	168.9	4.06	20	
Surr: Bromofluorobenzene (PID)	126.556		100.0		127	65	140		0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_WP_BTEX

Sample ID: **I111104LCS1** SampType: **LCS** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **LCSW** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271175**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	97.045	0.50	100.0	0	97.0	70	130				
Toluene	97.936	0.50	100.0	0	97.9	70	130				
Ethylbenzene	99.628	0.50	100.0	0	99.6	70	130				
m,p-Xylene	220.408	1.0	200.0	0	110	70	130				
o-Xylene	97.484	0.50	100.0	0	97.5	70	130				
Methyl tert-butyl ether	84.713	0.50	100.0	0	84.7	70	130				
Surr: Bromofluorobenzene (PID)	112.100		100.0		112	70	130				

Sample ID: **I111104LCSD1** SampType: **LCS** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **LCSW** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271176**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	97.766	0.50	100.0	0	97.8	70	130				
Toluene	98.632	0.50	100.0	0	98.6	70	130				
Ethylbenzene	101.101	0.50	100.0	0	101	70	130				
m,p-Xylene	224.357	1.0	200.0	0	112	70	130				
o-Xylene	99.326	0.50	100.0	0	99.3	70	130				
Methyl tert-butyl ether	92.448	0.50	100.0	0	92.4	70	130				
Surr: Bromofluorobenzene (PID)	107.897		100.0		108	70	130				

Sample ID: **I111104MB1** SampType: **MBLK** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **PBW** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271177**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	0.50									
Toluene	ND	0.50									
Ethylbenzene	ND	0.50									
m,p-Xylene	ND	1.0									
o-Xylene	ND	0.50									
Methyl tert-butyl ether	ND	0.50									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8021_WP_BTEX

Sample ID: **I111104MB1** SampType: **MBLK** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **PBW** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271177**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Bromofluorobenzene (PID)	101.731		100.0		102	70	130				

Sample ID: **120467-001A-MS** SampType: **MS** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **ZZZZZZ** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271183**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	2876.700	5.0	64.00	2675	315	70	130				S
Toluene	861.190	5.0	338.5	322.5	159	70	130				S
Ethylbenzene	315.430	5.0	109.5	149.0	152	70	130				S
m,p-Xylene	407.820	10	424.0	0	96.2	70	130				
o-Xylene	281.740	5.0	133.5	76.52	154	70	130				S
Methyl tert-butyl ether	1262.190	5.0	1318	0	95.7	70	130				
Surr: Bromofluorobenzene (PID)	1078.530		1000		108	70	130				

Sample ID: **120467-001A-MSD** SampType: **MSD** TestCode: **8021_WP_BT** Units: **µg/L** Prep Date: RunNo: **138163**
Client ID: **ZZZZZZ** Batch ID: **I11VW025** TestNo: **EPA 8021B** Analysis Date: **11/4/2011** SeqNo: **2271184**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	2808.240	5.0	64.00	2675	208	70	130	2877	2.41	20	S
Toluene	875.610	5.0	338.5	322.5	163	70	130	861.2	1.66	20	S
Ethylbenzene	310.390	5.0	109.5	149.0	147	70	130	315.4	1.61	20	S
m,p-Xylene	415.420	10	424.0	0	98.0	70	130	407.8	1.85	20	
o-Xylene	287.760	5.0	133.5	76.52	158	70	130	281.7	2.11	20	S
Methyl tert-butyl ether	1306.440	5.0	1318	0	99.1	70	130	1262	3.45	20	
Surr: Bromofluorobenzene (PID)	1061.510		1000		106	70	130		0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_WP_LL

Sample ID: **A111026LCS1** SampType: **LCS** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **LCSW** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265269**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1-Dichloroethene	16.830	0.50	20.00	0	84.2	70	130				
Benzene	37.610	0.50	40.00	0	94.0	70	130				
Chlorobenzene	20.180	0.50	20.00	0	101	70	130				
MTBE	18.450	0.50	20.00	0	92.2	70	130				
Toluene	39.900	0.50	40.00	0	99.8	70	130				
Trichloroethene	19.440	0.50	20.00	0	97.2	70	130				
Surr: 1,2-Dichloroethane-d4	23.940		25.00		95.8	70	130				
Surr: 4-Bromofluorobenzene	26.610		25.00		106	70	130				
Surr: Dibromofluoromethane	23.830		25.00		95.3	70	130				
Surr: Toluene-d8	26.160		25.00		105	70	130				

Sample ID: **A111026LCSD** SampType: **LCSD** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **LCSS02** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265270**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1-Dichloroethene	16.820	0.50	20.00	0	84.1	70	130	16.83	0.0594	20	
Benzene	37.860	0.50	40.00	0	94.6	70	130	37.61	0.663	20	
Chlorobenzene	20.480	0.50	20.00	0	102	70	130	20.18	1.48	20	
MTBE	18.950	0.50	20.00	0	94.8	70	130	18.45	2.67	20	
Toluene	39.730	0.50	40.00	0	99.3	70	130	39.90	0.427	20	
Trichloroethene	19.760	0.50	20.00	0	98.8	70	130	19.44	1.63	20	
Surr: 1,2-Dichloroethane-d4	23.110		25.00		92.4	70	130		0	0	
Surr: 4-Bromofluorobenzene	25.600		25.00		102	70	130		0	0	
Surr: Dibromofluoromethane	23.120		25.00		92.5	70	130		0	0	
Surr: Toluene-d8	25.700		25.00		103	70	130		0	0	

Sample ID: **A111026MB2** SampType: **MBLK** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **PBW** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265271**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- DO Surrogate Diluted Out
- E Value above quantitation range
- R RPD outside accepted recovery limits
- Calculations are based on raw values
- H Holding times for preparation or analysis exceeded
- S Spike/Surrogate outside of limits due to matrix interference

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_WP_LL

Sample ID: **A111026MB2** SampType: **MBLK** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **PBW** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265271**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1,2-Tetrachloroethane	ND	0.50									
1,1,1-Trichloroethane	ND	0.50									
1,1,2,2-Tetrachloroethane	ND	0.50									
1,1,2-Trichloroethane	ND	0.50									
1,1-Dichloroethane	ND	0.50									
1,1-Dichloroethene	ND	0.50									
1,1-Dichloropropene	ND	0.50									
1,2,3-Trichlorobenzene	ND	0.50									
1,2,3-Trichloropropane	ND	0.50									
1,2,4-Trichlorobenzene	ND	0.50									
1,2,4-Trimethylbenzene	ND	0.50									
1,2-Dibromo-3-chloropropane	ND	0.50									
1,2-Dibromoethane	ND	0.50									
1,2-Dichlorobenzene	ND	0.50									
1,2-Dichloroethane	ND	0.50									
1,2-Dichloropropane	ND	0.50									
1,3,5-Trimethylbenzene	ND	0.50									
1,3-Dichlorobenzene	ND	0.50									
1,3-Dichloropropane	ND	0.50									
1,4-Dichlorobenzene	ND	0.50									
2,2-Dichloropropane	ND	0.50									
2-Chlorotoluene	ND	0.50									
4-Chlorotoluene	ND	0.50									
4-Isopropyltoluene	ND	0.50									
Benzene	ND	0.50									
Bromobenzene	ND	0.50									
Bromodichloromethane	ND	0.50									
Bromoform	ND	0.50									
Bromomethane	ND	0.50									
Carbon tetrachloride	ND	0.50									

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_WP_LL

Sample ID: **A111026MB2** SampType: **MBLK** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **PBW** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265271**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chlorobenzene	ND	0.50									
Chloroethane	ND	0.50									
Chloroform	ND	0.50									
Chloromethane	ND	0.50									
cis-1,2-Dichloroethene	ND	0.50									
cis-1,3-Dichloropropene	ND	0.50									
Dibromochloromethane	ND	0.50									
Dibromomethane	ND	0.50									
Dichlorodifluoromethane	ND	0.50									
Ethylbenzene	ND	0.50									
Hexachlorobutadiene	ND	0.50									
Isopropylbenzene	ND	0.50									
m,p-Xylene	ND	1.0									
Methylene chloride	ND	1.0									
n-Butylbenzene	ND	0.50									
n-Propylbenzene	ND	0.50									
Naphthalene	ND	0.50									
o-Xylene	ND	0.50									
sec-Butylbenzene	ND	0.50									
Styrene	ND	0.50									
tert-Butylbenzene	ND	0.50									
Tetrachloroethene	ND	0.50									
Toluene	ND	0.50									
trans-1,2-Dichloroethene	ND	0.50									
Trichloroethene	ND	0.50									
Trichlorofluoromethane	ND	0.50									
Vinyl chloride	ND	0.50									
Surr: 1,2-Dichloroethane-d4	23.540		25.00		94.2	70	130				
Surr: 4-Bromofluorobenzene	25.170		25.00		101	70	130				
Surr: Dibromofluoromethane	23.950		25.00		95.8	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: M&N - 193, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 8260_WP_LL

Sample ID: **A111026MB2** SampType: **MBLK** TestCode: **8260_WP_LL** Units: **µg/L** Prep Date: RunNo: **137894**
Client ID: **PBW** Batch ID: **A11VW208** TestNo: **EPA 8260B** Analysis Date: **10/26/2011** SeqNo: **2265271**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Toluene-d8	25.680		25.00		103	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

CHAIN OF CUSTODY RECORD

Page 1 of 1

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#: _____
Logged By: _____ Date: 10/25/11

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FEDEX ☑ Other: _____

Sample Condition Upon Receipt
1. CHILLED 9.6 Y☑ N☐ 4. SEALED Y☐ N☑
2. HEADSPACE (VOA) Y☐ N☐ 5. # OF SPLS MATCH COC Y☑ N☐
3. CONTAINER INTACT Y☑ N☐ 6. PRESERVED Y☐ N☑

Client: GEOCON CONSULTANTS, INC.
Attn: L. BEMOLE
Address: 6671 Brisa Street
City: Livermore State: CA Zip Code: 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

Project Name: M$N - A3 Project #: E8469-06-03 Sampler: (Printed Name) D. WATTS (Signature) Watts

Relinquished by: (Signature and Printed Name) Watts Date: 10/19/2011 Time: 1700 Received by: (Signature and Printed Name) FED-EX Date: 10/19/11 Time: 1700
Relinquished by: (Signature and Printed Name) Date: Time: Received by: (Signature and Printed Name) Mayo Date: 10/20/11 Time: 935
Relinquished by: (Signature and Printed Name) Date: Time: Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr / Submitter:
D. WATTS 10/19/11
Print Name Date
Watts
Signature

Send Report To:
Attn: _____
Co: SAME AS ABOVE
Address _____
City _____ State _____ Zip _____

Bill To:
Attn: _____
Co: SAME AS ABOVE
Address _____
City _____ State _____ Zip _____

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample : $2.00 / sample / mo (after 45 days)
- Records : $1.00 / ATL workorder / mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / BTEX / MtBE; 8015B (DRO) / mo; 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER

PRESERVATION

Q A / Q C: RTNE ☐ CT ☐ SWRCB ☐ Logcode ____ OTHER ____

ITEM	LAB USE ONLY: Batch #: / Lab No.	Sample Description: Sample I.D. / Location	Date	Time	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120415-1	GB1-1	10/19/11	1029	E	1	T m	C	
	2	-3		1034					
	3	-5		1039					
	4	GB1A-4		1127					
	-5	GB1A-6.5 (GWI)		1201					
	-6	GB1A-GW		1251		9	VA VA2 VA3	VC/HCl	

• TAT starts 8 a.m. following day if samples received after 3 p.m.

TAT: A= Overnight ≤ 24 hr; B= Emergency Next workday; C= Critical 2 Workdays; D= Urgent 3 Workdays; E= Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=Hcl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

DISTRIBUTION: White with report Yellow to folder Pink to submitter

November 17, 2011

Luann Beadle
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550

TEL: (925) 371-5900
FAX: (925) 371-5915

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Workorder No.: 120415

RE: MSN A3, E8469-06-03

Attention: Luann Beadle

Enclosed are the results for sample(s) received on October 20, 2011 by Advanced Technology Laboratories . The sample(s) are tested for the parameters as indicated in the enclosed chain of custody in accordance with the applicable laboratory certifications.

This is an addendum report. Please incorporate with documentation previously submitted.

Thank you for the opportunity to service the needs of your company.

Please feel free to call me at (562)989-4045 if I can be of further assistance to your company.

Sincerely,

Eddie F. Rodriguez
Laboratory Director

The cover letter is an integral part of this analytical report. This Laboratory Report cannot be reproduced in part or in its entirety without written permission from the client and Advanced Technology Laboratories.

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

CLIENT: Geocon Consultants, Inc.
Project: MSN A3, E8469-06-03
Lab Order: 120415

CASE NARRATIVE

Analytical Comments for Method 6010

Dilution was necessary for samples 120415-001A, 120415-002A and 120415-003A, due to sample matrix.

Advanced Technology Laboratories
3275 Walnut Avenue, Signal Hill, CA 90755 Tel: 562. 989.4045 Fax: 562.989.4040

CLIENT: Geocon Consultants, Inc. **Lab Order:** 120415
Project: MSN A3, E8469-06-03

Lab ID: 120415-001 **Collection Date:** 10/19/2011 10:29:00 AM
Client Sample ID: GB1-1 **Matrix:** SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111114C	QC Batch: R138289			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/14/2011 10:35 PM

Lab ID: 120415-002 **Collection Date:** 10/19/2011 10:34:00 AM
Client Sample ID: GB1-3 **Matrix:** SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111114C	QC Batch: R138289			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/14/2011 10:38 PM

Lab ID: 120415-003 **Collection Date:** 10/19/2011 10:39:00 AM
Client Sample ID: GB1-5 **Matrix:** SOIL

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS BY STLC						
		WET/ EPA 6010B				
RunID: ICP8_111114C	QC Batch: R138289			PrepDate:		Analyst: **CBB**
Chromium	ND	1.0		mg/L	20	11/14/2011 10:41 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
S	Spike/Surrogate outside of limits due to matrix interference		Results are wet unless otherwise specified
DO	Surrogate Diluted Out		

CLIENT: Geocon Consultants, Inc.
Work Order: 120415
Project: MSN A3, E8469-06-03

ANALYTICAL QC SUMMARY REPORT

TestCode: 6010_ST

Sample ID: **MB-76832A**	SampType: **MBLK**	TestCode: **6010_ST**	Units: **mg/L**	Prep Date:	RunNo: **138289**
Client ID: **PBS**	Batch ID: **R138289**	TestNo: **WET/ EPA 60**		Analysis Date: **11/14/2011**	SeqNo: **2272995**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	0.005	1.0									

Sample ID: **LCS-76832A**	SampType: **LCS**	TestCode: **6010_ST**	Units: **mg/L**	Prep Date:	RunNo: **138289**
Client ID: **LCSS**	Batch ID: **R138289**	TestNo: **WET/ EPA 60**		Analysis Date: **11/14/2011**	SeqNo: **2272996**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	1.915	1.0	2.000	0.004946	95.5	85	115				

Sample ID: **120415-003A-MS**	SampType: **MS**	TestCode: **6010_ST**	Units: **mg/L**	Prep Date:	RunNo: **138289**
Client ID: **GB1-5**	Batch ID: **R138289**	TestNo: **WET/ EPA 60**		Analysis Date: **11/14/2011**	SeqNo: **2273001**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.567	1.0	2.500	0.09011	99.1	74	103				

Sample ID: **120415-003A-MSD**	SampType: **MSD**	TestCode: **6010_ST**	Units: **mg/L**	Prep Date:	RunNo: **138289**
Client ID: **GB1-5**	Batch ID: **R138289**	TestNo: **WET/ EPA 60**		Analysis Date: **11/14/2011**	SeqNo: **2273002**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium	2.556	1.0	2.500	0.09011	98.6	74	103	2.567	0.405	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits	S	Spike/Surrogate outside of limits due to matrix interference
DO	Surrogate Diluted Out		Calculations are based on raw values		

Rachelle Arada

From: Luann Beadle [beadle@geoconinc.com]
Sent: Tuesday, November 08, 2011 9:32 AM
To: Rachelle Arada
Subject: RE: Results for M&N - 193, E8469-06-03 (120415)

Hi Rachelle,

Could you please run WET chromium analysis on the following sample IDs from this work order?

GB1-1
GB1-3
GB1-5

Thanks,
Luann

From: Rachelle Arada [mailto:rachelle@atlglobal.com]
Sent: Monday, November 07, 2011 5:40 PM
To: beadle@geoconinc.com
Subject: Results for M&N - 193, E8469-06-03 (120415)

Hi Luann,

Enclosed are the results for the above project.

Thanks,

Rachelle Arada
Project Manager

Advanced Technology Laboratories
www.atlglobal.com
Tel: (562) 989-4045 ext. 237
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Nevada and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

This message is intended for the use of the individual or entity to which it is addressed. This may contain information that is privileged, confidential, and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone and delete the original message. Thank you.

ADVANCED TECHNOLOGY LABORATORIES

April 10, 2012

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

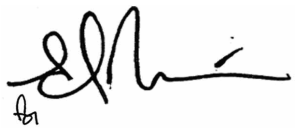
Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Tel: (925) 371-5900
Fax:(925) 371-5915

Re: ATL Work Order Number : 1201249
Client Reference : MSN, E8469-06-03A

Enclosed are the results for sample(s) received on April 06, 2012 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,



Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/10/2012

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB1-0	1201249-01	Soil	4/05/12 10:57	4/06/12 8:17
SB2-0	1201249-03	Soil	4/05/12 11:14	4/06/12 8:17
SB3-0	1201249-05	Soil	4/05/12 11:22	4/06/12 8:17
SB4-0	1201249-07	Soil	4/05/12 11:34	4/06/12 8:17
SB5-0	1201249-09	Soil	4/05/12 11:41	4/06/12 8:17
SB6-0	1201249-11	Soil	4/05/12 11:49	4/06/12 8:17

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/10/2012

Total Metals by ICP-AES EPA 6010B

Analyte: Lead **Analyst: KK/HF**

Laboratory ID	Client Sample ID	Result	Units	PQL	MDL	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1201249-01	SB1-0	**6.3**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:43	
1201249-03	SB2-0	**3.9**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:44	
1201249-05	SB3-0	**68**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:46	
1201249-07	SB4-0	**220**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:48	
1201249-09	SB5-0	**190**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:49	
1201249-11	SB6-0	**73**	mg/kg	1.0	NA	1	B2D0290	04/09/2012	04/09/12 18:51	

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/10/2012

QUALITY CONTROL SECTION

Total Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B2D0290 - EPA 3050B									
Blank (B2D0290-BLK1)					Prepared: 4/9/2012 Analyzed: 4/9/2012				
Lead	ND	1.0			NR				
LCS (B2D0290-BS1)					Prepared: 4/9/2012 Analyzed: 4/9/2012				
Lead	48	1.0	50.0		95.6	80 - 120			
Matrix Spike (B2D0290-MS1)		**Source: 1201281-14**			Prepared: 4/9/2012 Analyzed: 4/9/2012				
Lead	150	1.0	125	66	67.9	46 - 116			
Matrix Spike Dup (B2D0290-MSD1)		**Source: 1201281-14**			Prepared: 4/9/2012 Analyzed: 4/9/2012				
Lead	160	1.0	125	66	73.7	46 - 116	4.67	20	

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/10/2012

Notes and Definitions

ND	Analyte not detected at or above reporting limit
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#: _____

Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FEDEX ☐ Other: GSO

Sample Condition Upon Receipt: YC
1. CHILLED Y☑ N☐ 4. SEALED Y☐ N☐
2. HEADSPACE (VOA) Y☐ N☐ 5. # OF SPLS MATCH COC Y☐ N☐
3. CONTAINER INTACT Y☐ N☐ 6. PRESERVED Y☐ N☐

Client: GEOCON CONSULTANTS, INC.
Attn:
Address: 6671 Brisa Street
City Livermore State CA Zip Code 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

Project Name: MSN Project #: E8469-06-03A Sampler: (Printed Name) Dave Watts / L.C. Beadle (Signature)

Relinquished by: (Signature and Printed Name) LuAnn Beadle Date: 4-5-12 Time: 1700 — Received by: (Signature and Printed Name) GSO delivery — Date: 4/5/12 Time: 1700

Relinquished by: (Signature and Printed Name) Date: Time: — Received by: (Signature and Printed Name) 650 — Date: 4/6/12 Time: 817

Relinquished by: (Signature and Printed Name) Date: Time: — Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: LuAnn Beadle 4-5-12 (Print Name / Date)
Signature

Send Report To:
Attn: Rick Day
Co: SAME AS ABOVE
Address dar@geoconinc.com
City _____ State _____ Zip _____

Bill To:
Attn: Rick Day
Co: SAME AS ABOVE
Address _____
City _____ State _____ Zip _____

Special Instructions/Comments:
48-hr TAT

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample : $2.00 / sample / mo (after 45 days)
- Records : $1.00 / ATL workorder / mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides) / 8082 (PCB) / 8260B (Volatiles) / 8270C (BNA) / 6010B (Total Metal) - Pb / 8015B (GRO) / BTEX / 8015B (DRO) / 8021 (BTEX) / TITLE 22 / CAM 17 (6010 / 7000)

SPECIFY APPROPRIATE MATRIX: SOIL / WATER / GROUND WATER / WASTEWATER

PRESERVATION

QA/QC: RTNE ☐ CT ☐ SWRCB ☐ Logcode ____ OTHER ____

ITEM	LAB USE ONLY: Batch #: / Lab No.	Sample Description: Sample I.D. / Location	Date	Time	Pb	SOIL	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	120249-01	SB1-0	4/5/12	1057	X	X	C	1	2P	I	
	-02	SB1-1		↓							HOLD
	-03	SB2-0		1114							
	-04	SB2-1		↓							HOLD
	-05	SB3-0		1122							
	-06	SB3-1		↓							HOLD
	-07	SB4-0		1134							
	-08	SB4-1		↓							HOLD
	-09	SB5-0		1141							
	-10	SB5-1		↓							HOLD

• TAT starts 8 a.m. following day if samples received after 3 p.m.

TAT: A= Overnight ≤ 24 hr B= Emergency Next workday C= Critical 2 Workdays D= Urgent 3 Workdays E= Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=Hcl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

DISTRIBUTION: White with report Yellow to folder Pink to submitter

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#: _____

Logged By: _____ Date: _____

Method of Transport: Client ☐ ATL ☐ CA OverN ☐ FEDEX ☐ Other: _____

Sample Condition Upon Receipt
1. CHILLED Y☐ N☐ 4. SEALED Y☐ N☐
2. HEADSPACE (VOA) Y☐ N☐ 5. # OF SPLS MATCH COC Y☐ N☐
3. CONTAINER INTACT Y☐ N☐ 6. PRESERVED Y☐ N☐

Client: GEOCON CONSULTANTS, INC.
Attn:
Address: 6671 Brisa Street
City Livermore State CA Zip Code 94550
TEL: (925) 371-5900
FAX: (925) 371-5915

Project Name: MSN Project #: E8469-06-03A
Sampler: (Printed Name) Dave Watts / LuAnn Beadle (Signature)

Relinquished by: (Signature and Printed Name) LuAnn Beadle Date 4-5-12 Time 0550
Received by: (Signature and Printed Name) Date: 4/5/12 Time: 1706

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: 4/6/12 Time: 817

Relinquished by: (Signature and Printed Name) Date: Time:
Received by: (Signature and Printed Name) Date: Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter: LuAnn Beadle 4-5-12
Print Name Date
Signature

Send Report To:
Attn: Rick Day
Co: SAME AS ABOVE
Address
City State Zip

Bill To:
Attn: Rick Day
Co: SAME AS ABOVE
Address
City State Zip

Special Instructions/Comments:

Sample/Records - Archival & Disposal
Unless otherwise requested by client, all samples will be disposed 45 days after receipt and records will be disposed 1 year after submittal of final report.

Storage Fees (applies when storage is requested):
- Sample : $2.00 / sample / mo (after 45 days)
- Records : $1.00 / ATL workorder / mo (after 1 year)

Circle or Add Analysis(es) Requested: 8081A (Pesticides); 8082 (PCB); 8260B (Volatiles); 8270C (BNA); 6010B (Total Metal); 8015B (GRO) / BTEX; 8015B (DRO); 8021 (BTEX); TITLE 22 / CAM 17 (6010 / 7000)

SPECIFY APPROPRIATE MATRIX: SOIL; WATER; GROUND WATER; WASTEWATER

PRESERVATION

QA/QC: RTNE ☐ CT ☐ SWRCB ☐ Logcode ____ OTHER ____

ITEM	LAB USE ONLY: Batch #: / Lab No.	Sample Description: Sample I.D. / Location	Date	Time	8081A	8082	8260B	8270C	6010B	8015B (GRO) / BTEX	8015B (DRO)	8021 (BTEX)	TITLE 22 / CAM 17	SOIL	WATER	GROUND WATER	WASTEWATER	TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS
	1201249-11	SB6-0	4/5/12	1149				X						X				C	1	Zip	L	
	-12	SB6-1	↓	1152				↓						↓				↓	↓	↓	L	HOLD

• TAT starts 8 a.m. following day if samples received after 3 p.m.

TAT: A= Overnight ≤ 24 hr B= Emergency Next workday C= Critical 2 Workdays D= Urgent 3 Workdays E= Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=HCl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

DISTRIBUTION: White with report Yellow to folder Pink to submitter

ADVANCED TECHNOLOGY LABORATORIES

April 11, 2012

ELAP No.: 1838
NELAP No.: 02107CA
CSDLAC No.: 10196
ORELAP No.: CA300003

Rick Day
Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Tel: (925) 371-5900
Fax:(925) 371-5915

Re: ATL Work Order Number : 1201249
Client Reference : MSN, E8469-06-03A

Enclosed are the results for sample(s) received on April 06, 2012 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/11/2012

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB1-1	1201249-02	Soil	4/05/12 10:57	4/06/12 8:17
SB2-1	1201249-04	Soil	4/05/12 11:14	4/06/12 8:17
SB3-1	1201249-06	Soil	4/05/12 11:22	4/06/12 8:17
SB4-1	1201249-08	Soil	4/05/12 11:34	4/06/12 8:17
SB5-1	1201249-10	Soil	4/05/12 11:41	4/06/12 8:17
SB6-1	1201249-12	Soil	4/05/12 11:52	4/06/12 8:17

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/11/2012

Total Metals by ICP-AES EPA 6010B

Analyte: Lead **Analyst: SB**

Laboratory ID	Client Sample ID	Result	Units	PQL	MDL	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1201249-02	SB1-1	**11**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:02	
1201249-04	SB2-1	**19**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:04	
1201249-06	SB3-1	**6.4**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:06	
1201249-08	SB4-1	**7.9**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:11	
1201249-10	SB5-1	**6.3**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:13	
1201249-12	SB6-1	**9.4**	mg/kg	1.0	NA	1	B2D0415	04/11/2012	04/11/12 14:14	

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/11/2012

QUALITY CONTROL SECTION

Total Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B2D0415 - EPA 3050B									
Blank (B2D0415-BLK1)					Prepared: 4/11/2012 Analyzed: 4/11/2012				
Lead	ND	1.0			NR				
LCS (B2D0415-BS1)					Prepared: 4/11/2012 Analyzed: 4/11/2012				
Lead	46	1.0	50.0		92.6	80 - 120			
Matrix Spike (B2D0415-MS1)		**Source: 1201249-12**			Prepared: 4/11/2012 Analyzed: 4/11/2012				
Lead	110	1.0	125	9.4	83.0	46 - 116			
Matrix Spike Dup (B2D0415-MSD1)		**Source: 1201249-12**			Prepared: 4/11/2012 Analyzed: 4/11/2012				
Lead	110	1.0	125	9.4	78.6	46 - 116	5.00	20	

Geocon Consultants, Inc.	Project Number : MSN, E8469-06-03A
6671 Brisa Street	Report To : Rick Day
Livermore , CA 94550	Reported : 04/11/2012

Notes and Definitions

ND	Analyte not detected at or above reporting limit
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference

Diane Galvan

From: Rick Day [day@geoconinc.com]
Sent: Wednesday, April 11, 2012 9:23 AM
To: Diane Galvan
Subject: RE: Results/EDD/Invoice - MSN (1201249)

Hi Diane –

Please analyze the six samples on hold for total lead – need ASAP.

Thanks,
Rick.

Richard Day, CEG, CHG | *Senior Geologist / Vice President*
Geocon Consultants, Inc.
6671 Brisa Street, Livermore, California 94550
Tel 925.371.5900 Fax 925.371.5915 Cell 925.872.5860
www.geoconinc.com

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: (510) 895-3680 Email: sanleandrolab@emsl.com

Attn: **Rick Day**
Geocon Consultants, Inc.
6671 Brisa Street

Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8469-06-03 / Marin-Sonoma Narrows A 3**

Customer ID: GECN21
Customer PO: E8469-06-03
Received: 10/14/11 9:00 AM
EMSL Order: 091111754

EMSL Proj:
Analysis Date: 10/27/2011

Test Report: PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
NB4-2.5 *091111754-0001*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
NB5-2.5 *091111754-0002*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
NB8-2.5 *091111754-0003*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
NB11-2.5 *091111754-0004*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
NB14-2.5 *091111754-0005*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
NB17-2.5 *091111754-0006*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
NB20-2.5 *091111754-0007*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M38-2.5 *091111754-0008*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M36-2.5 *091111754-0009*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**

Initial report from 10/27/2011 21:13:23

Analyst(s)

Adam C. Fink (15)

Baojia Ke, Laboratory Manager
or other approved signatory

This report relates only to the samples listed above and may not be reproduced except in full, without EMSL's written approval. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. EMSL is not responsible for sample collection activities or method limitations. Some samples may contain asbestos fibers below the resolution limit of PLM. EMSL recommends that samples reported as none detected or less than the limit of detection undergo additional analysis via TEM.Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc San Leandro, CA

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: (510) 895-3680 Email: sanleandrolab@emsl.com

Attn: **Rick Day**
Geocon Consultants, Inc.
6671 Brisa Street

Livermore, CA 94550

Fax: (925) 371-5915 Phone: (925) 371-5900
Project: **E8469-06-03 / Marin-Sonoma Narrows A 3**

Customer ID: GECN21
Customer PO: E8469-06-03
Received: 10/14/11 9:00 AM
EMSL Order: 091111754

EMSL Proj:
Analysis Date: 10/27/2011

Test Report: PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling) Level A for 0.25% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
M35-2.5 *091111754-0010*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**<0.25% Chrysotile**
M33-2.5 *091111754-0011*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M30-2.5 *091111754-0012*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M27-2.5 *091111754-0013*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M24-2.5 *091111754-0014*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
M21-2.5 *091111754-0015*		Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**

Initial report from 10/27/2011 21:13:23

Analyst(s)
Adam C. Fink (15)

Baojia Ke, Laboratory Manager
or other approved signatory

This report relates only to the samples listed above and may not be reproduced except in full, without EMSL's written approval. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. EMSL is not responsible for sample collection activities or method limitations. Some samples may contain asbestos fibers below the resolution limit of PLM. EMSL recommends that samples reported as none detected or less than the limit of detection undergo additional analysis via TEM.Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc San Leandro, CA

THIS IS THE LAST PAGE OF THE REPORT.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Chain of Custody

EMSL Order Number (*Lab Use Only*): 091111754

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Company : GEOCON CONSULTANTS		**EMSL-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party	
Street: 6671 BRISA STREET			
City: LIVERMORE	**State/Province:** CA	**Zip/Postal Code:** 94550	**Country:** USA
Report To (Name): RICK DAY		**Fax #:** 925-371-5915	
Telephone #: 925-371-5900		**Email Address:** DAY@GEOCONINC.COM	
Project Name/Number: MARIN-SONOMA NARROWS A3		E8469-06-03	
Please Provide Results: ☐ Fax ☒ Email	**Purchase Order:**	**U.S. State Samples Taken:**	

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour | ☐ 6 Hour | ☐ 24 Hour | ☐ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☐ 1 Week | ☒ 2 Week

**For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability. Not all TAT options are valid for every test. Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour = End of Next Business Day)*

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM– Air ☐ 4-4.5hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☐ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☒ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)

Other:

Lead (Pb)

Flame Atomic Absorption
☐ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☐ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing

Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination
Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist
Radon Testing: Call for Kit and COC
Other: ☐

****Comments/Special Instructions:**

Client Sample #'s	Various		**Total # of Samples:** 15
Relinquished (Client):		**Date:** 10/13/4	**Time:** 1500
Received (Lab):		**Date:** 10/14/4	**Time:** 9 AM

Analysis Completed in Accordance with EMSL's Terms and Conditions located in the Analytical Price Guide

EMSL ANALYTICAL, INC.

Asbestos Lab Services Chain of Custody

EMSL Order Number *(Lab Use Only)*: 091111754

San Leandro, CA
Suite 230
2235 Polvorosa Ave
San Leandro, CA 94577
PHONE: (510) 895-3675
FAX: (510) 895-3680

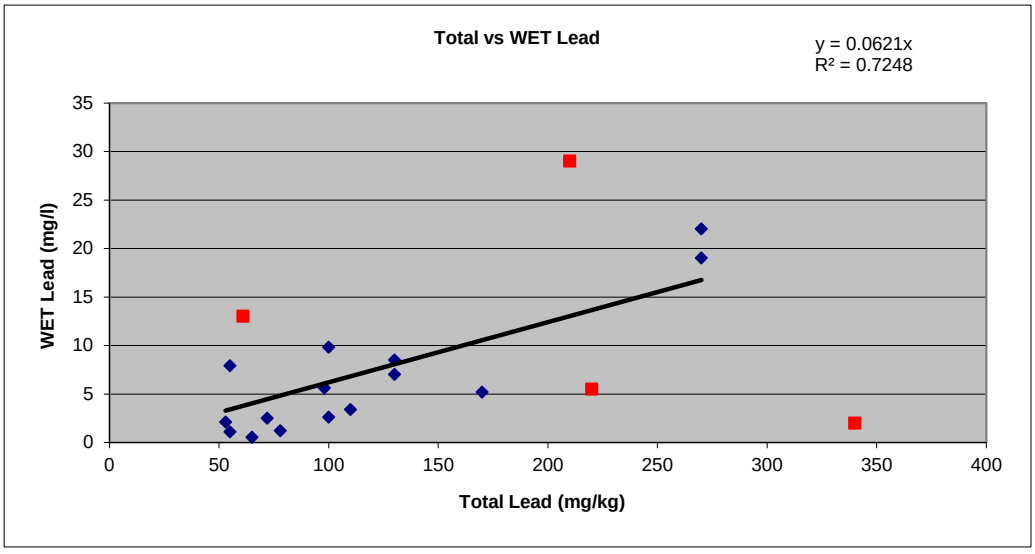
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
NB4-2.5	SOIL SAMPLE FROM DIRECT PUSH RIG. DEPTH OF 2.5'		10/10/11 0918
NB5-2.5			10/10/11 0925
NB8-2.5			10/10/11 0946
NB11-2.5			10/10/11 1009
NB14-2.5			10/10/11 1034
NB17-2.5			10/10/11 1216
NB20-2.5			10/10/11 1237
M38-2.5			10/10/11 1314
M36-2.5			10/10/11 1329
M35-2.5			10/10/11 1336
M33-2.5			10/10/11 1352
M30-2.5			10/10/11 1415
M27-2.5			10/10/11 1435
M24-2.5			10/10/11 1459
M21-2.5			10/10/11 1512

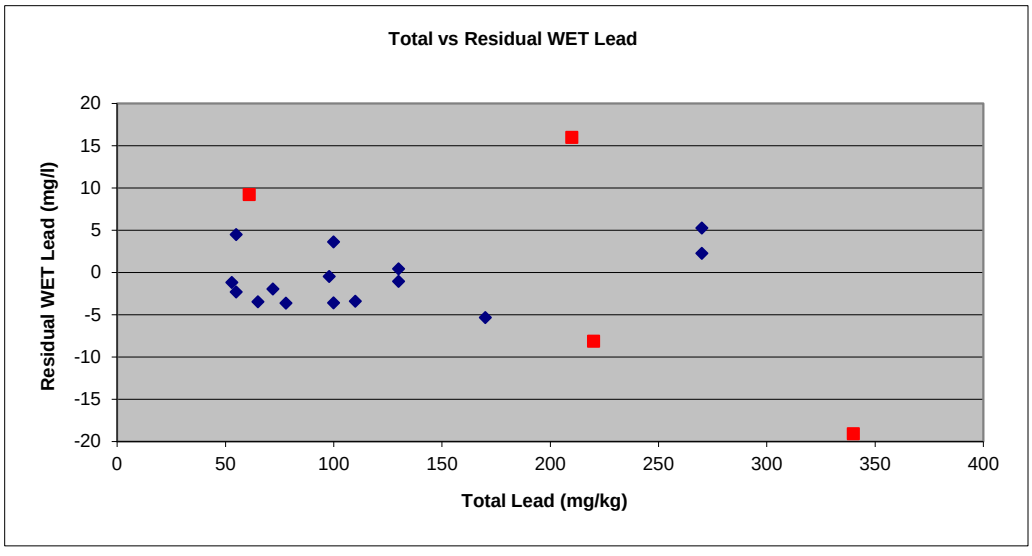
Comments/Special Instructions:

2 — 10/14/11 9:00A

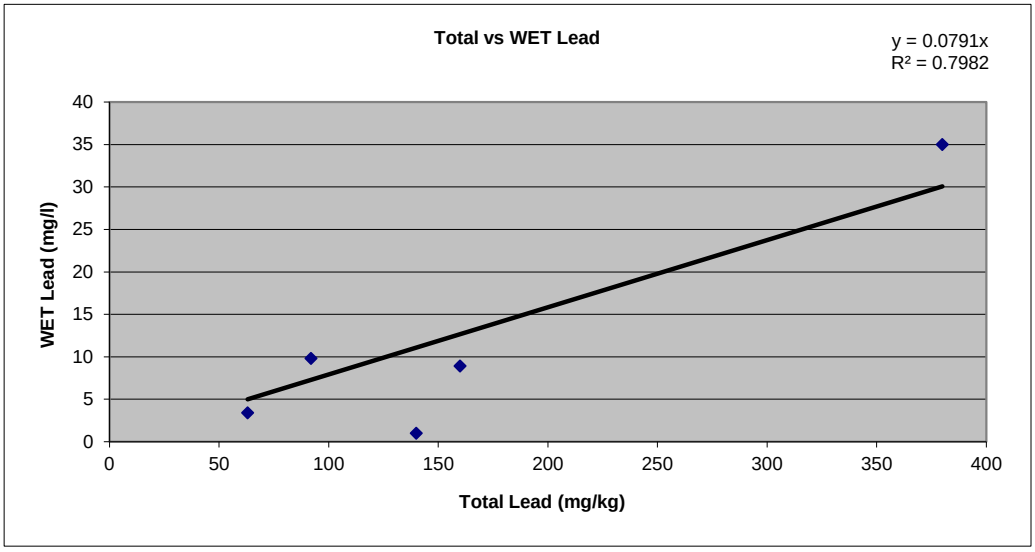
APPENDIX C

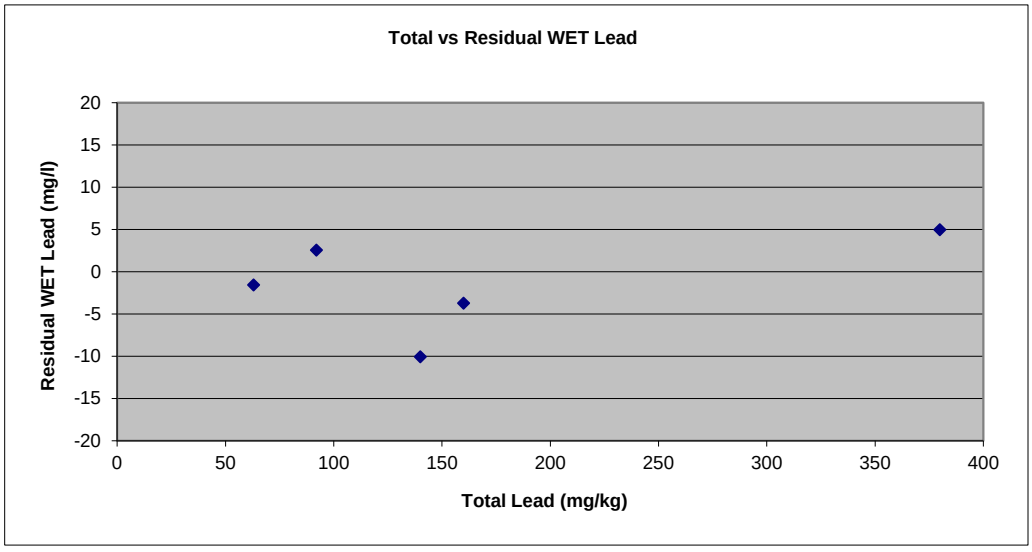
Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	Residual WET Lead (mg/l)	Squared Residual WET Lead (mg/l)
M29-0	0	130	8.5	0.43	0.18
M28-0	0	98	5.6	-0.48	0.23
M27-0	0	130	7.0	-1.07	1.15
M21-0	0	53	2.1	-1.19	1.42
M38-0	0	72	2.5	-1.97	3.88
M33-0	0	270	19	2.24	5.00
M31-2	2	55	1.1	-2.31	5.36
M37-0	0	110	3.4	-3.43	11.76
M36-0	0	65	0.54	-3.50	12.22
M31-0	0	100	9.8	3.59	12.90
M22-0	0	100	2.6	-3.61	13.02
M35-0	0	78	1.2	-3.64	13.27
M23-0	0	55	7.9	4.49	20.12
M26-0	0	270	22	5.24	27.42
M39-0	0	170	5.2	-5.36	28.68
Not Used					
M40-0	0	220	5.5	-8.16	66.58
M30-0	0	61	13	9.21	84.87
M32-0	0	210	29	15.96	254.77
M34-0	0	340	2.0	-19.11	365.20





Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	WET Lead (mg/l)	Residual WET Lead (mg/l)	Squared Residual WET Lead (mg/l)
NB15-1	1	63	3.4	-1.58	2.51
NB14-1	1	92	9.8	2.52	6.37
NB11-2	2	160	8.9	-3.76	14.10
NB19-1	1	380	35	4.94	24.44
NB15-0	1	140	1.0	-10.07	101.47





Pb - NB-0	
Number of Valid Observations	20
Number of Distinct Observations	19
Minimum	1.4
Maximum	140
Mean	18.78
Median	9.9
SD	30.11
Variance	906.4
Coefficient of Variation	1.604
Skewness	3.771
Mean of log data	2.323
SD of log data	1.063
90% Standard Bootstrap UCL	**27.43**
95% Standard Bootstrap UCL	**29.62**

Pb - Median-0	
Number of Valid Observations	20
Number of Distinct Observations	17
Minimum	28
Maximum	340
Mean	130.1
Median	100
SD	88.07
Variance	7757
Coefficient of Variation	0.677
Skewness	1.058
Mean of log data	4.655
SD of log data	0.679
90% Standard Bootstrap UCL	**154.5**
95% Standard Bootstrap UCL	**161.5**

Pb - NB-1	
Number of Valid Observations	20
Number of Distinct Observations	18
Minimum	2.6
Maximum	380
Mean	37.48
Median	9.05
SD	83.69
Variance	7005
Coefficient of Variation	2.233
Skewness	3.991
Mean of log data	2.692
SD of log data	1.161
90% Standard Bootstrap UCL	**60.29**
95% Standard Bootstrap UCL	**66.87**

Pb - Median-1	
Number of Valid Observations	20
Number of Distinct Observations	15
Minimum	1.5
Maximum	33
Mean	8.73
Median	7.4
SD	6.59
Variance	43.42
Coefficient of Variation	0.755
Skewness	2.766
Mean of log data	1.953
SD of log data	0.693
90% Standard Bootstrap UCL	**10.52**
95% Standard Bootstrap UCL	**11.16**

Pb - NB-2	
Number of Valid Observations	20
Number of Distinct Observations	16
Minimum	3.7
Maximum	160
Mean	14.4
Median	6.5
SD	34.31
Variance	1177
Coefficient of Variation	2.383
Skewness	4.454
Mean of log data	2.034
SD of log data	0.763
90% Standard Bootstrap UCL	**24.13**
95% Standard Bootstrap UCL	**26.75**

Pb - Median-2	
Number of Valid Observations	20
Number of Distinct Observations	16
Minimum	0.5
Maximum	55
Mean	7.92
Median	5.4
SD	11.54
Variance	133.1
Coefficient of Variation	1.457
Skewness	3.917
Mean of log data	1.553
SD of log data	1.048
90% Standard Bootstrap UCL	**11.22**
95% Standard Bootstrap UCL	**12.1**

Pb SB	
Number of Valid Observations	20
Number of Distinct Observations	19
Minimum	3.9
Maximum	220
Mean	38.44
Median	13
SD	60.39
Variance	3647
Coefficient of Variation	1.571
Skewness	2.443
Mean of log data	2.879
SD of log data	1.165
90% Standard Bootstrap UCL	**55.3**
95% Standard Bootstrap UCL	**60.0**

Pb - Site - 0	
Number of Valid Observations	50
Number of Distinct Observations	45
Minimum	1.4
Maximum	340
Mean	72.97
Median	36.5
SD	83.5
Variance	6972
Coefficient of Variation	1.144
Skewness	1.492
Mean of log data	3.501
SD of log data	1.43
90% Standard Bootstrap UCL	**87.76**
95% Standard Bootstrap UCL	**92.3**

Pb - Site - 1	
Number of Valid Observations	51
Number of Distinct Observations	36
Minimum	1.5
Maximum	380
Mean	20.21
Median	8.6
SD	53.65
Variance	2878
Coefficient of Variation	2.655
Skewness	6.33
Mean of log data	2.297
SD of log data	0.912
90% Standard Bootstrap UCL	**29.79**
95% Standard Bootstrap UCL	**32.56**

Pb - Site - 2	
Number of Valid Observations	40
Number of Distinct Observations	31
Minimum	0.5
Maximum	160
Mean	11.16
Median	6.2
SD	25.48
Variance	649.2
Coefficient of Variation	2.283
Skewness	5.503
Mean of log data	1.794
SD of log data	0.937
90% Standard Bootstrap UCL	**16.36**
95% Standard Bootstrap UCL	**17.67**

As	
Number of Valid Observations	29
Number of Distinct Observations	18
Minimum	0.5
Maximum	10
Mean	2.41
Median	1.6
SD	2.159
Variance	4.662
Coefficient of Variation	0.896
Skewness	1.613
Mean of log data	0.466
SD of log data	0.972
95% Standard Bootstrap UCL	**3.052**

Co	
Number of Valid Observations	29
Number of Distinct Observations	19
Minimum	2.7
Maximum	46
Mean	13.1
Median	11
SD	8.84
Variance	78.14
Coefficient of Variation	0.675
Skewness	2.088
Mean of log data	2.382
SD of log data	0.64
95% Standard Bootstrap UCL	**15.7**

Hg	
Number of Valid Observations	29
Number of Distinct Observations	10
Minimum	0.05
Maximum	1.4
Mean	0.142
Median	0.05
SD	0.252
Variance	0.0635
Coefficient of Variation	1.778
Skewness	4.764
Mean of log data	-2.44
SD of log data	0.805
95% Standard Bootstrap UCL	**0.216**

V	
Number of Valid Observations	29
Number of Distinct Observations	20
Minimum	8
Maximum	49
Mean	23.39
Median	21
SD	10.46
Variance	109.4
Coefficient of Variation	0.447
Skewness	0.752
Mean of log data	3.053
SD of log data	0.464
95% Standard Bootstrap UCL	**26.56**

Ni	
Number of Valid Observations	29
Number of Distinct Observations	23
Minimum	10
Maximum	770
Mean	72.62
Median	45
SD	136.3
Variance	18579
Coefficient of Variation	1.877
Skewness	5.114
Mean of log data	3.798
SD of log data	0.842
95% Standard Bootstrap UCL	**112**

TPHd	
Number of Valid Observations	24
Number of Distinct Observations	23
Minimum	0.5
Maximum	230
Mean	49.52
Median	22
SD	61.67
Variance	3803
Coefficient of Variation	1.245
Skewness	1.79
Mean of log data	3.002
SD of log data	1.587
95% Standard Bootstrap UCL	**69.92**

Pb - Site - All Depths	
Number of Valid Observations	145
Number of Distinct Observations	91
Minimum	0.5
Maximum	380
Mean	35.7
Median	8.7
SD	65.57
Variance	4299
Coefficient of Variation	1.836
Skewness	3.062
Mean of log data	2.575
SD of log data	1.315
95% Standard Bootstrap UCL	**44.53**

TPHmo	
Number of Valid Observations	24
Number of Distinct Observations	23
Minimum	0.5
Maximum	1600
Mean	271.6
Median	120
SD	385.2
Variance	148377
Coefficient of Variation	1.418
Skewness	2.266
Mean of log data	4.294
SD of log data	2.099
95% Standard Bootstrap UCL	**396.6**

GEOTECHNICAL MATERIALS REPORT

MSN A3 NB HOV LANE WIDENING PROJECT
NOVATO, MARIN COUNTY, CALIFORNIA
04-Mrn-101, PM R22.2/24.3

For

BKF-ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94588

PARIKH CONSULTANTS, INC.

2360 Qume Drive, Suite A, San Jose, CA 95131
(408) 452-9000

June 2012

Job No. 2011-145-GDR

PARIKH
Practicing in the Geosciences

Geotechnical ■
Environmental ■
Materials Testing ■
Construction Inspection ■

BKF-ENGINEERS
4670 Willow Road, Suite 250
Pleasanton, CA 94558

Job No.: 2011-145-GDR
June 7, 2012

Attn: Mr. Gordon Sweet

Sub: GEOTECHNICAL MATERIALS REPORT
MSN A3 NB HOV LANE WIDENING PROJECT, NOVATO, MARIN COUNTY CALIFORNIA
04-Mrn-101, PM R22.2/24.3

Dear Mr. Gordon Sweet:

Transmitted herewith is the Geotechnical Materials Report for the subject project. The report was prepared in accordance with the scope of work outlined in our agreement. The report has incorporated Caltrans review comments.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning our findings or conclusions, please feel free to contact this office.

Very truly yours,
PARIKH CONSULTANTS, INC.

Gary Parikh, P.E., G.E., 666
Project Manager

Attachment: Geotechnical Materials Report

"Approved as to impact on State facilities and conformance with applicable State standards and practices, and the technical oversight were performed as described in the California Department of Transportation A&E Consultant Services Manual."

Caltrans_____

Title_____

Date_____

Caltrans_____

Title_____

Date_____

TABLE OF CONTENTS

Page No.

Title Page 1

Letter of Transmittal 2

Legal Protection of Design Immunity for State 3

Table of Contents 4

List of Tables 7

List of Plates 8

1. INTRODUCTION 9

2. EXISTING FACILITIES AND PROPOSED IMPROVEMENTS 10

3. PERTINENT REPORTS AND INVESTIGATION 11

4. PHYSICAL SETTING 11

   4.1 Climate 11

   4.2 Topography 12

   4.3 Drainage Features 12

   4.4 Man-Made and Natural Features of Engineering and Construction Significance 13

   4.5 Regional Geology and Seismicity 13

5. EXPLORATION 15

   5.1 Drilling and Sampling 15

   5.2 Geologic Mapping 16

   5.3 Geophysical Studies 16

   5.4 Instrumentation 17

   5.5 Exploration Notes 17

6. GEOTECHNICAL TESTING 17

   6.1 In-Situ Testing 17

TABLE OF CONTENTS (Cont.)

Page No.

6.2 Laboratory Testing 17

7. GEOTECHNICAL CONDITIONS 17

7.1 Site Geology 17

7.1.1 Lithology 20

7.1.2 Structure 20

7.1.3 Existing Slope Stability 21

7.2 Subsurface Soil Conditions 21

7.3 Water 22

7.3.1 Surface Water 22

7.3.1.1Scour 22

7.3.1.2Erosion 22

7.3.2 Groundwater 23

7.4 Project Site Seismicity 23

7.4.1 Ground Motions 23

7.4.2 Ground Rupture 24

7.4.3 Liquefaction Potential 24

8. GEOTECHNICAL ANALYSES AND DESIGN 25

8.1 Cuts and Excavations 25

8.1.1 Stability 25

8.1.2 Rippability 25

8.1.3 Grading Factor 26

TABLE OF CONTENTS (Cont.)

Page No.

8.2 Embankments 26

8.3 Corrosion Investigation 26

8.4 Culvert 27

9. STRUCTURAL PAVEMENT 28

10. MATERIAL SOURCES 31

11. MATERIAL DISPOSAL 31

12. CONSTRUCTION CONSIDERATIONS 32

12.1 Construction Advisories 32

12.2 Construction Consideration that Influence Specifications 33

12.3 Construction Monitoring and Instrumentation 33

12.4 Hazardous Waste Considerations 33

12.5 Differing Site Conditions 33

13. RECOMMENDATIONS AND SPECIFICATIONS 34

13.1 Summary of Recommendations 34

13.2 Recommended Materials Specifications 34

13.2.1 Standard Specifications 34

13.2.2 Special Provisions 35

14. INVESTIGATIONS LIMITATIONS 36

REFERENCES

TABLE OF CONTENTS (Cont.)

APPENDICES

Appendix A

Field Exploration

Reference Log of Test Borings from "North Novato Overhead (Widen)"

Appendix B

Laboratory Tests ..... Plate B-1

Plasticity Chart ..... Plate B-2
Corrosion Tests ..... Plates B-3A through B-3F
R-Value Tests ..... Plates B-4A through B-4K

Appendix C

Structural Pavement Design

Caltrans "AltPipe" Program Input /Output Recommended Minimum Coating Thickness for Culverts

Appendix D

003 MSN A3 95% Technical Comment Review and Reponses - Materials

009 MSN A3 95% Technical Comment Review and Reponses - Geotechnical Design

018 - MSN A3 Final PS&E – Geotechnical Design

LIST OF TABLES

Table		Page No.
1	Summary of Borings	16
2	Summary of Subsurface Soil Conditions	21
3	Earthquake Data	24
4	Summary of Corrosion Test Results	26
5	Summary of As-built Structural Pavement Sections	29
6	Summary of R-Value Test Results	29

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

Table		Page No.
7	Summary of Recommended Structural Pavement Sections	31
8	Sources of Imported Borrow	31

PLATES

Project Location Map ..... Plate 1

Site Plan ..... Plate 2

Geologic Map ..... Plate 3

Fault Map ..... Plate 4

Recommended ARS Curve ..... Plate 5

Typical Cross Sections (X-1 through X-6)

GEOTECHNICAL MATERIALS REPORT
MSN A3 NB HOV LANE WIDENING PROJECT
NOVOTO, MARIN COUNTY, CALIFORNIA
04-Mrn-101, PM R22.2/24.3

1. INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed "MSN A3 NB HOV Lane Widening Project", hereinafter referred to as "PROJECT" in City of Novato, Marin County, California. The work was performed in general accordance with the scope of work outlined in our agreement with BKF-Engineers (Designer). The general location of the project is shown on the Project Location Map, Plate 1.

This report addresses geotechnical design recommendations for corrosion potential and structural pavement design of the roadway portion of the High Occupancy Vehicle (HOV) lane widening of the project. The investigation included review of readily available geologic literature pertaining to the site, site reconnaissance, obtaining representative soil bulk samples and logging soil materials encountered in soil borings, laboratory testing of the representative soil samples, performing engineering analyses, and preparation of this report. No structures, walls or other elements are proposed that requires preparation of a "Geotechnical Design Report". Therefore only a "Materials Report" is prepared.

The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the roadway portions of the project including structural pavement. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions, if any. A separate Foundation Report for the "North Novato Overhead Widen" had been submitted.

The report is intended for use by the project roadway design engineer, construction personnel, bidders and contractors for information and reference purposes only and should not be construed as project specifications.

2. EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

Existing Facilities

The project site is located in the vicinity of the intersection of the northbound State Route (SR) 101and SMART railroad in the City of Novato, Marin County.

Within the Segment A3 project limits, northbound State Route (SR) 101 is an access-controlled facility in the City of Novato. The northbound 101 facility begins as a four-lane freeway from the SR 101/Atherton Avenue Interchange, with 1 High Occupancy Vehicle (HOV) lane and 3 Single Occupancy Vehicle (SOV) lanes. The freeway ends at about 1.24 miles north of the SR 101/Atherton Avenue Interchange and reduces from 3 lanes to 2 lanes of expressway. The travel lanes are 12 feet wide. Outside shoulders vary between 8 to 10 feet wide and inside shoulders vary between 4 to 5 feet wide.

At the southern project limits, the Atherton Avenue Interchange is a Type L-1 (diamond) interchange. North Novato Overhead (Bridge No. 27-0094R) is located approximately 0.2 miles north of the Atherton Avenue Overcrossing. This bridge structure spans over the Sonoma Marin Area Rail Transit (SMART) railway and Rush Landing Road. The overhead structure accommodates three 12 foot lanes, a 5-foot inside shoulder, and a 10 outside shoulder in each direction.

Proposed Improvements

The California Department of Transportation (Caltrans) in cooperation with Federal Highways Administration (FHWA), the Transportation Authority of Marin (TAM), and Sonoma County Transportation Authority (SCTA) propose to improve State Route (SR) 101 through Marin/Sonoma Narrows (MSN) between SR 37 in the City of Novato to just north of the Corona Road Overcrossing in the City of Petaluma.

The “Marin-Sonoma Narrows (MSN) A3 NB High Occupancy Vehicle (HOV) Lane Widening Project” (hereinafter referred to as “MSN A3 PROJECT”) is proposed to widen northbound SR

101 to provide an HOV lane and 10-foot inside shoulder for approximately 2 miles north of the MSN A1 HOV system within the City of Novato in Marin County.

The existing North Novato Overhead Bridge, which is located just north of Atherton Avenue, will be widened by 18 feet 4 inches to accommodate the 10-foot shoulders and the 12-foot HOV Lane. The northbound North Novato Overhead will be widened and the widening will be on the west side of the existing bridge between the northbound and southbound structure.

Our recommendations presented in this report are based on the above information. Any major deviation should be reported to PARIKH Consultants, Inc. (PARIKH) for consideration.

3. PERTINENT REPORTS AND INVESTIGATION

The "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California," was referenced in the evaluation of the geotechnical conditions for this project.

We also referred to Caltrans as-built LOTB for North Novato Overhead (Bridge No. 0027-94 R/L) to supplement the subsurface soil information for the project.

4. PHYSICAL SETTING

4.1 Climate

The project site is located in Marin County, California. The climate at the project site and the surrounding area is characterized by warm, mostly dry summers and cool, wet winters. Based on Western Regional Climate Center of NOAA, the temperature at the site typically ranges from 51°F to 79°F in summer and 38°F to 58°F during winter. The average annual rainfall is approximately 25.5 inches per year in the project area; most of the rainfall occurs in the months of October through April.

4.2 Topography

At the project location, existing Rte 101 cuts across the toes of several steep slopes and gently sloping valleys and plains adjacent to Petaluma River marshes to the east. Topography along Rte 101alignment is relatively flat with elevations ranging between 8 to 20 feet except for the North Novato Overhead section where the elevation of the roadway was raised to a maximum elevation of about 45 feet. On the western side of Rte 101, the terrain rises from the road level throughout the alignment within project limits. On the eastern side, the terrain is relatively flat except a small hill is located at the northeast quadrant of Rte 101/Atherton Avenue intersection.

4.3 Drainage Features

Per the Designers, there are 16 existing seasonal creeks/stream locations or large drainage facilities within the project limits, which pass below Rte 101. These are listed below (all stationing are per "J1R" Line) including locations where upsizing is proposed (in parenthesis):

- 386+17 – 2-12'x8'RCB
- 390+80 – 2-10'x8'RCB
- 395+01 – 18" RCP
- 406+02 – 15" RCP
- 411+02 – 15" RCP
- 416+03 – 24" CMP
- 421+00 – 2-48"RCP
- 429+00 – 24"RCP
- 438+95 – 36"RCP
- 444+36 – 36"RCP
- 448+75 – 12' x 4.5' RCB
- 467+65 – 2'x 2' RCB
- 470+05 – 36"' x 18"CMP Arch (upsize to 4' x 2' RCB)
- 473+60 – 30" HDPE (upsize to 4' x 2' RCB)

- 477+78 – 24" RCP (upsize to 4' x 2' RCB)
- 479+85 – 18" RCP

4.4 Man-Made and Natural Features of Engineering and Construction Significance

Man-made features within and in the vicinity of the project site that have potential engineering significance to this project include:

- North Novato Overhead (Widen).
- Sixteen (16) cross culverts (4 will be upsized).
- Water Pipelines (NMWD).
- Joint Trench (PG&E Gas, Comcast Cable, and Verizon Telephone).
- PG&E overhead electric line.
- Verizon Fiber Optic and Telemetry.
- Novato Sanitary District Sewer Line.
- SMART Railroad.

4.5 Regional Geology and Seismicity

California is divided into 11 geologic regions, referred to as geomorphic provinces, which are defined by similar physical characteristics such as relief, landforms, and geology. The project site is located primarily within the Coast Range geomorphic provinces, with eastern portions of Contra Costa and Solano Counties extending into the neighboring Great Valley geomorphic provinces.

The Coast Range geomorphic province extends 400 miles along the Pacific Coast, from Oregon south into Southern California. Independent and discontinuous northwest-trending mountain ranges, ridges, and intervening valleys are distinguishing features of the Coast Range geomorphic province and generally characterize the geologic setting of the San Francisco Bay region. San Francisco Bay, which was formed within a shallow, regional structural depression, is the predominant feature, separating smaller northern and southern mountain ranges.

Mount Diablo marks the northern end of the Diablo Range, which stretches 130 miles southwards to the Kettlemen Hills at the cusp of the San Joaquin Valley. In the North Bay, the rugged, mountainous character of the Marin Peninsula is dominated by Mount Tamalpais.

The bedrock and surficial deposits in the region are the result of a long history of tectonic plate movements, regional uplift, large-scale slope failures, erosion, and deposition that is recorded in the composition, structure, and geometry of rock and soil units exposed at the current ground surface.

By 12 million years ago, it extended into what has since then become the San Francisco Bay Area. During the last 12 million years, the San Andreas transform evolved into the complex system of northwest-striking, generally sub-parallel strike-slip faults that are still active today. Since development, the San Andreas transform fault system is believed to have accommodated as much as 1000 km of right-lateral motion between the Pacific and North American plates (Wakabayashi, 1999).

The Coast Ranges are primarily thrust-bounded fault blocks or bounded by strike-slip faults with a significant component of vertical slip. However, in many cases the ranges are not bound or uplifted along obvious structures, and are likely the result of folding and uplift along blind thrust or reverse faults.

Faults in the vicinity of the project site with a moderate to high potential for surface rupture include the Rodgers Creek Fault and the San Andreas Fault Zone (north coast section). Significant earthquakes, which have occurred in the region, are generally associated with crustal movements along well-defined active fault zones. A Regional Fault Map (based on Caltrans, 2007), showing the project site location relative to the major active faults in the region, is presented on Plate 4.

In the past, numerous earthquakes have originated from the active faults within the

region and produced strong ground shaking throughout the area. Per the report (Reference No. 7), which has been released by the United States Geological Survey (USGS), there is a 63% probability that an earthquake of 6.7 magnitude or greater will be released from one of the active faults within San Francisco Bay Area during the next 30 years. The probability of an earthquake of magnitude 6.7 or greater over Northern California is 93 percent. Such an event will likely produce strong ground shaking at the project location.

5. EXPLORATION

5.1 Drilling and Sampling

Based on the preliminary plan and discussions with the designer, twenty-one soil borings were drilled to the depth of 5 feet for this project. Approximate locations of these borings are shown on the Site Plan (Plates 2A through 2D). The details of the field exploration are included in Appendix A.

The borings were advanced with a truck-mounted drill rig using 8-inch diameter hollow stem augers. The borings were drilled under the technical supervision of our engineer, who classified and logged the soils encountered during drilling and supervised the collection of soil samples for visual examination and laboratory testing. The boring locations, stations, and relevant information are summarized in Table 1.

TABLE 1: SUMMARY OF BORINGS

Boring No.	Station (feet)	Median/Northbound Shoulder	Boring Depth (feet)	Approx. Ground Elev. (feet)
A-11-101	"J1R" 394+00	Median	5	35.0
A-11-102	"J1R" 404+00	Median	5	41.0
A-11-103	"J1R" 412+00	Median	5	32.0
A-11-104	"J1R" 420+00	Median	5	20.0
A-11-105	"J1R" 428+00	Median	5	14.0
A-11-106	"J1R" 436+00	Median	5	11.0
A-11-107	"J1R" 444+00	Median	5	10.0
A-11-108	"J1R" 452+00	Median	5	11.0
A-11-109	"J1R" 460+00	Median	5	14.0
A-11-110	"J1R" 468+00	Median	5	11.0
A-11-111	"J1R" 476+00	Median	5	10.0
A-11-112	"J1R" 408+00	Northbound Shoulder	5	35.0
A-11-113	"J1R" 416+00	Northbound Shoulder	5	24.0
A-11-114	"J1R" 424+00	Northbound Shoulder	5	17.0
A-11-115	"J1R" 432+00	Northbound Shoulder	5	15.0
A-11-116	"J1R" 440+00	Northbound Shoulder	5	11.0
A-11-117	"J1R" 448+00	Northbound Shoulder	5	9.0
A-11-118	"J1R" 456+00	Northbound Shoulder	5	12.0
A-11-119	"J1R" 464+00	Northbound Shoulder	5	12.0
A-11-120	"J1R" 472+00	Northbound Shoulder	5	11.0
A-11-121	"J1R" 480+00	Northbound Shoulder	5	12.0

5.2 Geologic Mapping

Published geologic maps and other geologic information pertinent to the project site were reviewed. No site-specific geological mapping was performed based on the scope of the proposed work.

5.3 Geophysical Studies

Based on the "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California", the project site is underlain by alluvial fill over marine and marsh deposits, alluvium and Metagreywacke of Franciscan Complex. The subsurface soils are relatively uniform.

Geophysical techniques such as cross-hole surveys, seismic refraction and reflection were considered unnecessary for this type of geologic condition.

5.4 Instrumentation

The subject was considered and was considered unnecessary for this project.

5.5 Exploration Notes

Existing roadway fill material consisting of sandy lean clay and/or clayey/silty sand with gravel was typically encountered in the shallow (5 feet) borings. In general, drilling did not encounter any unusual conditions. No caving of the drilled holes was observed during drilling.

6. GEOTECHNICAL TESTING

6.1 In-Situ Testing

No in-situ testing was required for this project.

6.2 Laboratory Testing

Atterberg Limits (California Test Method T-204), Corrosion Test (California Test Method T-643) and R-value Tests (California Test Method T-301) were performed for this project. The laboratory test methods and results are included in Appendix B.

7. GEOTECHNICAL CONDITIONS

7.1 Site Geology

General geologic features pertaining to the site were evaluated by reference to the "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California, by M.C. Blake Jr., R.W. Graymer and D.L. Jones, 2000". Based on the publication, the project site is underlain by artificial fill over marine and marsh deposits (Bay Mud) (Quaternary) (Qmf),

Alluvium (Quaternary) (Qal) that were deposited upon the previously eroded surface of Franciscan bedrock and Metagreywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex. A geologic map of the general project area is shown on Plate 3. The general constituents and the engineering characteristics of each geologic unit are described below.

Artificial fill over marine and marsh deposits (Quaternary) (Qmf) – Mud, including much organic material, silty mud, silt, and sand; very soft to soft if wet, similar to unit Qm overlain by artificial fill, the limits of which are not mapped.

Alluvium (Quaternary) (Qal) – Variably sized gravel overlain by unconsolidated sand, silt and clay comprises the unit. Alluvium (Quaternary) is mapped in small valleys where separate fan, basin, and terrace units could not be delineated at the scale of general geologic mapping, and where deposits might be of either latest Pleistocene or Holocene age. This unit occurs in the floodplains of streams and rivers. The sediments form a rich loam and are excellent for agriculture.

The older Quaternary deposits are those mapped units that were deposited in the Quaternary, but are no longer actively being deposited. They have been deposited within the Pleistocene Epoch between 10,000 to 1.8 million years ago. These older units may also have an increased susceptibility to seismic shaking, liquefaction, differential settlement and landslide because they have generally not been buried deep or long enough to become well compacted and indurated. However, in general they are less susceptible to geologic hazards than the younger surficial deposits.

The **Metagraywacke (Early Cretaceous and Late Jurassic) (KJfm) of Franciscan Complex** was formed in a subduction zone where sea floor (basalt) was forced downward into the upper mantle beneath the North American Continent; carrying with it various sediments (sand, silt, and clay) eroded from the continent or precipitated by organisms. Increased pressure and heat, combined with the tectonic displacement and shear forces, resulted in a chaotic mixing of the

various materials with various strengths. The Franciscan Complex forms a diverse assemblage of rock types called mélanges (French: *mélange* or "mixture"), chaotic mixtures of hard blocks of various rock types surrounded by weaker matrix of sheared to pulverized rock. The Franciscan mélange is predominantly weathered and fractured sandstone and shale, with lesser amounts of chert.

To focus on the common fundamental engineering problems related to the characterization of complex geological mixtures, Medley (1994) coined the geologically neutral word "bimrocks" from Raymond's (1984) "block-in-matrix rocks". Medley's definition of bimrocks is: *"a mixture of rocks composed of geotechnically significant blocks within a bonded matrix of finer texture*". The expression "geotechnically significant blocks" means that there is mechanical contrast between blocks and matrix, and the volume and size of the blocks influence the rock mass properties at the scales of engineering interest. Consequently, bimrocks may have considerable spatial, lithological, and mechanical variability. The weakest elements in bimrocks are the contacts between blocks and matrix. In mélanges, matrix shears generally pass around blocks with intense shearing adjacent to the larger blocks. The overall strength of bimrocks is independent of the strength of the individual blocks and depends more on the strength of the matrix between the blocks. Subsurface exploration may not reveal the size and distribution of strong blocks and the extent of weaker matrix in mélange. Consequently, the overall strength of Franciscan bedrock buried beneath the project site may not be fully characterized by even a significant number of borings. Interpolation between even closely spaced borings can lead to an overly simplistic representation of the rock mass strength.

Franciscan Complex bedrock is exposed in the hills surrounding the project site and is buried beneath approximately 60 feet to 80 feet of younger alluvium and Bay Mud at the site. The bedrock consists of greywacke sandstone that was metamorphosed during subduction. Franciscan greywacke is a variety of sandstone

generally characterized by its significant hardness, dark color, and poorly sorted angular grains of quartz, feldspar, and small rock fragments or lithic fragments set in a compact, clay-fine matrix. The cementing material between the grains may be siliceous or argillaceous and is sometimes calcareous. Component particles are usually not very rounded or polished, and the rocks are often considerably indurate by re-crystallization. When subjected to increasing metamorphism, greywacke frequently passes into mica-schist, chloritic schist and sedimentary gneisses. Veins of white quartz are commonly found in Franciscan greywacke.

Rock core samples encountered from Boring R-11-NO-001 and Boring R-12-NO-003, consist of very hard, medium to dark gray colored greywacke sandstone that is fine-grained and well-cemented. For the rock core samples recovered from Boring R-11-NO-001, the upper few feet of the rock is stained light orange-brown from iron oxide, indicating that it was previously exposed to near surface oxidation, prior to being buried by Bay Mud and alluvium. At a depth of 89 feet, a several inch thick zone of pulverized rock appears to be sheared matrix situated between two large blocks of intact greywacke sandstone. The same disrupted zone was encountered in Boring R-12-NO-003 between 86.5 feet and 91.5 feet below the ground surface.

7.1.1 Lithology

The geological unit presented at the project site consists of alluvial deposits near the surface (gravel, sand and clay). Detailed description of subsurface soil conditions are presented in Section 7.2.

7.1.2 Structure

The structures of the geological units such as bedding, folds, fracture, jointing, and foliation had been considered and were determined to be not applicable for the project.

7.1.3 Existing Slope Stability

The slopes at the project site consist of natural slopes and man-made cut slopes on the hillsides and along the freeway. Most of the natural slopes and cut slopes have gradients of 2(H):1(V) or flatter and are covered with vegetation. Proposed project does not require development of any cut and fill slopes.

7.2 Subsurface Soil Conditions

Based on the available boring data, the subsurface soil conditions at the project site consist of medium stiff sandy lean clay with gravel or medium dense silty sand with gravel, underlain by stiff to very stiff lean clay and stiff to very stiff lean clay with gravel. The descriptions of the soil materials encountered in the exploratory borings and relevant boring information are presented in Table 2 below.

TABLE 2: SUMMARY OF SUBSURFACE SOIL CONDITIONS

Boring No.	Soil Description
A-11-101	0-3 feet SANDY lean CLAY and CLAYEY SAND, underlain by 2 feet of Lean CLAY.
A-11-102	0-5 feet SANDY lean CLAY and CLAYEY SAND.
A-11-103	0-3 feet SANDY lean CLAY with GRAVEL, underlain by 2 feet of Lean CLAY.
A-11-104	0-3 feet SANDY lean CLAY with GRAVEL underlain by 2 feet of stiff Lean CLAY.
A-11-105	0-3 feet SANDY lean CLAY with GRAVEL, underlain by 2 feet of Lean CLAY.
A-11-106	0-2 feet CLAYEY GRAVEL, underlain by 3 feet of Lean CLAY with GRAVEL.
A-11-107	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of CLAYEY GRAVEL, underlain by Lean CLAY.
A-11-108	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of CLAYEY GRAVEL, underlain by Lean CLAY.
A-11-109	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of Lean CLAY.
A-11-110	0-2 SILTY SAND with GRAVEL, underlain by 3 feet of Lean CLAY.
A-11-111	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of Lean CLAY.
A-11-112	0-5 feet SANDY Lean CLAY with GRAVEL with pockets of SAND and GRAVEL.
A-11-113	0-5 feet SANDY Lean CLAY with GRAVEL with pockets of SAND and GRAVEL.
A-11-114	0-5 feet SANDY Lean CLAY with pockets of SAND and GRAVEL.

TABLE 2: SUMMARY OF SUBSURFACE SOIL CONDITIONS (CONTINUED)

Boring No.	Soil Description
A-11-115	0-5 feet CLAYEY SAND with GRAVEL.
A-11-116	0-5 feet CLAYEY SAND with GRAVEL.
A-11-117	0-5 feet SANDY Lean CLAY with GRAVEL (FILL).
A-11-118	0-3 feet SILTY SAND with GRAVEL, underlain by 2 feet of Lean CLAY with GRAVEL.
A-11-119	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of Lean CLAY with GRAVEL.
A-11-120	0-2 feet SILTY SAND with GRAVEL, underlain by 3 feet of Lean CLAY with GRAVEL.
A-11-121	0-2 feet CLAYEY SAND with GRAVEL, underlain by 3 feet of Lean CLAY with GRAVEL.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the subsurface soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope. Such variations, when encountered, generally require additional engineering services to attain a properly constructed project. We, therefore, recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during construction.

7.3 Water

7.3.1 Surface Water

The project site is along existing Rte 101. The overall terrain at the project site is generally flat, the surface water/drainage is generally by sheet flow, or collected by local drainage systems.

7.3.1.1 Scour

Scour is not anticipated to be an issue at the project site because there is no open watercourse running near or through the project site.

7.3.1.2 Erosion

The existing slopes have established landscaping to help control erosion. Therefore erosion is not a concern for this project.

7.3.2 Groundwater

Groundwater was not encountered in the 5-foot borings during the field exploration in October 2011. Groundwater was measured at approximate Elev. +21.5 feet (depth of 17 feet) in Boring R-11-NO-002, approximate Elev. +1.0 feet (depth of 11 feet) in Boring R-11-NO-001 and approximate Elev. +6.0 feet (depth of 6.5 feet) in Boring R-12-NO-003 during drilling. The groundwater measured in Boring R-11-NO-002 was much higher than those measured in the other two borings and appears to be the perched water.

In our opinion, the groundwater level is anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, change in the water level in the nearby creeks and other environmental factors which may not have been present at the time of our investigation.

7.4 Project Site Seismicity

7.4.1 Ground Motions

The project site is located in a seismically active part of northern California. Seismic activity may result in geological and seismic hazards including seismically induced fault displacement and rupture, ground shaking, liquefaction, lateral spreading, landslides, and structural hazards. Many faults exist in the San Francisco Bay Area and are capable of producing earthquakes. These faults may cause strong ground shaking at the site.

Caltrans has revised the 1996 Hazard Map and has produced a new map and an associated report (2009 Caltrans Deterministic PGA Map and ARS Online Report). The new map (2007 Caltrans Deterministic PGA Map) shows all the known faults and contours of peak ground accelerations (PGA) based on New Generation Attenuation (NGA) ground motion prediction equations. The report also includes associated database (2007 Data Base) providing relevant information for all the faults in the map; and

procedures for the development of Acceleration Response Spectra (ARS) curves based on a user friendly on-line web tool. The Regional Fault Map, Plate 4, presents the locations of the fault systems relative to the project site, based on the 2007 Caltrans Deterministic PGA Map. The Peak Ground Acceleration per the 2009 Online Report is 0.63g.

The major faults in the vicinity, their distances from the project site, fault types and the maximum credible earthquake magnitudes associated with each fault are summarized in the Table 3 below. These maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault based on the current understanding of the regional tectonic structure.

TABLE 3: EARTHQUAKE DATA

Fault (Fault ID)	Maximum Moment Magnitude of Fault, M_{Max}	Fault Type	Site-to-Fault Distance
Rodgers Creek Fault (157)	7.1	Right Lateral Strike Slip	5.5 mi.
San Andreas Fault Zone (North Coast section) (308)	7.9	Right Lateral Strike Slip	13 mi.

Based on available geological and seismic data, the possibility of the site to experience strong ground shaking should be considered moderate to high.

7.4.2 Ground Rupture

No active fault passes through the project sites, therefore the potential for ground surface rupture due to faulting within the project limits is considered low.

7.4.3 Liquefaction Potential

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. Submerged cohesionless sands and silts of low relative density are the type

of soils, which usually are susceptible to liquefaction. Clays are generally not susceptible to liquefaction.

Liquefaction and its impact are more critical to bridge structure than pavement construction. Based on the available borings at the "North Novato Overhead (Widen)" and our evaluation, isolated and deep pockets or lenses of loose to medium dense sand may liquefy due to liquefaction. This may resulted in an estimated 0.7 inches to 2.2 inches of post-liquefaction settlement as discussed in the Foundation Report for "North Novato Overhead (Widen)". However, it is our opinion that the impact due to the potential liquefaction on the proposed pavement widening is considered to be low because:

- The potentially liquefiable soil pockets/lenses are generally covered by predominantly cohesive soils, which tend to serve as a "soil mat" and should reduce the potential impact of liquefaction.
- The post-liquefaction settlement probably would be random and localized and could spread out over some distance/area.

8. GEOTECHNICAL ANALYSES AND DESIGN

8.1 Cuts and Excavations

Minor cut and fill will be required for the pavement construction.

8.1.1 Stability

The subject was considered and determined to be not applicable for the project.

8.1.2 Rippability

The proposed cuts are anticipated to be in roadway fill and native soils. Based on the investigation, rippability does not appear to be a concern for

construction.

8.1.3 Grading Factor

Source of the project fill may include the fill generated from the cuts (as long as the on-site native soil meets the project specifications) planned for the project. Fill may also be imported from outside borrow sources. The source of borrow is unknown at the time of report preparation. Based on previous experience, for preliminary estimate, a grading factor of 0.9 may be assumed for import materials.

8.2 Embankments

There is no new embankment proposed for this project. The subject was considered and determined to be not applicable for the project.

8.3 Corrosion Investigation

The corrosion investigation for this project was performed in general accordance with the provisions of California Test Method 643. Chemical tests were performed on selected soil samples from Borings A-11-101, A-11-103, A-11-105, A-11-117, A-11-120 and A-11-121 to evaluate the corrosion potential of the subsurface soil. A summary of the corrosion test results is presented in Table 4.

TABLE 4 - SUMMARY OF CORROSION TEST RESULTS

Boring No.	Station & Offset	Depth (ft)	Min. Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
A-11-101	"J1R" 394+00 (median)	0-5	2,680	7.13	33.2	28.9
A-11-103	"J1R" 412+00 (median)	0-5	940	7.72	475.4	72.1
A-11-105	"J1R" 428+00 (median)	0-5	910	7.11	1022.4	61.0
A-11-117	"J1R" 448+00 (NB shoulder)	0-5	2,410	7.88	37.4	21.5
A-11-120	"J1R" 472+00 (NB shoulder)	0-5	2,470	7.63	26.9	28.5
A-11-121	"J1R" 480+00 (NB shoulder)	0-5	2,280	7.43	13.6	41.2

According to Caltrans Corrosion Guidelines, September 2003 (Version 1.0), Caltrans considers a site to be corrosive to foundation element if one of the following conditions exists for the representative soil samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm,
- Sulfate concentration is greater than or equal to 2000 ppm,
- pH is 5.5 or less.

Based on the corrosion test results, the subsurface soils collected in the borings in Table 4 are considered non-corrosive per Caltrans corrosion design guidelines. Standard Type II modified or Type I-P (MS) modified cement may be used for the concrete substructure.

8.4 Culverts

For selection of pipe material for culvert and storm drain applications, it is our understanding that AltPipe computer program is used by Caltrans to assist Designers. AltPipe program is a web-based tool (*http://dap1.dot.ca.gov//design/altpipe/*), which updates and supersedes the previous CULVERT4 program. The computations performed by AltPipe are based on the procedures and California Test Methods described in Chapter 850 of the Caltrans Highway Design Manual (HDM). AltPipe incorporates current requirements from the HDM supplemented by Caltrans Design Information Bulletin No. 83 (D.I.B. No. 83, June 30, 2003) for abrasion potential for material selection. The AltPipe program is intended for final design by the civil or hydraulic designer. In addition to soil corrosivity data, the input requires data such as Abrasion Level, 2-5 year Flow Velocity, and height of cover, which should be determined while finalizing the drainage design.

Analyses were performed by the Designer using the AltPipe program and the soil corrosivity data presented in Table 4. Analyses were performed for 10 drainage units (16i, 20b, 20d, 20e, 21f, 21e, 22c, 22j, 22f and 22i). These pipes are 18-inches in diameter. Appropriate depths of soil cover and soil corrosion values from Table 4

were incorporated in the analyses, based on the location of the unit. All analyses used a 50-year design life; a 2-5 year flow velocity of 2.2 and 3.2 ft/sec.; and an abrasion level of 1. The results of the analyses performed by the Designer are presented in Appendix C.

Following are some general findings, based on the analyses. The designer should refer to their calculations in Appendix C for more specific information.

- Corrugated steel pipes (helical or annular corrugation) [coated with AL2, BC, BCI, Polymerized Asphalt (PA) and Polymeric Sheet (PS)] are allowable for Drainage Unit 16i, 22j, 22f and 22i with minimum thickness of coating of either 0.052 inches or 0.064 inches. Corrugated steel pipes (coated with PS or PA) are allowable for Drainage Units 20b, 20d, 20e, 21f, 21e and 22c with minimum thickness of coating of 0.052 inches for Corrugated Steel Pipe Helical Corrugation and 0.064 inches for Corrugated Steel Pipe Annual Corrugation.
- Corrugated aluminum pipes (helical or annular corrugation) are allowable only for Drainage Unit 16i, 22j, 22f and 22i with a minimum coating thickness of 0.06 inches.
- Plastic pipes (PVC Corrugated, HDPE Corrugated – Type S and Type C) are allowable for all of the ten drainage units (16i, 20b, 20d, 20e, 21f, 21e, 22c, 22j, 22f, and 22i).
- Reinforced concrete pipes are allowable for all the ten drainage units. Required thickness of steel cover is 0.75-in. Five sacks of cement and 11.1 percent water are indicated in the AltPipe output for all cases.

9. STRUCTURAL PAVEMENT SECTIONS

The draft as-built structural pavement sections provided by the designer are shown in Table 5 below.

TABLE 5: SUMMARY OF AS-BUILT STRUCTURAL PAVEMENT SECTIONS

Approx. stations	Inside Shoulder	Travel Way	Outside Shoulder
"J1R" Sta. 444+70 to Sta. 478+00	Paved	0.10 feet RAC-G 0.46 –1.10 feet AC PFR 0.67 feet PCC Var AB	Paved
"J1R" Sta. 436+50 to Sta. 444+70	Paved	0.10 feet RAC-G 0.46 – 1.10 feet AC PFR 0.67 feet PCC Var AB	0.10 feet RAC-G 0.46 – 1.10 feet AC PFR 0.67 feet PCC Var AB
"J1R" Sta. 394+00 to Sta. 397+40.68 and "J1R" Sta. 411+83.83 to Sta. 436+50	0.25 feet AC (A) 0.80 feet AB (Cl. 2) 1.30 feet AS (Cl. 4)	0.40 - 0.50 feet AC (A) 0.80- 0.90 feet CTB (A) 1.10-1.30 feet AS (Cl. 4)	0.35 feet AC (A) 0.90 feet AB (Cl. 2) 1.10 feet AS (Cl. 4)

R-value tests were conducted on representative samples collected at subgrade level. The test results are summarized in Table 6.

TABLE 6: SUMMARY OF R-VALUE TEST RESULTS

Test Boring	Approximate Station(feet)	Inside/Outside Lane	Approx. Existing Ground Elev. (ft)	Plasticity Index	R-Value
A-11-101	"J1R" 394+00	Inside	35.0	9	24
A-11-102	"J1R" 404+00	Inside	41.0	-	21
A-11-104	"J1R" 420+00	Inside	20.0	5	61
A-11-107	"J1R" 444+00	Inside	10.0	-	15
A-11-109	"J1R" 460+00	Inside	14.0	-	19
A-11-112	"J1R" 408+00	Outside	35.0	-	23
A-11-114	"J1R" 424+00	Outside	17.0	-	24
A-11-115	"J1R" 432+00	Outside	15.0	-	25
A-11-117	"J1R" 448+00	Outside	9.0	-	66
A-11-120	"J1R" 472+00	Outside	11.0	-	32
A-11-121	"J1R" 480+00	Outside	12.0	6	68

Findings, Design Approach and Recommendations:

- As shown in the "Summary of R-value Test Results", the tested R-values of the soil samples from the project site were found to range from 15 to 61 in the median and

from 23 to 68 along the northbound shoulder. An R-Value of 15 is assumed for the native soil materials in the design of structural pavement sections for the inside lanes. An R-Value of 20 is assumed for the native soil materials in the design of structural pavement sections for the outside lanes.

- Traffic Index (TI) of 14.0 used in the pavement design of HOV Lane Widening is based on a 40-year projection. This 40-year traffic index was used in the pavement design. However, since there is no 40-year design method for HMA section per Caltrans, the pavement cannot be classified as a "40-year design section".

- The design is according to Caltrans Highway Design Manual, using Hot Mixed Asphalt (HMA) (Type A); Aggregate Base (Class 2) and Aggregate Subbase (Class 4).

- Fill material placed within 4 feet of the finish pavement subgrade should have a minimum R-value of 20.

- The structural pavement design is based on Caltrans Highway Design Manual Section 608 (July 1, 2008).

- The recommended minimum R-value for Class 2 Aggregate Base (AB) is 78 and for Class 4 Aggregate Subbase (AS) is 50. Caltrans Standard Specifications Section 26-1.02A specifies that the amount of reclaimed material shall not exceed 50 percent of the total volume of the aggregate used provided the reclaimed material fulfills the aggregate grading requirements in the specifications.

Based on the Traffic Indices provided by the designer and the design R-value, the recommended pavement sections are shown in Table 7 below.

TABLE 7: SUMMARY OF RECOMMENDED STRUCTURAL PAVEMENT SECTIONS

Location	R-Value	TI	Option-1	Option-2				Option-3			
			FDHMA*	HMA-A*	AB	AS	Total	HMA-A*	LCB	AS	Total
Inside Lane	15	14	1.75	0.75	1.10	1.35	3.20	0.70	0.70	1.35	2.75
"J1R" Station 470+00–478+00	15	14	1.75	0.75	1.10	1.35	3.20	0.70	0.70	1.35	2.75
Outside Lane	20	14	1.70	0.75	1.10	1.10	2.95	0.70	0.70	1.10	2.50
Rush Landing Road	15	6.5	0.75	0.30	0.55	0.50	1.35	-	-	-	-
FDHMA: Full Depth Hot Mix Asphalt (Type A) **LCB:** Lean Concrete Base **HMA-A:** Hot Mix Asphalt Concrete (Type A) **AS:** Aggregate Subbase (Class 4, R-Value=50) **AB:** Aggregate Base											
***RHMA-**G (Gap Graded Rubberized HMA), up to 0.15 ft may be placed at the surface, replacing equivalent thickness of HMA-A											

10. MATERIAL SOURCES

There are several commercial sources of asphalt, concrete, and aggregate products in the vicinity of the project area. Some of the available commercial suppliers in the vicinity of the project area are listed in Table 8 below:

TABLE 8: SOURCES OF IMPORTED BORROW

Source	Location	Approx. Haul Dist.(One way, miles)
Shamrock Materials, Inc.	7552Redwood Blvd., Novato, California	2.5
Scott's Concrete & Pumping	523 McClay Rd, Novato, California	5.5
Affordable Asphalt	22 Columbine Lane, Novato, California	6.0

11. MATERIAL DISPOSAL

Project may require off-haul of some of the excavated material that cannot be used on site. Prior to excavating, materials should be tested for contamination in accordance with the recommendations of the environmental report. Asbestos, if encountered, will require special handling and disposal. Disposal of ADL and other contaminated material (if any) is beyond the scope of this project.

12. CONSTRUCTION CONSIDERATIONS

12.1 Construction Advisories

The following sections are written primarily for the engineer responsible for the preparation of plans and specifications. Since these sections identify potential construction issues related to the project, it may also be of use to the Agency's representatives involved in the monitoring of construction activity. The field investigation performed by PARIKH primarily addresses design issues and was not planned specifically to identify construction issues.

The majority of the project consists of roadway widening and pavement construction; therefore traffic control is required to maintain traffic flow along Rte 101 during construction. The contractor should verify the utility lines at the project site, be aware of the existing conditions and plan the construction activities accordingly to minimize the construction impact on the integrity of the existing utilities.

In our opinion, conventional equipment may be used to excavate the on-site soil materials. The materials to be excavated may consist of firm to very stiff clays with varying amounts of medium dense sand. Localized subgrade pumping may be encountered during earthwork construction depending on the weather, moisture condition of the subsurface soils, and surface drainage conditions. Equipment mobility may also be difficult if the subgrade is wet. Under such circumstances, the subgrade soils may require reworking, moisture conditioning, aeration, or over-excavation and replacing with dry granular fill to facilitate earthwork construction. It is possible that unknown old buried utilities or abandoned structures, concrete rubble etc. are located along the alignment. It might require special equipment and additional efforts to remove these buried objects.

Prospective contractors for the project must be directed to evaluate construction-related issues on the basis of their own knowledge and experience in the local area,

on the basis of similar projects in other localities, or on the basis of field investigation on the site performed by them, taking into account their proposed construction methods and procedures. In addition, construction activities related to excavation and lateral earth support must conform to safety requirements of Occupational Safety Health Administration (OSHA) and other applicable municipal and State regulatory agencies .

12.2 Construction Considerations that Influence Specifications

The contractor should verify the existing utility line conditions. These locations should not be used for stockpiling of borrow materials. Any utility conflicts with proposed construction should also be reviewed prior to construction.

12.3 Construction Monitoring and Instrumentation

The construction monitoring and instrumentation subject was considered and was determined to be not applicable for the project.

12.4 Hazardous Waste Considerations

The project environmental study report should be referred to for further details about any hazardous materials within the project.

12.5 Differing Site Conditions

The soil conditions described in this report are based on available boring data. It should be noted that these borings depict subsurface soil conditions and groundwater conditions only at the locations drilled and at the time drilled. Because of the variability from place to place within soils in general, and the nature of geologic depositions, subsurface soil conditions and groundwater conditions could change between the explored boring locations.

Early communication should be made between the Resident Engineer, the Contractor and the Geotechnical Engineer as soon as conditions that differ from those established in this report are recognized by any of the parties. Additional

recommendations could thereby be provided if such conditions arise.

13. RECOMMENDATIONS AND SPECIFICATIONS

13.1 Summary of Recommendations

If the designer has questions or concerns with any of these recommendations, or, if conditions are found to be different during construction, the Geotechnical Engineer who prepared this report should be contacted. Additional fieldwork, analysis or changes in recommendations may be required during the construction phase. These services may be provided under a separate authorization, as necessary. A concise summary of the geotechnical recommendations is presented below:

- Design peak ground acceleration (PGA) = 0.63g, based on the 2009 Caltrans ARS Online Report. (Ref.: Section 7.4.1)

- The boring data indicates that the subsurface soil conditions generally consist of medium stiff sandy lean clay with gravel or medium dense silty sand with gravel, underlain by stiff to very stiff lean clay and stiff to very stiff lean clay with gravel. Groundwater was encountered in Borings R-11-NO-001and R-12-NO-003 during the field exploration in 2011 and 2012. The impact of liquefaction potential is considered to be low for the proposed pavement widening. (Ref.: Section 8.1.3)

- Structural pavement sections for the project (Ref: Section 9):

13.2 Recommended Materials Specifications

13.2.1 Standard Specifications

Unless otherwise stated in the special provisions, all materials specifications should conform to Caltrans Standard Specifications, 2010, including but not limited to the following: Earthwork, Structure Backfill, Hot-Mix Asphalt,

Aggregate Base and Aggregate Subbase.

13.2.2 Special Provisions

Note that there are most-current standard special provisions (February 11, 2010) available. The up-to-date SSPs for all pavement-related items should be used.

Imported Borrow:

Imported material should be in accordance with the specifications set forth in Caltrans Section 19. In particular, for new roadway construction, the material placed within 4 feet of the finish pavement subgrade should meet the following requirements:

1. Free of organic or other deleterious materials.
2. An R-value of not less than 20.

Aggregate Base: Aggregate Base (Class 2) shall conform to the provisions in Section 26 of the Caltrans Standard Specifications, 2010.

Aggregate Subbase: Aggregate Subbase (Class 4) shall conform to the provisions in Section 25 of the Caltrans Standard Specifications, 2010 and to the Special Provisions.

Aggregate Subbase (Class 4) shall be clean and free from organic matter and other deleterious substances. The percentage composition by weight of Class 4 aggregate subbase shall conform to the following grading as determined by California Test Method No. 202.

Gradation Requirement (Percent Passing)

Sieve Sizes	Operating Range	Contract Compliance
2 1/2 "	100	100
No. 4	30 – 65	25 – 70
No. 200	0 – 15	0 – 18

Aggregate Subbase (Class 4) shall also conform to the quality requirements given on the following table:

Quality Requirements

California Test Method	Operating Range	Contract Compliance
Sand Equivalent (217)	21 Min.	18 Min.
Resistance (R-value) (301)	50	50 Min.

14. INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our field exploration and the assumption that the soil conditions do not deviate from observed conditions.

No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings. The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater or air, below or around this site. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require that additional expenditures be made during construction to attain a properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed "MSN A3 NB HOV Lane Widening Project" as described earlier, to assist the engineer in the design of this project. In the event any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our findings and recommendations shall not be considered valid unless the changes or variations are reviewed and our recommendations modified or approved by us in writing.

This report is issued with the understanding that it is the designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the project and that necessary steps are also taken to see that the recommendations are carried out in the field.

The findings in this report are valid as of the present date. However, changes in the soil conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

Very truly yours,
PARIKH CONSULTANTS, INC.

Alston Lam, P.E., G.E. 2605
Project Engineer

Gary Parikh, P.E., G.E. 666
Project Manager

C:\Project Files\2011-145 MSN A3 Project\Report\North Novato Overhead Widen Geotechnical Materials Report (6-2012).docx

REFERENCES

1. Caltrans Department of Transportation, June 2010, Soil & Rock Logging, Classification, and Presentation Manual, Office of Structural Foundations California Department of Transportation.

2. "Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California, by M.C. Blake Jr., Graymer, R.W., and Jones, D.L., 2000".

3. United States Geological Survey (USGS), 2008, "The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2), by 2007 Working Group of Earthquake Probabilities, USGS Open File Report 2007-1437

4. California Department of Transportation, Caltrans Deterministic PGA Map and ARS Online Report (2009)

5. California Department of Transportation, Highway Design Manual, Chapter 600, July 2008.

6. California Department of Transportation, 2010, Standard Specifications, Sections 1 through 95.

APPROVED AS TO IMPACT ON STATE FACILITIES AND CONFORMANCE WITH APPLICABLE STATE STANDARDS AND PRACTICES AND THAT TECHNICAL OVERSIGHT WAS PERFORMED.

CALTRANS DESIGN OVERSIGHT APPROVAL — JAMES CHUANG — DATE SIGNED

CONSULTANT DESIGN ENGINEER — NATALINA V. BERNARDI — REGISTRATION No. 74690 — LICENSE Exp DATE 12/31/13

INDEX OF PLANS

SHEET No.	DESCRIPTION
1	TITLE SHEET
2 – 7	TYPICAL CROSS SECTIONS
8	KEY MAP AND LINE INDEX
9	PROJECT CONTROL
10 – 17	LAYOUTS
18 – 28	PROFILES AND SUPERELEVATION DIAGRAMS
29 – 42	CONSTRUCTION DETAILS
43	TEMPORARY WATER POLLUTION CONTROL QUANTITIES
44 – 55	EROSION CONTROL PLANS, DETAILS AND QUANTITIES
56 – 98	DRAINAGE PLANS, PROFILES, DETAILS AND QUANTITIES
99 – 100	TEMPORARY DRAINAGE PLAN AND QUANTITIES
101 – 108	UTILITY PLANS
109 – 111	CONSTRUCTION AREA SIGNS
112 – 119	STAGE CONSTRUCTION PLANS
120 – 144	TRAFFIC HANDLING PLANS AND QUANTITIES
145 – 154	DETOUR PLANS
155 – 163	PAVEMENT DELINEATION PLANS AND QUANTITIES
164 – 174	SIGN PLANS, DETAILS AND QUANTITIES
175 – 176	SUMMARY OF QUANTITIES
177 – 181	ELECTRICAL PLANS
STRUCTURE PLANS	
182 – 212	NORTH NOVATO OVERHEAD (WIDEN) – BRIDGE NO. 27-0094R

THESE NOTES TO FACILITATE REVIEW ONLY.
WILL BE REMOVED IN OE MICROSTATION SUBMITTAL.

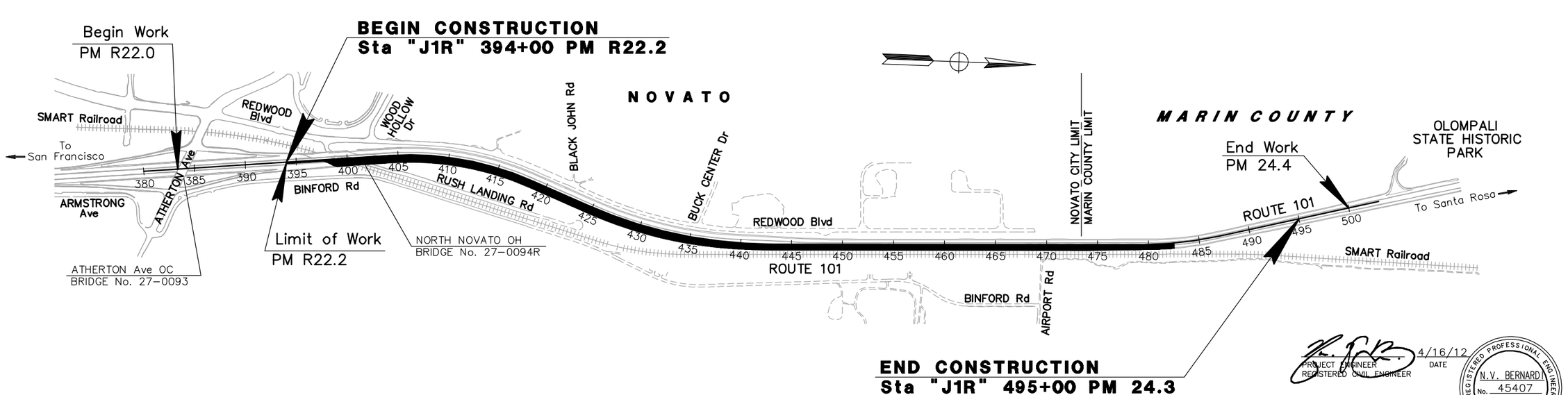
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY

IN THE CITY OF NOVATO
IN AND NEAR MARIN COUNTY
FROM 0.2 MILE NORTH OF ATHERTON AVENUE OVERCROSSING
TO 1.4 MILES SOUTH OF REDWOOD LANDFILL OVERCROSSING

TO BE SUPPLEMENTED BY STANDARD PLANS DATED 2010

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		



PROJECT LOCATION MAP

NO SCALE

PLATE NO.: 1

PROJECT ENGINEER
REGISTERED CIVIL ENGINEER — 4/16/12 DATE

REGISTERED PROFESSIONAL ENGINEER
N.V. BERNARDI
No. 45407
Exp. 9/30/12
CIVIL
STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

APPROVE AS TO FEATURES AFFECTING THE CITY OF NOVATO

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA. 94588

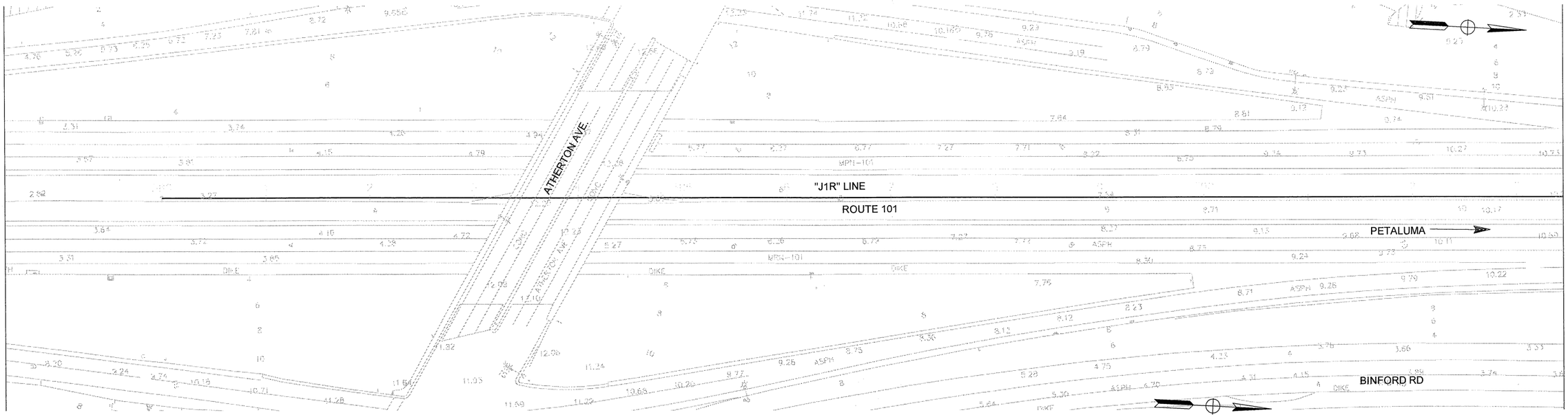
TRANSPORTATION AUTHORITY OF MARIN
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

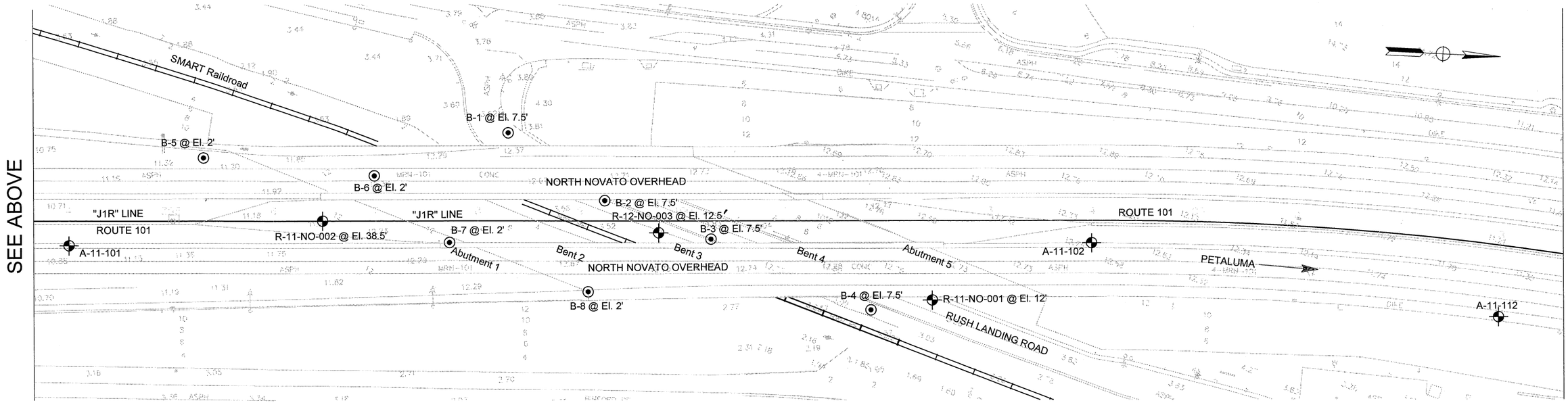
CONTRACT No.	04-2640L1
PROJECT ID	0412000337

LAST REVISION 04-16-12 — DATE PLOTTED => $DATE — TIME PLOTTED => $TIME

P:\Engdb\087003-20\DWG\SHEETS\TITLE\T-1 TITLE.dwg 16 Apr 2012 5:09:51pm lora

BORDER LAST REVISED 7/2/2010 | CALTRANS WEB SITE IS: HTTP//WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | USERNAME => $USER DGN FILE => $REQUEST | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371





LEGEND

- R-12-NO-003 Boring drilled by Parikh Consultants Inc. in April, 2012.
- R-11-NO-001 Borings drilled by Parikh Consultants Inc. in October & November, 2011.
- A-11-101 APPROX. R-Value Boring Location.
- Borings drilled by Caltrans in October & November, 1968.

SCALE 1 inch = 100 feet

Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

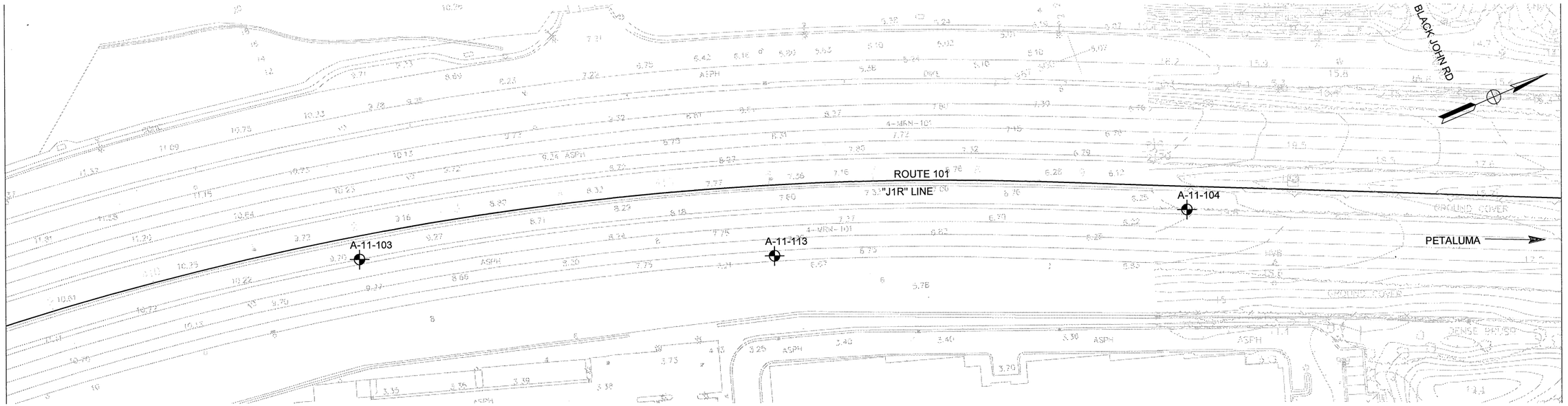
SITE PLAN

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT
NOVATO, MARIN COUNTY, CALIFORNIA

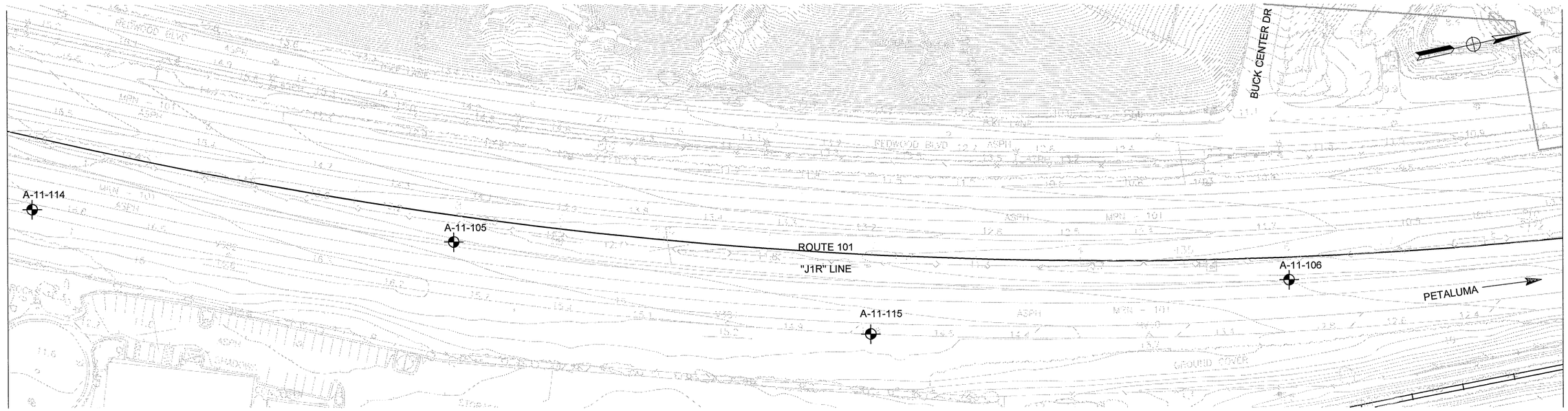
JOB NO.:2011-145-GDR | PLATE NO: 2A

SEE PLATE 2A



SEE BELOW

SEE ABOVE



SEE PLATE 2C

SITE PLAN

LEGEND

Approx. R-Value Boring Location

SCALE 1 inch = 100 feet

Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

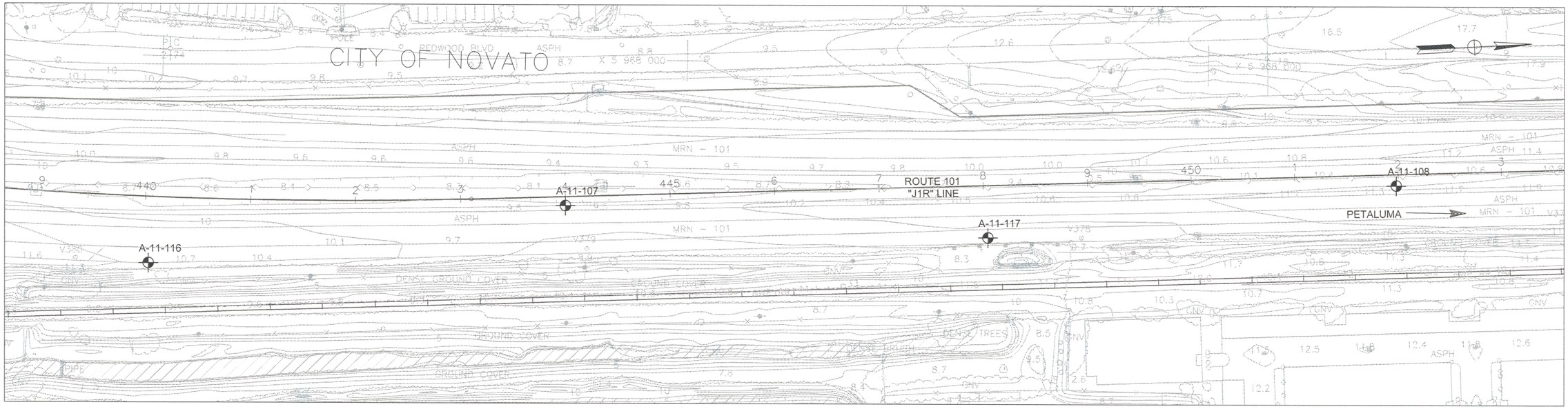
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT
NOVATO, MARIN COUNTY, CALIFORNIA

JOB NO.:2011-145-GDR | PLATE NO: 2B

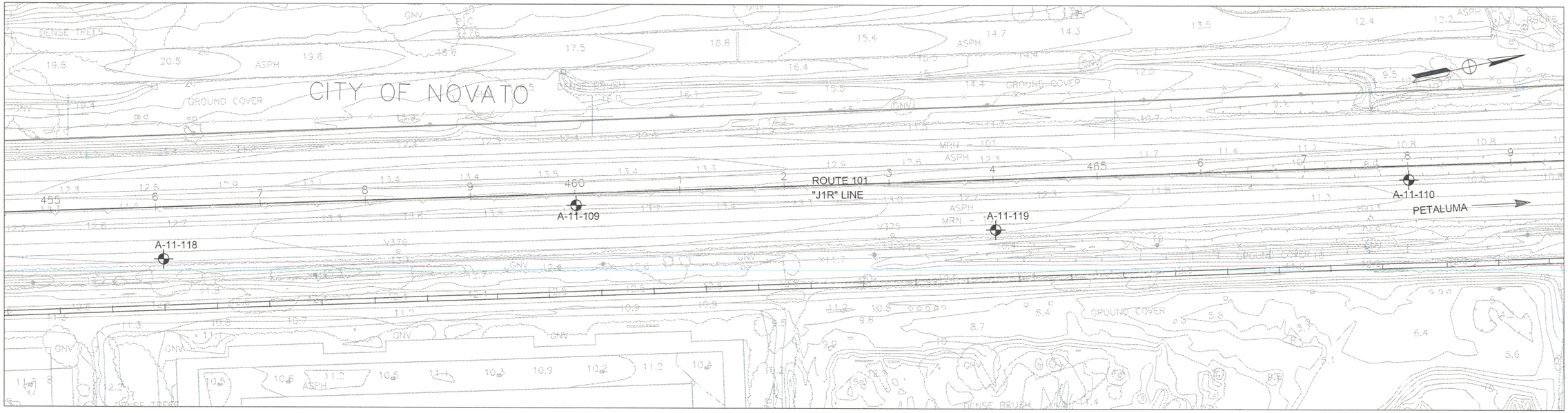
SEE PLATE 2B

SEE BELOW



SEE ABOVE

SEE PLATE 2D



SITE PLAN

LEGEND

⌖ Approx. R-Value Boring Location

SCALE 1 inch = 100 feet

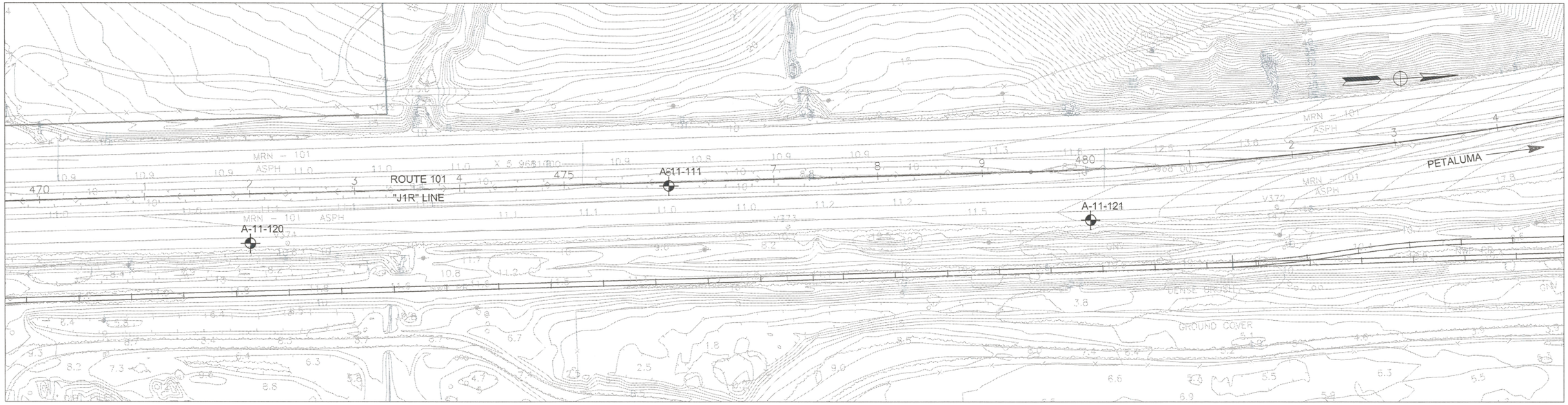
Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT
NOVATO, MARIN COUNTY, CALIFORNIA

JOB NO.:2011-145-GDR | PLATE NO: 2C

SEE PLATE 2C



SITE PLAN

LEGEND

Approx. R-Value Boring Location

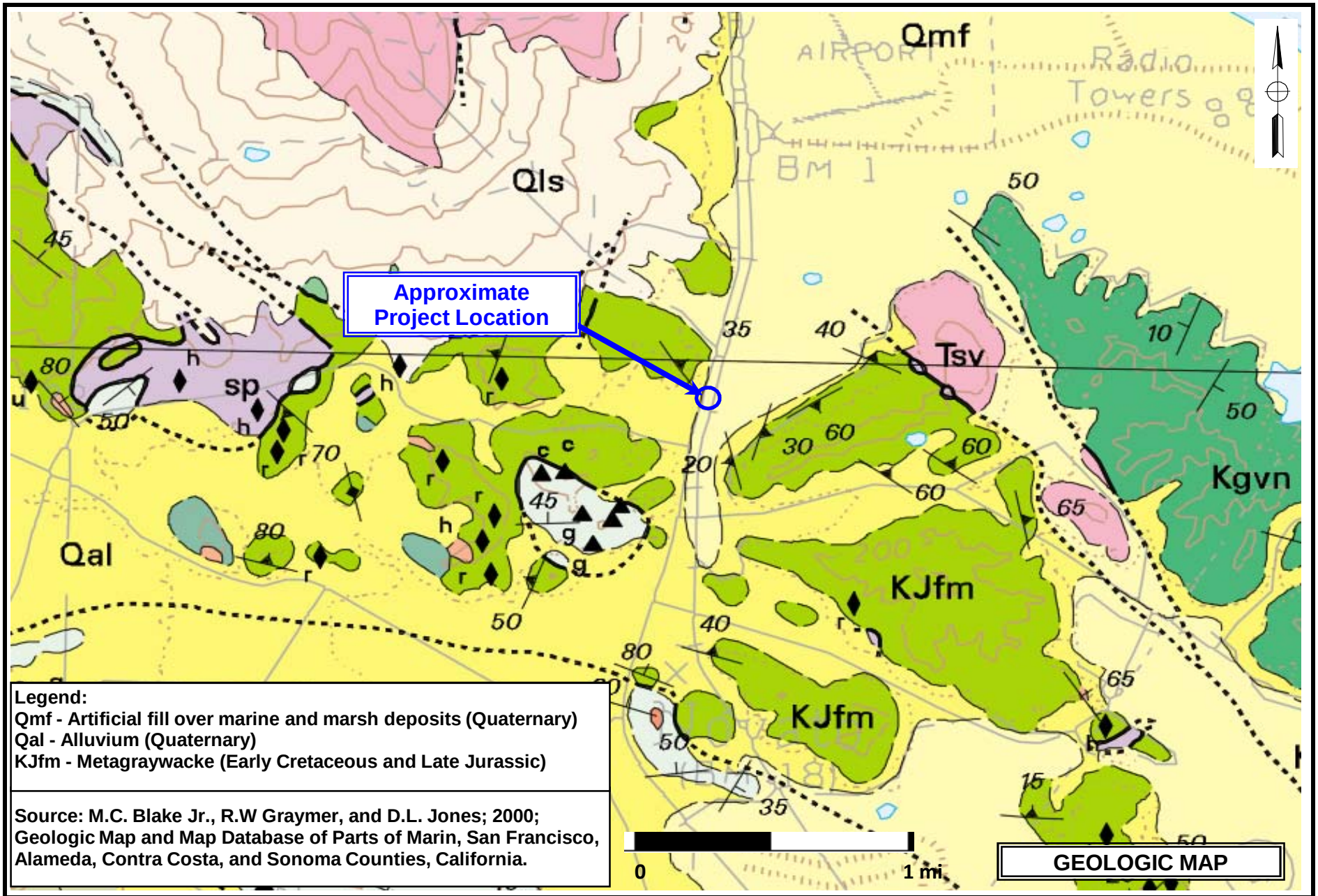
SCALE 1 inch = 100 feet

Note: All units are in feet unless otherwise specified
Reference Map was provided by BKF-Engineers.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 NB HOV LANE WIDENING PROJECT
NOVATO, MARIN COUNTY, CALIFORNIA

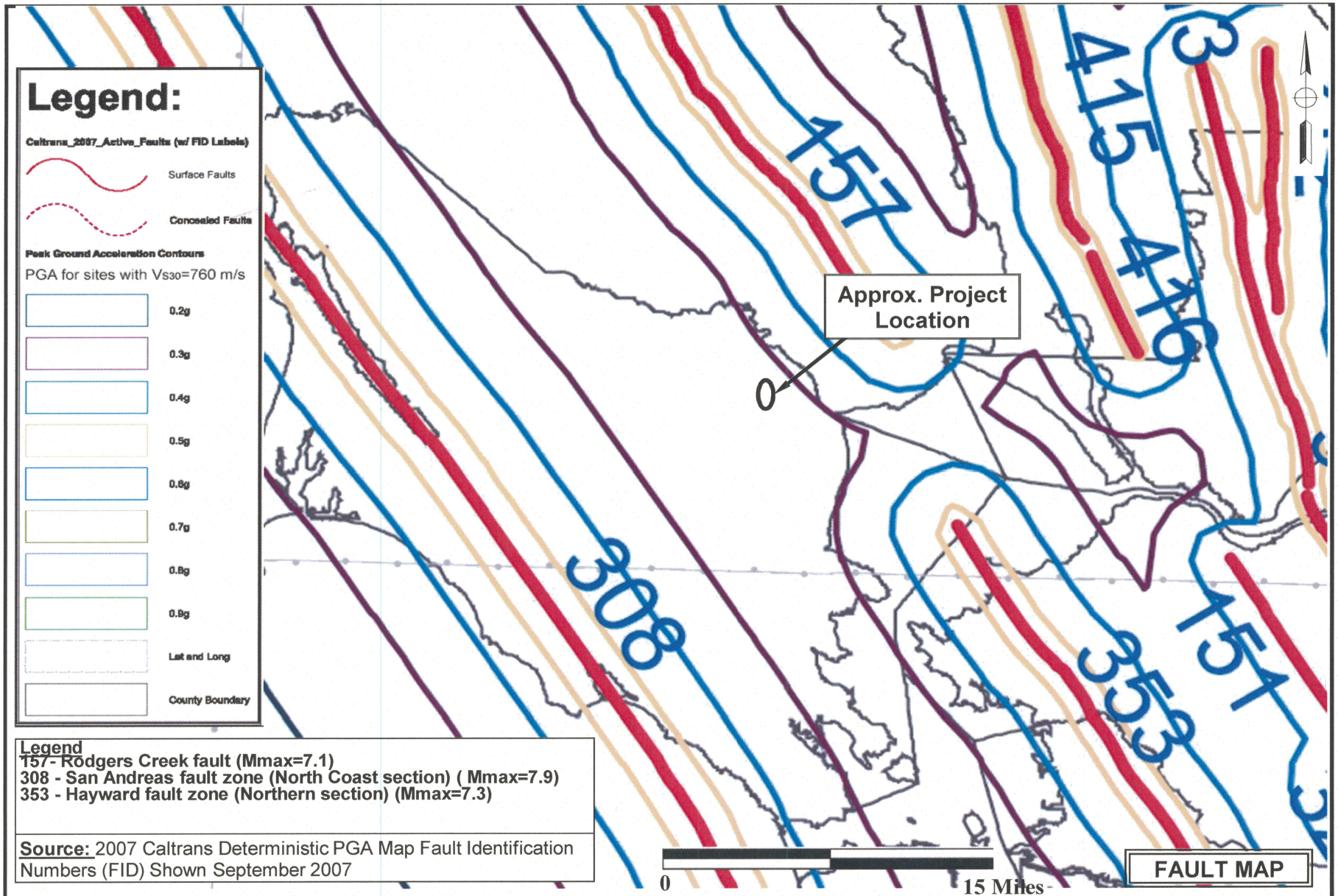
JOB NO.:2011-145-GDR | PLATE NO: 2D



PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

MSN A3-NB HOV WIDENING PROJECT, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-GDR	PLATE NO.: 3



Legend
157 - Rodgers Creek fault (Mmax=7.1)
308 - San Andreas fault zone (North Coast section) (Mmax=7.9)
353 - Hayward fault zone (Northern section) (Mmax=7.3)

Source: 2007 Caltrans Deterministic PGA Map Fault Identification Numbers (FID) Shown September 2007

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

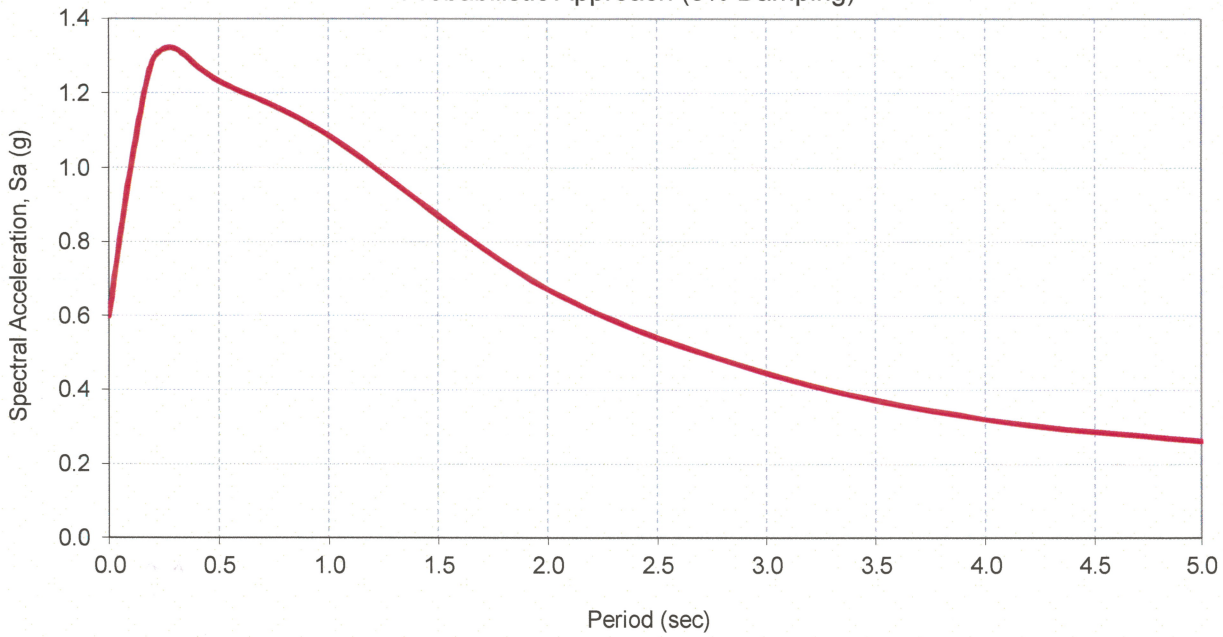
MSN A3-NB HOV WIDENING PROJECT, NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO.: 2011-145-GDR

PLATE NO.: 4

RECOMMENDED ARS CURVE

Probabilistic Approach (5% Damping)



Site Information

Latitude:	38.1220
Longitude	-122.5658
V_{S30} (m/s) =	230
$Z_{1.0}$ (m) =	N/A
$Z_{2.5}$ (km) =	N/A
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	8.1

Governing Curve:

USGS Deaggregation 2008 (beta)

Recommended Response Spectrum

Period (sec)	USGS Deagg. Spectral Acceleration (g)	Adjusted for Near Fault Effect	Adjusted For Basin Effect	Final Adjusted Spectral Acceleration (g)
0.0	0.5981	1.000	1.000	0.598
0.1	0.9972	1.000	1.000	0.997
0.2	1.2856	1.000	1.000	1.286
0.3	1.3197	1.000	1.000	1.320
0.5	1.2331	1.000	1.000	1.233
1.0	0.9049	1.200	1.000	1.086
2.0	0.5613	1.200	1.000	0.674
3.0	0.3722	1.200	1.000	0.447
4.0	0.2677	1.200	1.000	0.321
5.0	0.2184	1.200	1.000	0.262

Source:

1. Caltrans ARS Online tool (V.1.0.4, http://dap3.dot.ca.gov/shake_stable/)
2. USGS Deaggregation 2008 beta (http://eqint.cr.usgs.gov/deaggint/2008/index.php)
3. Caltrans Geotechnical Services Design Manual (Version 1.0)

Note:

Refer to "Probablistic Response Spectum Spreadsheet" (attached) for development of the recommended ARS curve.

REGISTERED CIVIL ENGINEER 4/16/12 DATE
PLANS APPROVAL DATE
N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL STATE OF CALIFORNIA
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588
TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTES:

1. DIMENSIONS OF THE PAVEMENT SECTION (STRUCTURAL SECTIONS) ARE SUBJECT TO TOLERANCES SPECIFIED IN THE STANDARD SPECIFICATIONS.
2. FOR SUPERELEVATION DIAGRAMS, SEE PROFILE AND SUPERELEVATION DIAGRAM.
3. SLOPE ROUNDING WILL BE REQUIRED ON ALL SIDE SLOPES UNLESS OTHERWISE NOTED.
4. FOR VEGETATION CONTROL, SEE Std PLAN A77C5, A77C6, A77C7, A78C4, AND A78C6.
5. FOR LIMITS AND DETAILS OF DRAINAGE DITCHES AND UNDERDRAINS, SEE DRAINAGE PLAN, DRAINAGE PROFILES, AND DRAINAGE DETAILS.
6. FOR LIMITS AND TYPES OF DIKE, MBGR, Conc BARRIER, AND DTBB, SEE LAYOUT, SUMMARY OF QUANTITIES AND CONSTRUCTION DETAILS.
7. HMA-O OVERLAY WILL BE PLACED OVER THE ENTIRE MAINLINE PAVEMENT AS SHOWN ON THE LAYOUTS.
8. FOR TYPES AND LIMITS OF HMA DIKES AND PAVEMENT EDGE TREATMENTS, SEE LAYOUTS.
9. FOR DETAILS FOR HMA DIKES, SEE Std PLAN A87B AND CONSTRUCTION DETAILS.
10. FOR DETAILS FOR SHOULDER BACKING AND SAFETY EDGE, SEE REVISED Std PLAN RSP P74, RSP P75, AND RSP P76.
11. FOR AERIALLY DEPOSITED LEAD MANAGEMENT, SEE CONSTRUCTION DETAILS AND SPECIFICATIONS.
12. FOR LOCATIONS OF BIOFILTRATION STRIPS AND LINEAR BIORETENTION AREAS, SEE EROSION CONTROL PLANS.
13. SEAL ALL CRACKS 1/4 INCH OR WIDER, AND REMOVE AND REPLACE FAILED EXISTING AC PAVEMENT PRIOR TO THE SPECIFIED OVERLAYS.
14. FOR Conc SIDEWALK AND CURB, SEE DRAINAGE DETAILS FOR SLOPE PAVING-FULL SLOPE IN THE STRUCTURE PLANS.
15. FOR Conc CURB (TYPE A2-6), SEE Std PLAN A87A.

ABBREVIATIONS:

CSC	CROSS SLOPE CORRECTION
HMA-O	HOT MIXED ASPHALT (OPEN GRADED)
MPH	MILES PER HOUR
RAC	RUBBERIZED ASPHALT CONCRETE
RAC-G	RUBBERIZED AC (GAP GRADED)
Rem	REMOVE
RHMA-G	RUBBERIZED HMA (GAP GRADED)
SC	SAWCUT

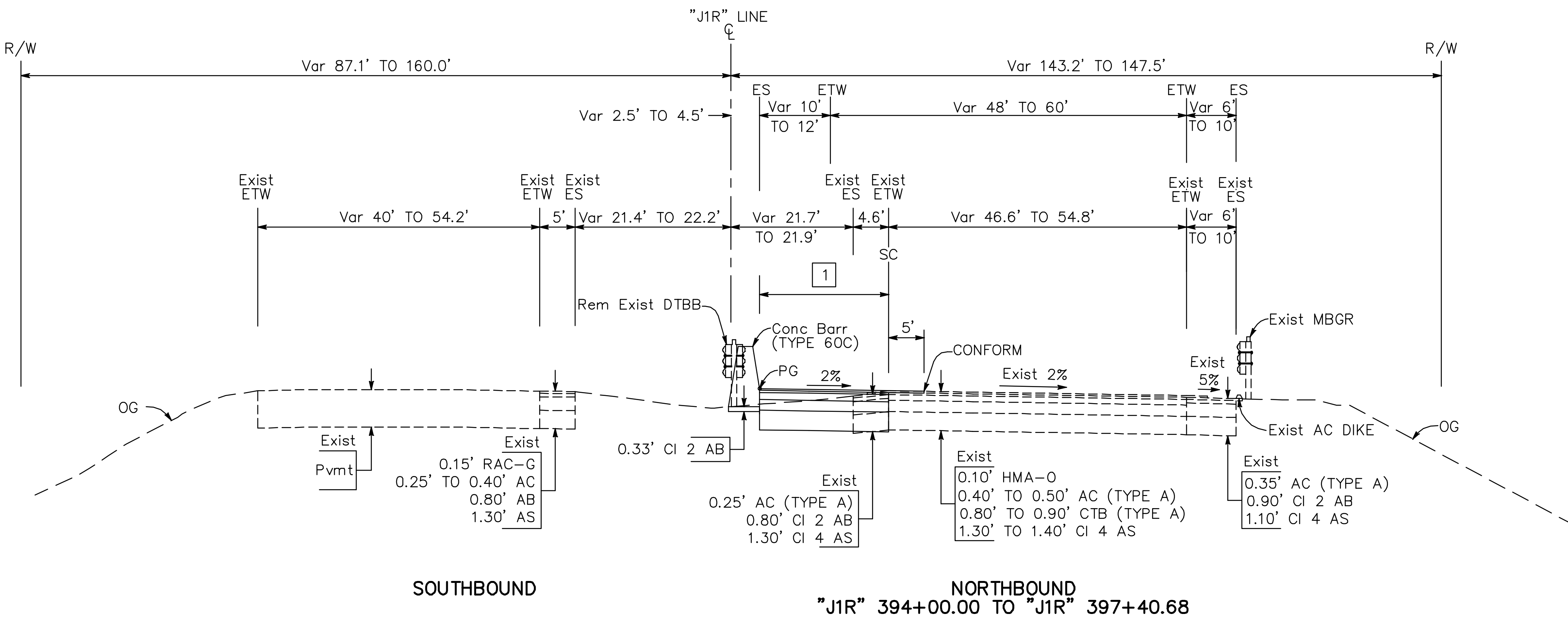
PAVEMENT STRUCTURAL SECTIONS:

1	0.10' HMA-O 0.15' RHMA-G 0.55' HMA 0.70' LCB 1.35' CI 4 AS
2	0.10' HMA-O 0.15' RHMA-G 0.55' HMA 0.70' LCB 1.10' CI 4 AS
3	0.10' HMA-O
4	0.10' HMA-O 0.15' RHMA-G Var HMA-A (CSC)
5	0.75' HMA
6	0.33' PCC 0.50' CI 4 AS

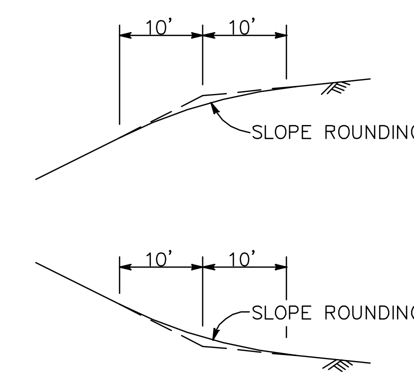
DESIGN DESIGNATION:

MAINLINE (ROUTE 101) TI = 14 R VALUE = 14 (OUTSIDE LANE) V_{DESIGN} = 70 MPH
R VALUE = 15 (INSIDE LANE)
R VALUE = 15 ("J1R" 470+00 TO 478+00)

RUSH LANDING Rd TI = 6.5 R VALUE = 15



ROUTE 101



SLOPE ROUNDING DETAIL (TYPICAL)

TYPICAL CROSS SECTIONS

NO SCALE

X-1

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

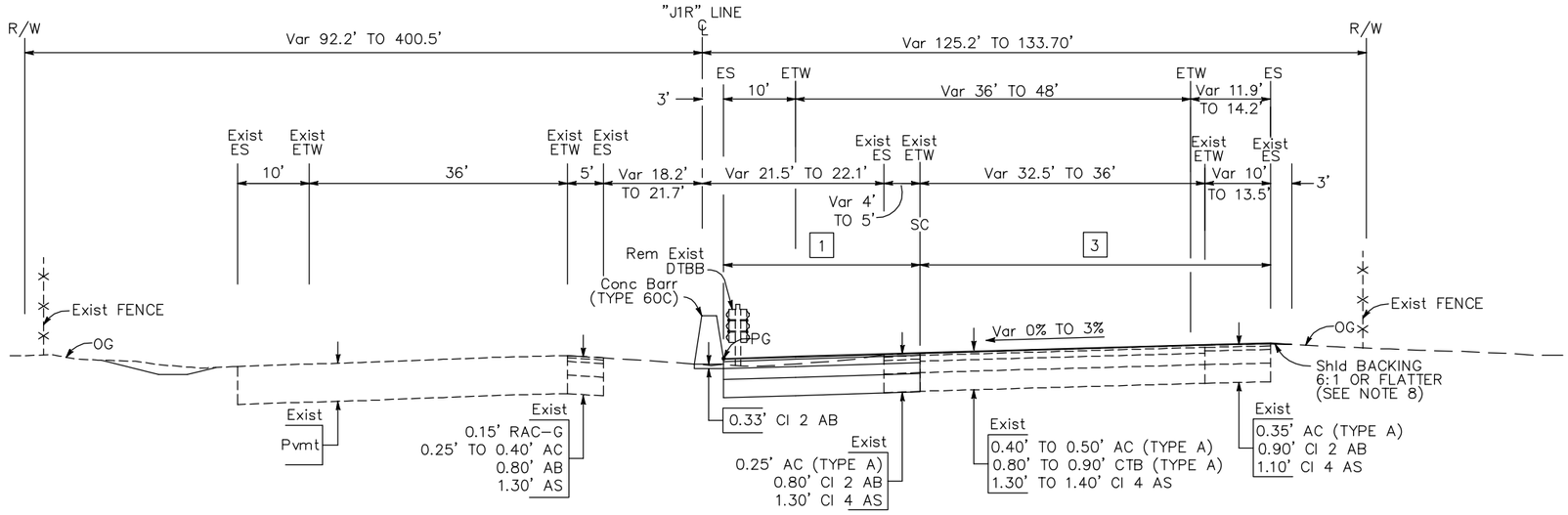
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

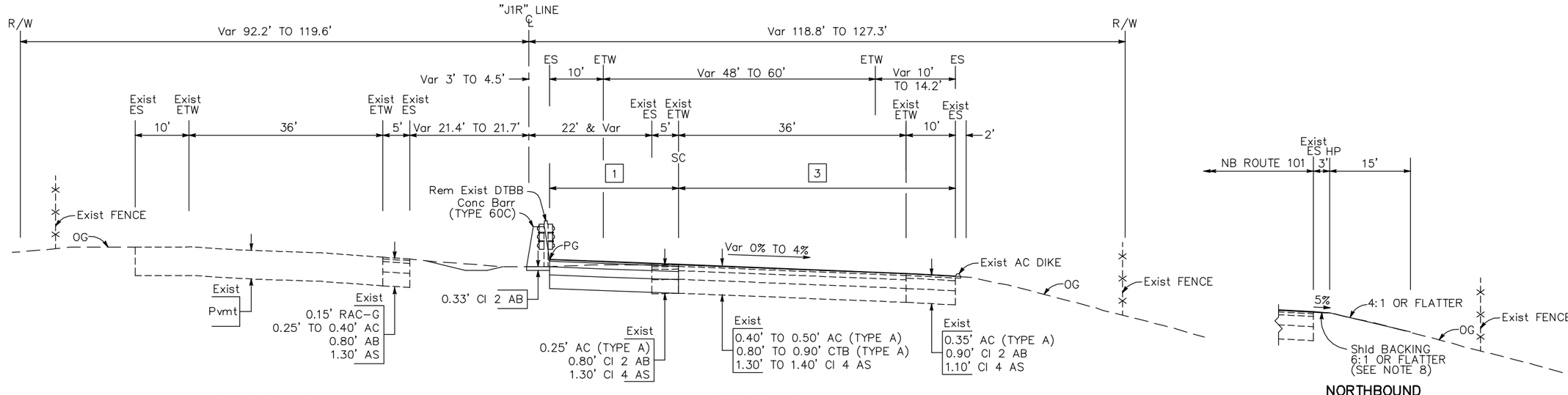
BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



SOUTHBOUND NORTHBOUND

"J1R" 422+79.23 TO "J1R" 437+50.00



SOUTHBOUND NORTHBOUND

"J1R" 401+83.83 TO "J1R" 422+79.23

NORTHBOUND

"J1R" 411+05.00 TO "J1R" 422+79.23

ROUTE 101

TYPICAL CROSS SECTIONS

NO SCALE

FOR NOTES AND ABBREVIATIONS, SEE SHEET X-1

X-2

REVISED BY	DATE REVISED
IA	4/16/12

INNA ASHUROV — GORDON SWEET — CALCULATED–DESIGNED BY — CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR — NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Gates+Cattars

\\BKF-FS1\Vol1\Dgn\BK07003-20\DWG\SHEETS\TYPICALS\X-02.dwg 16 Apr 2012 4:38:37pm MANA

LAST REVISION 04-16-12 — DATE PLOTTED => Apr 16 2012 — TIME PLOTTED => 4:38 pm

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

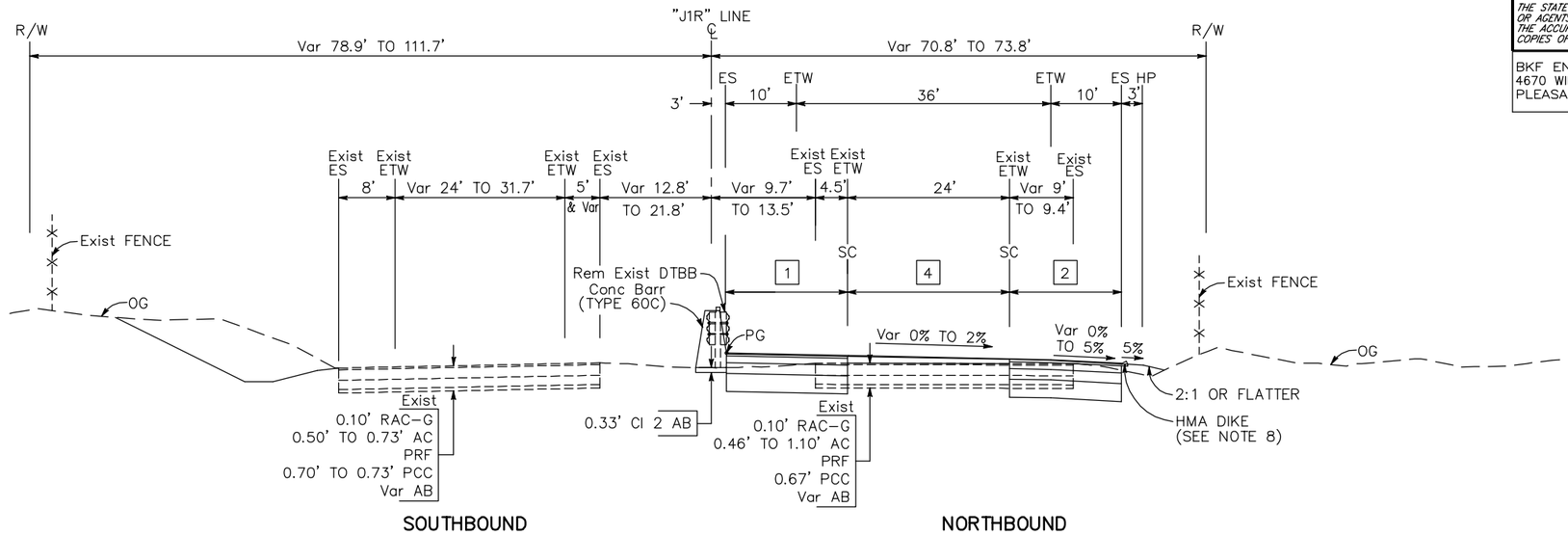
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

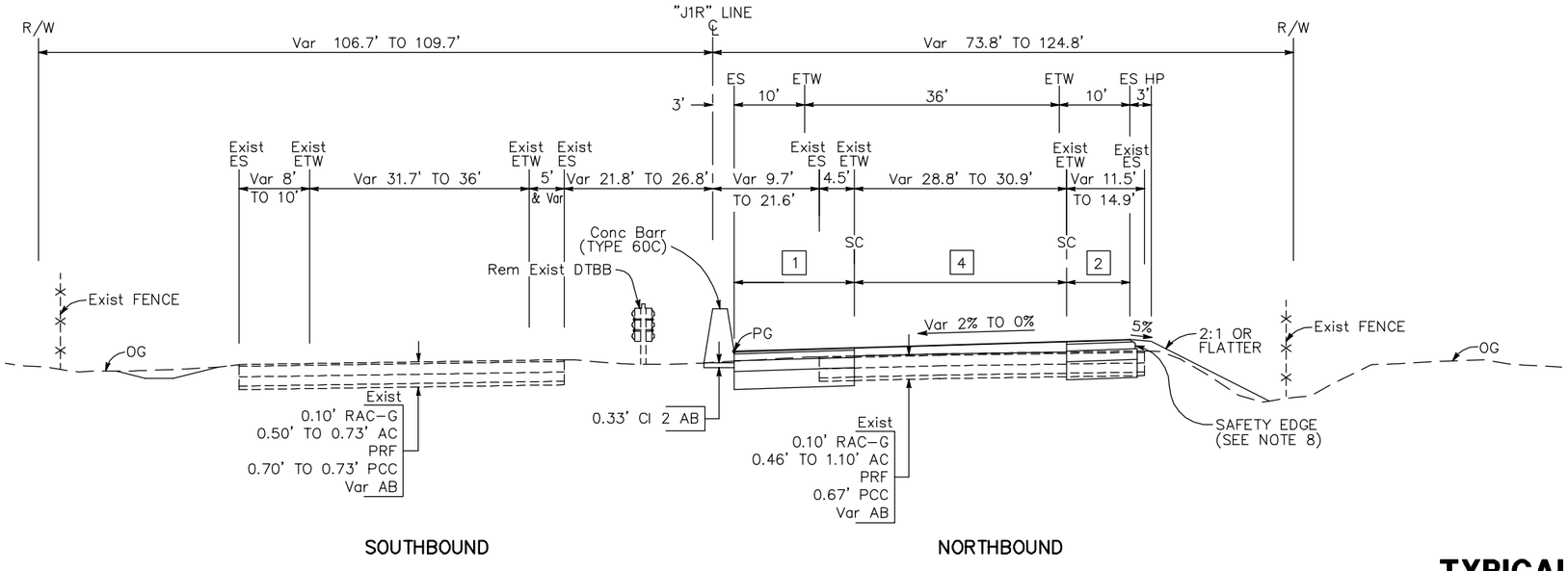
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



"J1R" 444+70.00 TO "J1R" 470+00.00



"J1R" 437+50.00 TO "J1R" 444+70.00

ROUTE 101

FOR NOTES AND ABBREVIATIONS, SEE SHEET X-1

TYPICAL CROSS SECTIONS

NO SCALE

X-3

	IA	4/16/12	
	REVISED BY	DATE REVISED	
	INNA ASHUROV	GORDON SWEET	
	CALCULATED–DESIGNED BY	CHECKED BY	
	CONSULTANT FUNCTIONAL SUPERVISOR		
	NATALINA V. BERNARDI		

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

\\BKF-FS1\Vol4\Engr\BKF003-20\DWG\SHEETS\TYPICALS\X-03.dwg 16 Apr 2012 4:38:17pm MANA

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 16 2012 | TIME PLOTTED => 4:39 pm

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

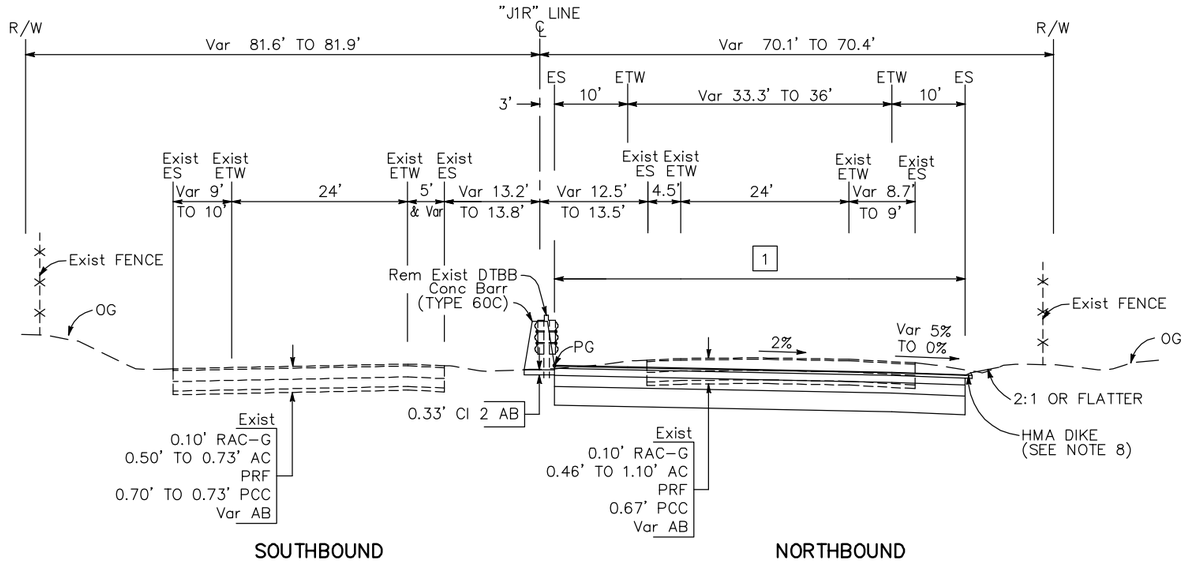
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

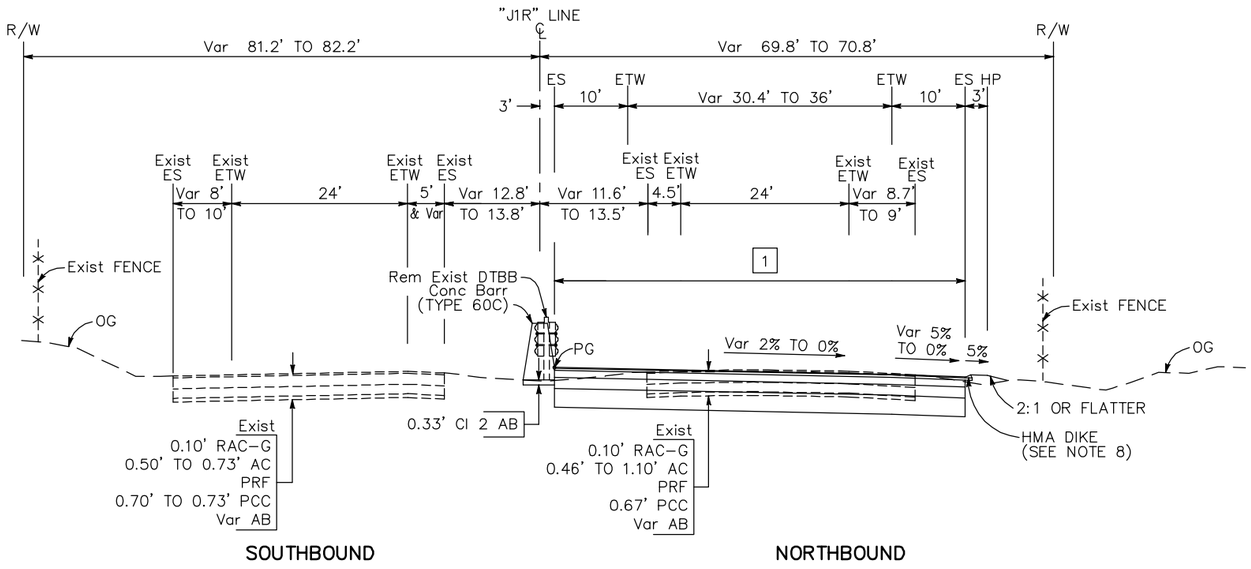
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



"J1R" 473+50.00 TO "J1R" 476+00.00



"J1R" 470+00.00 TO "J1R" 473+50.00
"J1R" 476+00.00 TO "J1R" 478+00.00

ROUTE 101

TYPICAL CROSS SECTIONS

NO SCALE

X-4

FOR NOTES AND ABBREVIATIONS, SEE SHEET X-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	INNA ASHUROV	GORDON SWEET	IA	4/16/12	
Caltrans	CALCULATED-DESIGNED BY	CHECKED BY	REVISED BY	DATE REVISED	

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

LAST REVISION 04-16-12 | DATE PLOTTED => Apr 16 2012 | TIME PLOTTED => 4:40 pm

\\BKF-FS1\Vol1\Engdft\087003-20\DWG\SHEETS\TYPICALS\X-04.dwg 16 Apr 2012 4:40:43pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

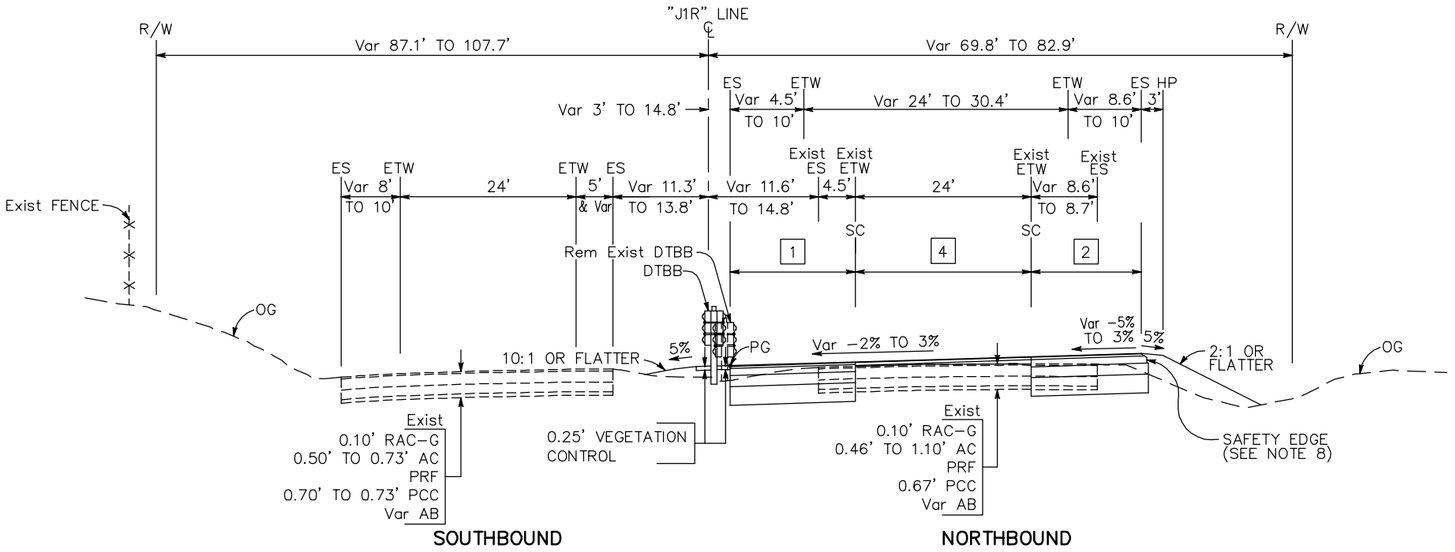
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI — No. 45407 — Exp. 9/30/12 — CIVIL — STATE OF CALIFORNIA

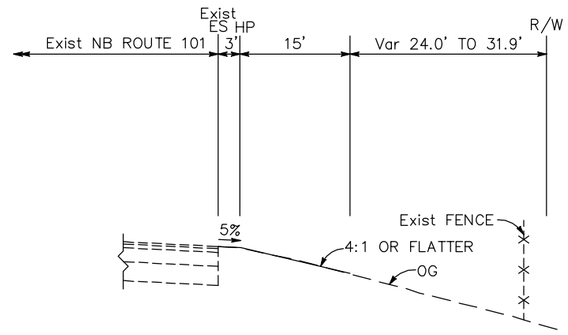
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

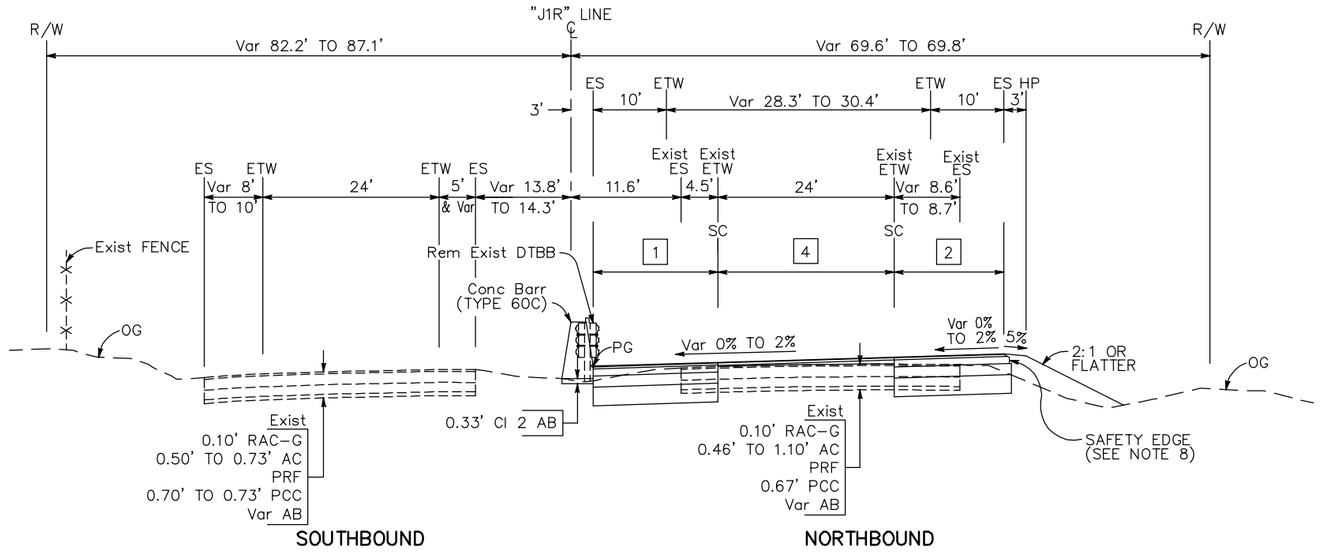
TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901



"J1R" 479+47.00 TO "J1R" 482+79.37



NORTHBOUND
"J1R" 486+61.00 TO "J1R" 494+86.00



"J1R" 478+00.00 TO "J1R" 479+47.00
ROUTE 101

TYPICAL CROSS SECTIONS

NO SCALE

X-5

FOR NOTES AND ABBREVIATIONS, SEE SHEET X−1

REVISED BY	DATE REVISED
IA	4/16/12

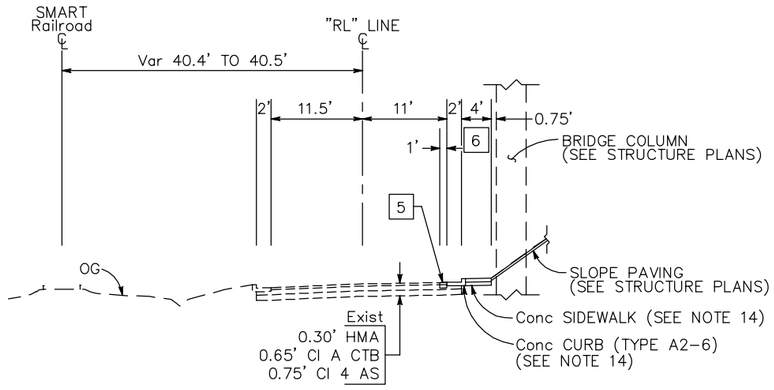
CALCULATED−DESIGNED BY: INNA ASHUROV
CHECKED BY: GORDON SWEET
CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA − DEPARTMENT OF TRANSPORTATION
Caltrans

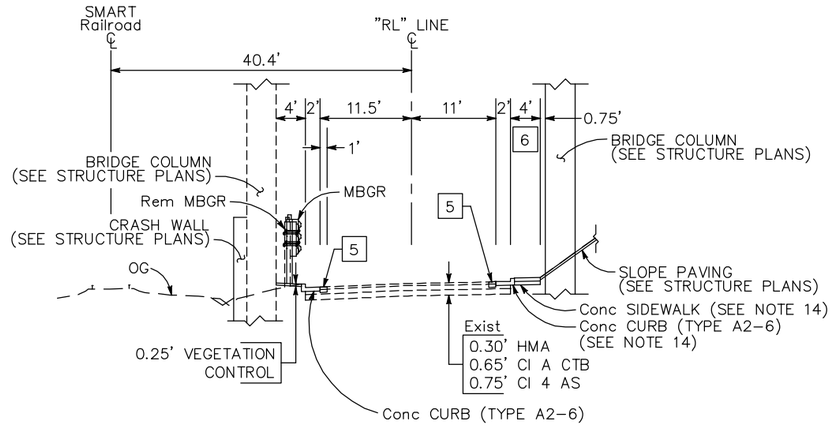
\\BKF−FS1\Vol4\Engr\087003−20\DWG\SHEETS\TYPICALS\X−05.dwg 16 Apr 2012 4:41:58pm MANA

LAST REVISION 04−16−12 | DATE PLOTTED => Apr 16 2012 | TIME PLOTTED => 4:41 pm

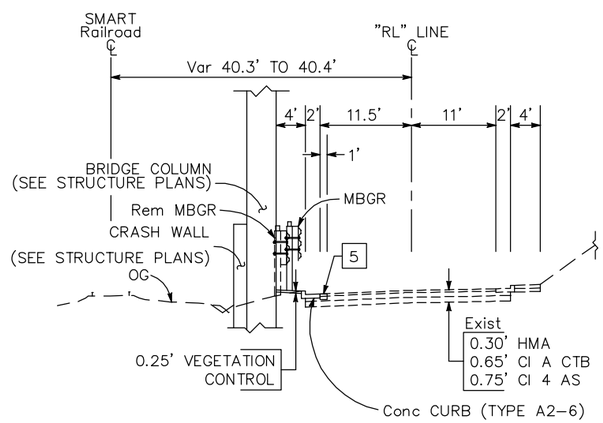
BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER | DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371



"RL" 41+67.15 TO "RL" 42+52.15



"RL" 40+88.48 TO "RL" 41+67.15



"RL" 39+86.46 TO "RL" 40+88.48
RUSH LANDING Rd

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET X-1

TYPICAL CROSS SECTIONS

NO SCALE

X-6

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	Mrn	101	R22.0/24.4		

REGISTERED CIVIL ENGINEER — DATE 4/16/12

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — N.V. BERNARDI No. 45407 Exp. 9/30/12 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

BKF ENGINEERS
4670 WILLOW ROAD, SUITE 250
PLEASANTON, CA 94588

TAM
750 LINDARO ST. SUITE 200
SAN RAFAEL, CA 94901

REVISED BY	DATE REVISED
IA	4/16/12

CALCULATED–DESIGNED BY: INNA ASHUROV
CHECKED BY: GORDON SWEET

CONSULTANT FUNCTIONAL SUPERVISOR: NATALINA V. BERNARDI

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 04-16-12 — DATE PLOTTED => Apr 16 2012 — TIME PLOTTED => 4:44 pm

\\BKF-PLW41\Engdat\87003-20\DWG\SHEETS\TYPICALS\X-06.dwg 16 Apr 2012 4:44:28pm MANA

BORDER LAST REVISED 7/2/2010 | USERNAME =>$USER, DGN FILE => $REQUEST | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0716 | PROJECT NUMBER & PHASE 04120003371

APPENDIX A

APPENDIX A

FIELD EXPLORATION

The soil borings were advanced with a jeep-mounted drill rig using 8-inch diameter continuous-flight auger. Bulk samples were obtained from the borings within the top 5 feet. The borings were drilled under the technical supervision of our engineer, who visually classified in the field (according to the Unified Soil Classification System) and logged the soils encountered during drilling. The engineer supervised the collection and transportation of soil samples for visual examination and laboratory testing. Upon completion of drilling, all the borings were backfilled.

The descriptions of the soil materials presented in the report depict subsurface conditions only at the locations indicated on the plan and on the particular date of drilling. Because of the variability from place to place within soil/rock in general, subsurface conditions at other locations may differ from conditions occurring at the locations explored. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental changes.

REFERENCE LOG OF TEST BORINGS
NORTH NOVATO OVERHEAD (WIDEN)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Mrn	101	R22.2/24.3		

GEOTECHNICAL PROFESSIONAL — 5/31/12 DATE

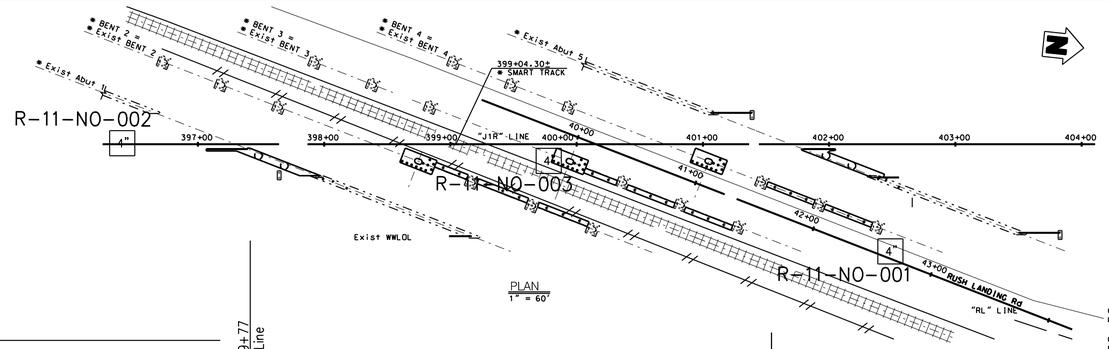
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

TAM
750 LINDARO STREET, SUITE 200
SAN RAFAEL, CA 94901

PARIKH CONSULTANTS, INC.
2360 QUME DRIVE, SUITE A
SAN JOSE, CA 95131



0.00' Rt Sta 396+50 "J1R" Line

R-11-NO-002

Elev. 38.5'

4"

26 2.5 — SANDY lean CLAY (CL); very stiff; brown; moist; some fine SAND; low plasticity fines.

32 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); medium dense; gray; moist; fine SAND; little fine GRAVEL; 31% fines.

36 2.5 — Dense; gray/brown.

31 2.5 — SANDY lean CLAY with GRAVEL (CL); very stiff; gray; moist to wet; some fine SAND; little fine GRAVEL; low plasticity fines.

GWS Elev. 21.5'

23 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); medium dense; brownish gray; wet; 51% fine SAND fine; 29% fine GRAVEL; 20% fines.

21 1.4 — SANDY lean CLAY with GRAVEL (CL); very stiff; brownish gray; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

24 2.5 (PI) — (LL=32; PI=12).

49 2.5 (PA) — Poorly graded SAND with CLAY and GRAVEL (SP-SC); medium dense; gray; wet; 47% fine SAND; 41% fine GRAVEL; 13% fines.

38 2.5 (UC) — SANDY lean CLAY with GRAVEL (CL); hard; gray; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

67 2.5 (PA) — CLAYEY SAND with GRAVEL (SC); very dense; gray; wet; 49% fine SAND; 30% fine GRAVEL; 21% fines.

16 2.5 (UC) — Lean CLAY with SAND (CL); stiff; brown; wet; little fine SAND; low plasticity fines, PP<0.5 tsf.

32 1.4 — SANDY lean CLAY (CL); hard; brown; wet; some fine SAND; low plasticity fines.

51 2.5 (PA) — Well-graded SAND with SILT (SW-SM); dense; brown; wet; 85% fine SAND; 6% fine GRAVEL; 9% fines.

23 2.5 (PA) — SILTY SAND (SM); medium dense; brown; wet; fine SAND; 24% fines.

19 2.5 (PI) — ORGANIC fat CLAY (OH); stiff; grayish black; wet; high plasticity fines.

22 2.5 (UC) — PP=1.25 tsf (LL=94; PI=55).

60/5 1.4 — SANDY Lean CLAY with GRAVEL (CL); very stiff; grayish black; wet; some fine SAND; little fine GRAVEL; low plasticity fines.

Hard; gray.

10-19-11
Terminated at Elev -57.5'
ERi = 84%

12.00' Rt Sta 399+77 "J1R" Line

R-12-NO-003

Elev. 12.5'

4"

ASPHALT 6" AC over 6" AB & 6" Concrete.

GWS Elev. 6.0'

15 2.5 (M UW PA) — SILTY SAND with GRAVEL (SM); medium dense; reddish brown; moist; 44% fine SAND; 38% fine GRAVEL; 18% fines.

4 2.5 (C) — Fat CLAY (CH); soft; dark gray; wet; high plasticity fines; PP=0.5 tsf.

16 2.5 (M UW PI UC) — SANDY lean CLAY (CL); stiff; brown; moist; fine SAND; low plasticity fines; (LL=33; PI=17).

22 2.5 (M UW CR) — Very stiff; PP=2.0 tsf..

25 1.4 (M) — CLAYEY GRAVEL (GC); dense; brown; moist.

7 1.4 (M) — SANDY lean CLAY (CL); stiff; brown; wet; low plasticity fines; PP=1.3 tsf.

25 2.5 (M UW UC) — Lean CLAY (CL); very stiff; gray with orange brown mottling; moist; low plasticity fines.

24 2.5 (M UW PI UC) — (LL=32; PI=14).

22 2.5 (M UW PA) — CLAYEY SAND (SC); medium dense; brown; moist; 59% fine SAND; 3% fine GRAVEL; 38% fines.

60 2.5 (M UW) — Lean CLAY with GRAVEL (CL); hard; mottled orange brown & gray; moist; (Weathered METASEDIMENTARY ROCK); PP>4.5 tsf.

50/4 2.5 (M UW) — METAMORPHIC ROCK, (METASANDSTONE), hard, brown, intensely weathered, intensely fractured.

50/4 1.4 (M) — METAMORPHIC ROCK, (METASHALE), hard, dark greenish gray, moderately weathered, intensely fractured.

2.4" — METAMORPHIC ROCK, (METASANDSTONE), hard, gray, fresh.

REC=75% RQD=50% — METAMORPHIC ROCK, (METASANDSTONE/ METASHALE), gray, fresh, very intensely fractured/crushed.

REC=100% RQD=100% — METAMORPHIC ROCK, (METASANDSTONE/ METASHALE), gray, fresh, very intensely fractured/crushed.

REC=100% RQD=100%

REC=100% RQD=86%
REC=73% RQD=53% — Very intensely fractured/crushed.

REC=68% RQD=100%
REC=100% RQD=63%
REC=100% RQD=92% — Gray, very intensely fractured/crushed.

REC=100% RQD=100%

REC=100% RQD=100%

REC=87% RQD=87%

REC=86% RQD=64%
REC=100% RQD=56%
REC=90% RQD=67%
REC=80% RQD=57%
REC=100% RQD=100%

04-30-12
Terminated at Elev -108'
ERi = 77%

85.00' Rt Sta 402+50 "J1R" Line

R-11-NO-001

Elev. 12.0'

4"

ASPHALT.

21 2.5 — CLAYEY SAND with GRAVEL (SC); brown; moist; fine SAND; little fine GRAVEL; some fines (FILL).

9 2.5 (PI) — SANDY lean CLAY (CL); very stiff; brown; moist; some fine SAND; trace fine GRAVEL; low plasticity fines.

GWS ▽ ELEV. =1.0' = 11-04-11

10 2.5 — Fat CLAY (CH); soft; gray; moist to wet; high plasticity fines; PP=1.0 tsf. (LL=68; PI=47).

24 2.5 (UC) — Lean CLAY (CL); stiff; brown; wet; low plasticity fines.

21 2.5 (UC) — Very stiff ; PP=1.5 tsf.

36 2.5 — Mottled dark brown; little fine SAND; PP=2.0 tsf.

52 2.5 — CLAYEY SAND (SC); dense; brown; wet; coarse to fine SAND; little fines.

79 2.5 — SILTY SAND (SM); very dense; brownish gray; wet; fine SAND; some fines.

109/8 2.5 — SILTY SAND with GRAVEL (SM); very dense; brown; wet; fine SAND; little fine GRAVEL; some fines.

50/6 2.5 — Lean CLAY (CL); stiff; gray; wet; medium plasticity fines.

14 2.5 (PI) — (LL=45; PI=23).

16 2.5 (PA) — Well-graded SAND with CLAY and GRAVEL (SW-SC); medium dense; gray; wet; 60% fine SAND; 33% fine GRAVEL; 7% fines.

Lean CLAY (CL); stiff; gray; wet; low plasticity fines.

16 2.5 (C) — SILTY SAND with GRAVEL (SM); very dense; gray; wet; fine SAND; little fine GRAVEL; some fines.

REC=50% RQD=0% — 50/4 2.5 — 2.4" — METAMORPHIC ROCK, (METASILTSTONE), very thinly bedded, gray, hard, very intensely fractured, (slightly weathered).

REC=10% RQD=0% — METAMORPHIC ROCK, (METASILTSTONE / METASANDSTONE), gray, hard, very intensely fractured, (fresh).

REC=45% RQD=0%
REC=33% RQD=0%
REC=50% RQD=0%
REC=25% RQD=0%
REC=25% RQD=0%
REC=13% RQD=0% — METAMORPHIC ROCK, (METASANDSTONE), gray, hard, very intensely fractured, (fresh).(Gougy).

METAMORPHIC ROCK, (METAHALE / METASANDSTONE), dark gray/gray, hard, very intensely fractured, (fresh).

11-04-11
Terminated at Elev -89'
ERi = 84%

Notes:
Standard Penetration Test Sampler: I.D. = 1.4"; O.D. = 2"
Modified California Sampler: I.D. = 2.5"; O.D. = 3"
Hammer Assembly: A 140 lb hammer with a 30" drop (Automatic Hammer)
This LOTB sheet was prepared in accordance with the Caltrans Soil & Rock, Logging, Classification, and Presentation Manual (2010)
All dimensions are in feet unless otherwise shown

BENCH MARK

BM GPS30 1" IRON PIPE WITH PLASTIC PLUG AT NORTHBOUND SHOULDER OF HIGHWAY 101 AT THE BEGINNING OF OFFRAMP TO ATHERTON AVENUE/SAN MARIN DRIVE. THE VALUES FOR GPS30 WERE PROVIDED BY CALTRANS PER JOB No. 00071, MRN-101, PM18.6/23.0 EA 8200K, JUNE 27,2000.
N 2234473.120 E 5967838.330
ELEVATION = 17.98

PROFILE
Vert. : 1" = 10'
Hor. : 1" = 40'

"J1R" LINE

396+00 397+00 398+00 399+00 400+00 401+00 402+00 403+00 404+00 405+00

ELEVATION (feet)

DESIGN OVERSIGHT	DRAWN BY	E. ORTAKCI	L.S. BHANGOO	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ALSTON LAM PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	A. LAM	FIELD INVESTIGATION BY: DATE: OCTOBER & NOVEMBER, 2011		

BRIDGE NO. 27-0094R
POST MILES R22.3

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES

SHEET 27 OF 28

DGN FILE=>270094rzltb01.dgn

CONTRACT NO.: 04-2640L4 PROJECT ID: 0412000337

27-0094r-z-ltb01.dgn Default 6/6/2012 3:07:56 PM

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIVISION OF ENGINEERING SERVICES – GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	Sheet No.	Total Sheets
04	Mrn	101	R22/24.3		

REGISTERED CIVIL ENGINEER — DATE 5/31/12

NORTH NOVATO OVERHEAD (WIDEN)

LOG OF TEST BORINGS 2 OF 2

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT: 0716
PROJECT NUMBER & PHASE: 04120003371

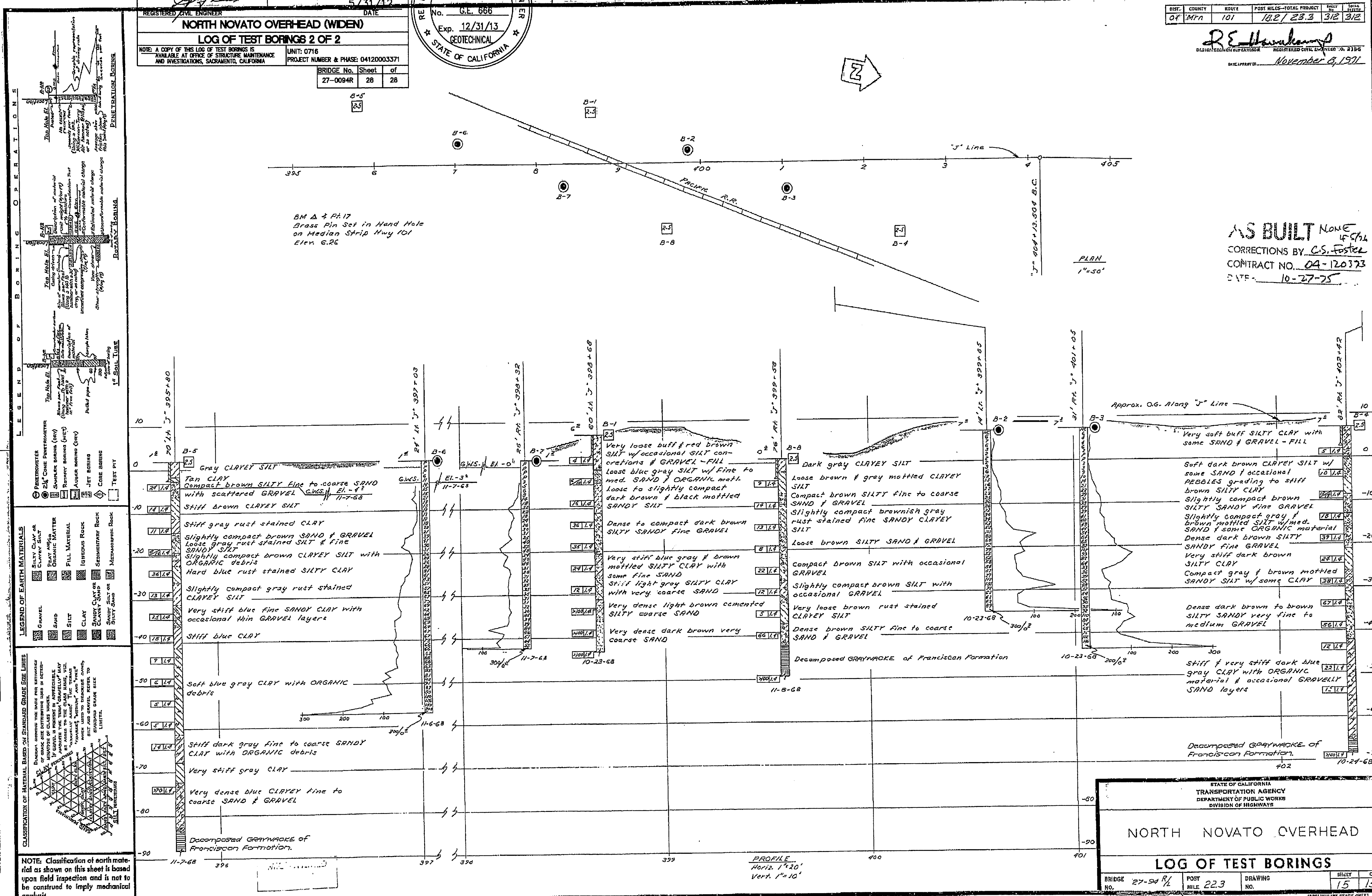
BRIDGE No.	Sheet	of
27-0094R	28	28

REGISTERED PROFESSIONAL ENGINEER — GARY PARIKH — No. G.E. 666 — Exp. 12/31/13 — GEOTECHNICAL — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	Mrn	101	10.2/23.3	312	312

November 8, 1971

AS BUILT
CORRECTIONS BY C.S. Foster
CONTRACT NO. 04-120373
DATE 10-27-75



NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NORTH NOVATO OVERHEAD

LOG OF TEST BORINGS

BRIDGE NO. 27-94 R/L — POST MILE 223 — DRAWING NO. — SHEET 15 OF 15

WO 120371
CU 04219 PR-2794-2

312

AS BUILT PLANS
Contract No. 04-120374
Date Completed
Document No. 4000 8049

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 6/28/76

ClibPDF - www.fastio.com

APPENDIX B

APPENDIX B

LABORATORY TESTS

Atterberg Limits

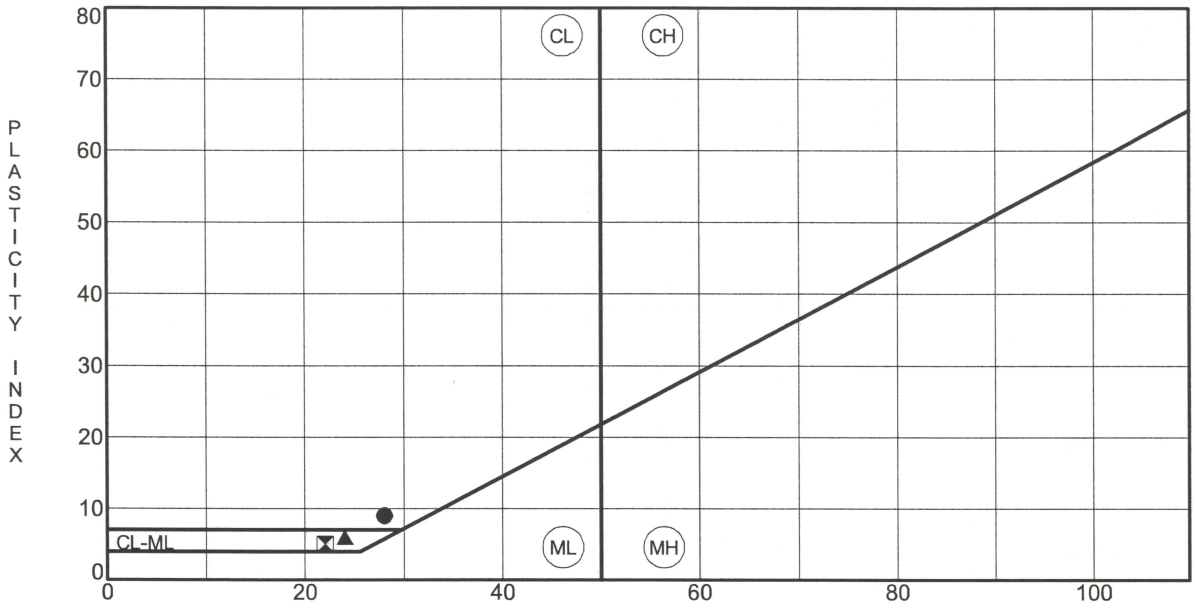
The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on" Plasticity Chart", Plate No. B-2, Appendix B.

Corrosion Tests

Corrosion tests were performed on selected samples to determine the corrosion potential of the soils. The pH and minimum resistively tests were performed according to California Test Method 643. The tests were performed by Sunland Analytical. The test results are presented on Plate B-3A to Plate B-3F, Appendix B.

R-value Tests

R-value tests were performed on representative bulk samples for pavement design. The tests were performed by Cooper Testing Laboratory. The test results are presented in Plate B-4A to Plate B-4K, Appendix B.



PLASTICITY

	BOREHOLE	SAMPLE #	DEPTH (ft)	LL	PL	PI	Fines	USCS Classification
●	**A-11-101**	**BULK**	**2.5**	**28**	**19**	**9**		**Lean CLAY**
⧓	**A-11-104**	**BULK**	**2.5**	**22**	**17**	**5**		**SILTY CLAY**
▲	**A-11-121**	**BULK**	**2.5**	**24**	**18**	**6**		**SILTY CLAY**

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

MSN A3 - NB HOV WIDENING PROJECT,NOVATO
MARIN COUNTY, CALIFORNIA

JOB NO:2011-145-GDR

PLATE NO: B-2

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-101 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125855.

EVALUATION FOR SOIL CORROSION

Soil pH	7.13	
Minimum Resistivity	2.68 ohm-cm (x1000)	
Chloride	28.9 ppm	00.00289 %
Sulfate	33.2 ppm	00.00332 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

RECEIVED
NOV 4 2011

PLATE NO. B-3A

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-103 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125856.

EVALUATION FOR SOIL CORROSION

Soil pH	7.72	
Minimum Resistivity	0.94 ohm-cm (x1000)	
Chloride	72.1 ppm	00.00721 %
Sulfate	475.4 ppm	00.04754 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

RECEIVED
NOV 4 2011
BY

PLATE NO. B-3B

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-105 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125857.

EVALUATION FOR SOIL CORROSION

Soil pH	7.11	
Minimum Resistivity	0.91 ohm-cm (x1000)	
Chloride	61.0 ppm	00.00610 %
Sulfate	1022.4 ppm	00.10224 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

RECEIVED
NOV 4 2011
By

PLATE NO. B-3C

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-117 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125858.

EVALUATION FOR SOIL CORROSION

Soil pH	7.88	
Minimum Resistivity	2.41 ohm-cm (x1000)	
Chloride	21.5 ppm	00.00215 %
Sulfate	37.4 ppm	00.00374 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

RECEIVED
NOV 4 2011

PLATE NO. B-3D

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-120 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125859.

EVALUATION FOR SOIL CORROSION

Soil pH	7.63	
Minimum Resistivity	2.47 ohm-cm (x1000)	
Chloride	28.5 ppm	00.00285 %
Sulfate	26.9 ppm	00.00269 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

RECEIVED
NOV 4 2011
By

PLATE NO. B-3E

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 11/02/2011
Date Submitted 10/27/2011

To: Prav Dayah
Parikh Consultants, Inc.
2360 Qume Dr, Ste.A
San Jose, CA 95131

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2011-145-GDR/MSN A3 Site ID : A11-121 @ 0-5'.
Thank you for your business.

* For future reference to this analysis please use SUN # 61254-125860.

EVALUATION FOR SOIL CORROSION

Soil pH	7.43	
Minimum Resistivity	2.28 ohm-cm (x1000)	
Chloride	41.2 ppm	00.00412 %
Sulfate	13.6 ppm	00.00136 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

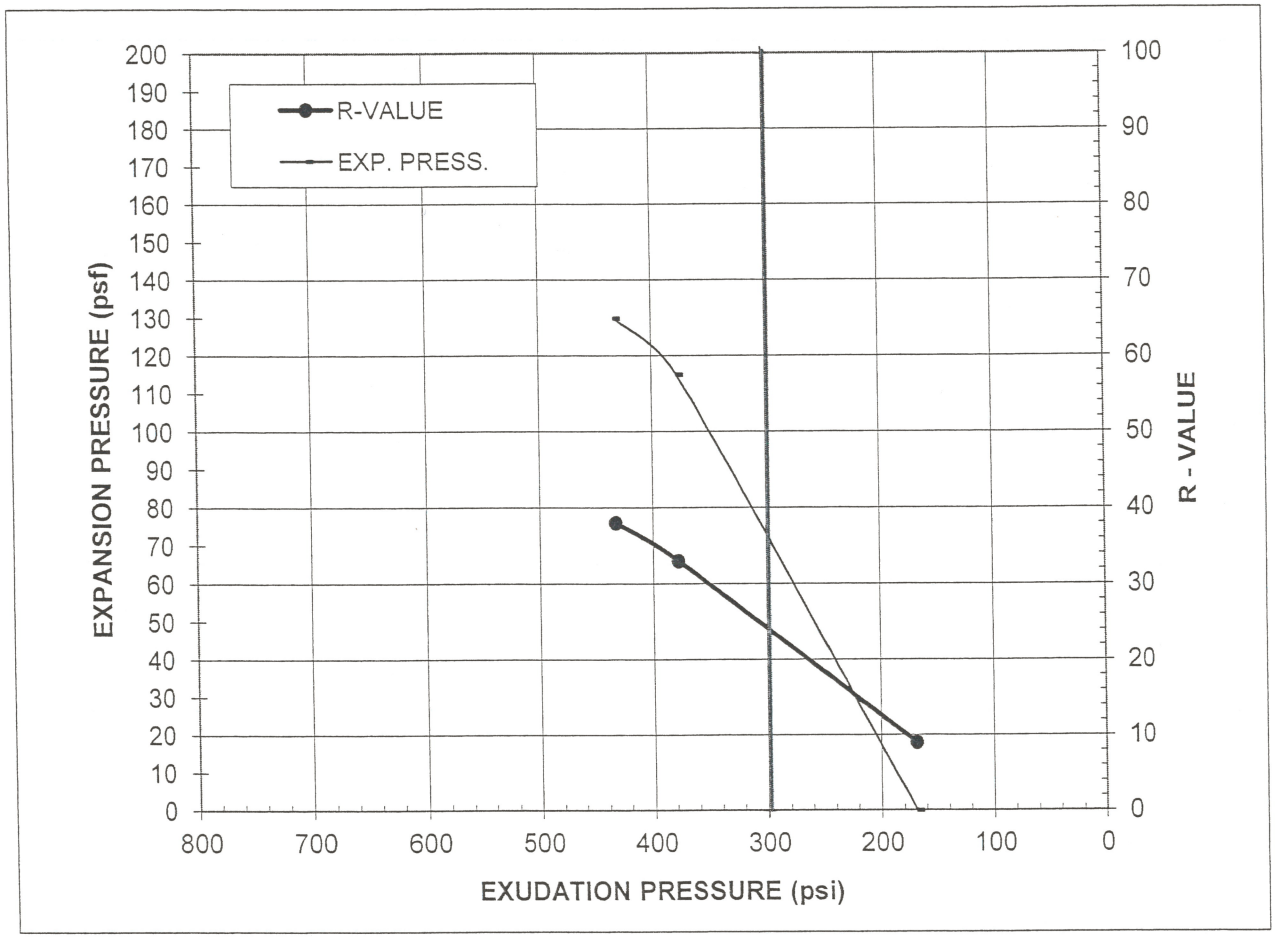
RECEIVED NOV 4 2011

PLATE NO. B-3F

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/25/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-101	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, light brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	169	378	433
Expansion Pressure, psf	0	115	129.9
R-Value	9	33	38
Moisture Content at Test, %	13.5	11.7	11.1
Dry Density at Test, pcf	126.2	132.4	133.6

R-Value @ 300 psi Exudation Pressure = 24

Expansion Pressure @300 psi Exudation, psf = **70**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

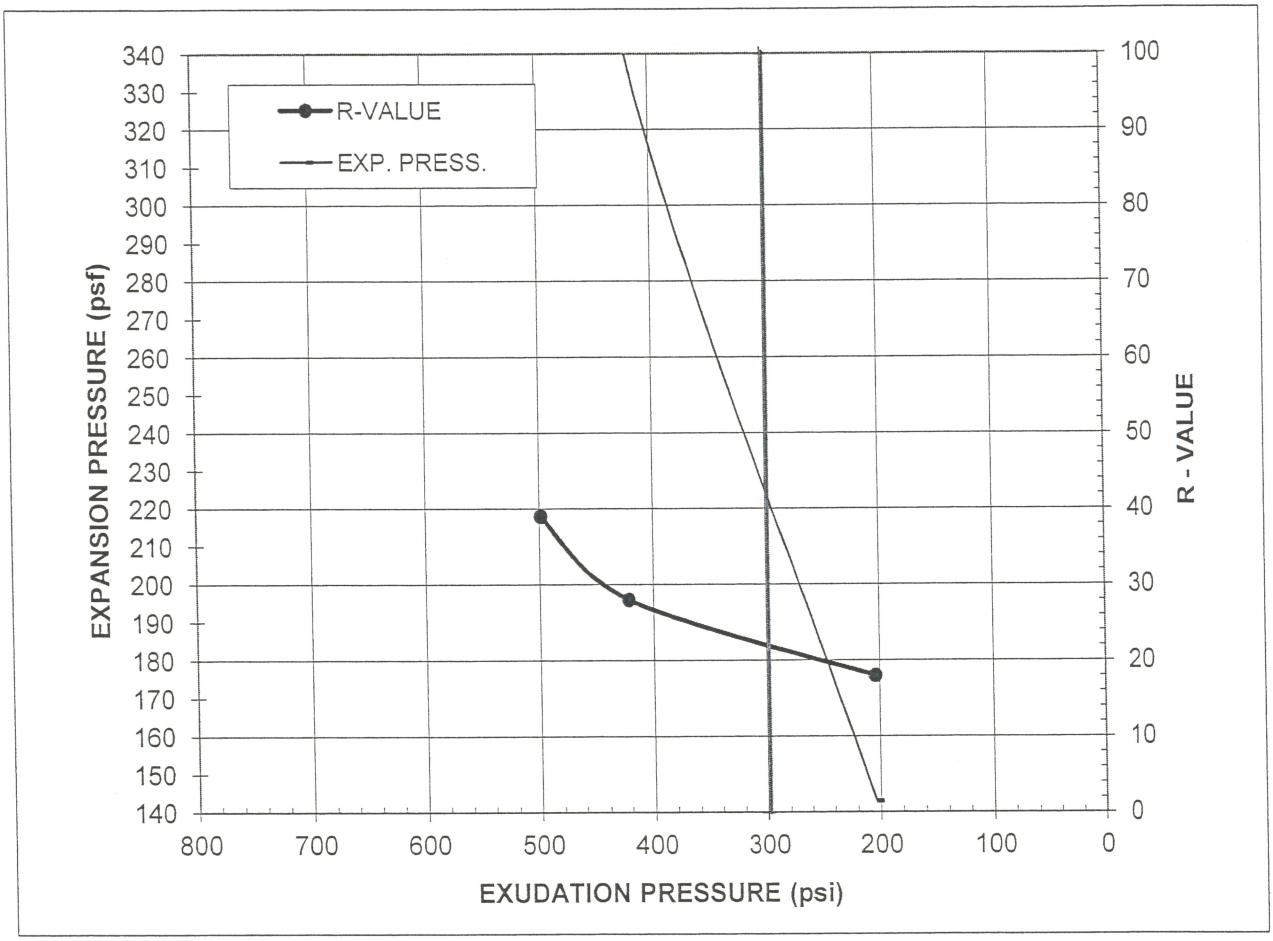
RVALUE with calcs pdp

PLATE NO. B-4A

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/25/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-102	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	204	422	499
Expansion Pressure, psf	143	342	528
R-Value	18	28	39
Moisture Content at Test, %	14.7	13.4	12.8
Dry Density at Test, pcf	120.0	123.9	126.8

R-Value @ 300 psi Exudation Pressure = 21

Expansion Pressure @300 psi Exudation, psf = **220**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

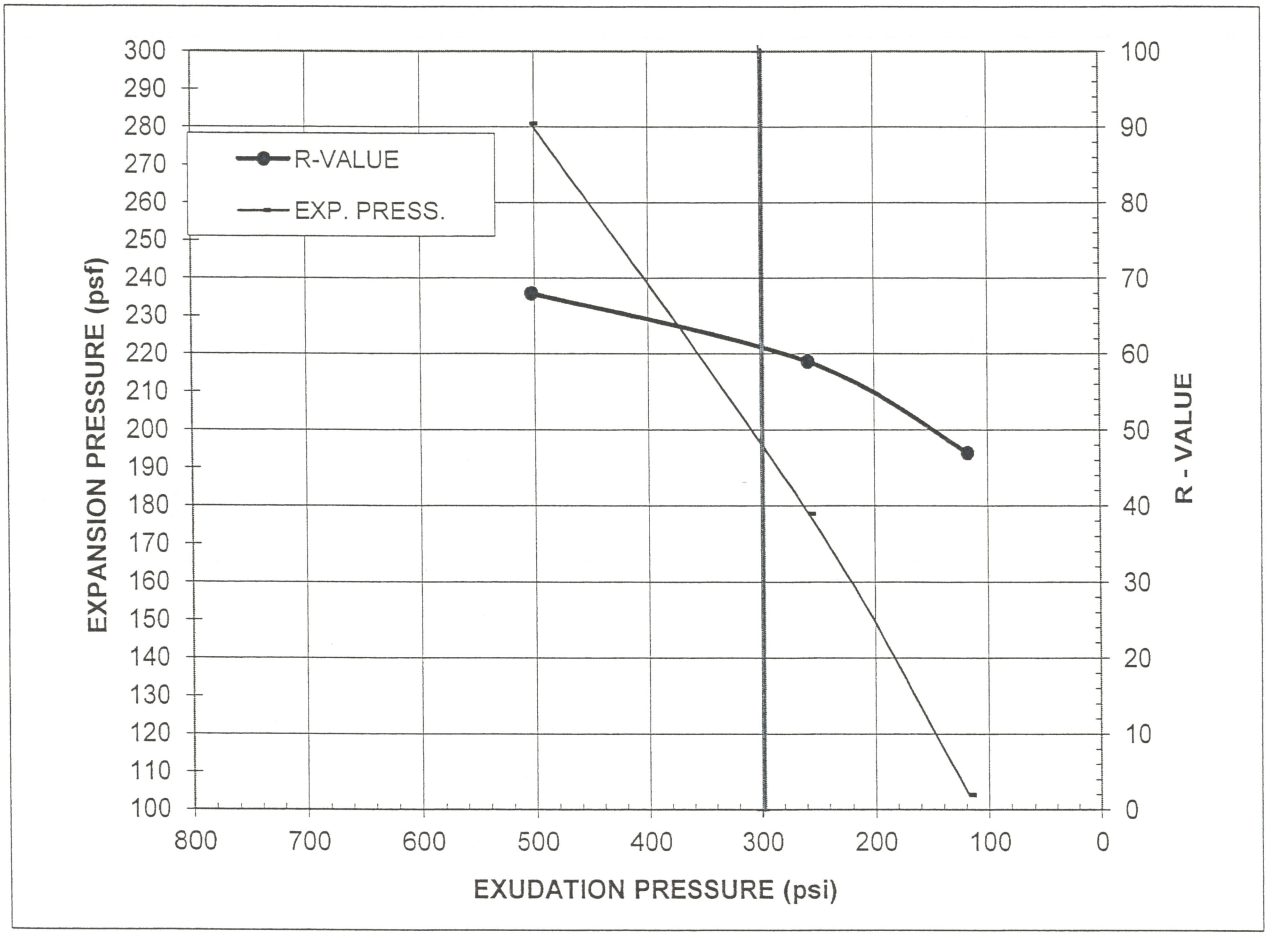
RVALUE with calcs pdp

PLATE NO. B-4B

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/28/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-104	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Silty Clay with Gravel, gray			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	118	258	503
Expansion Pressure, psf	104	178	281
R-Value	47	59	68
Moisture Content at Test, %	8.2	7.7	7.1
Dry Density at Test, pcf	137.0	137.5	138.1

R-Value @ 300 psi Exudation Pressure = 61

Expansion Pressure @300 psi Exudation, psf = **195**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

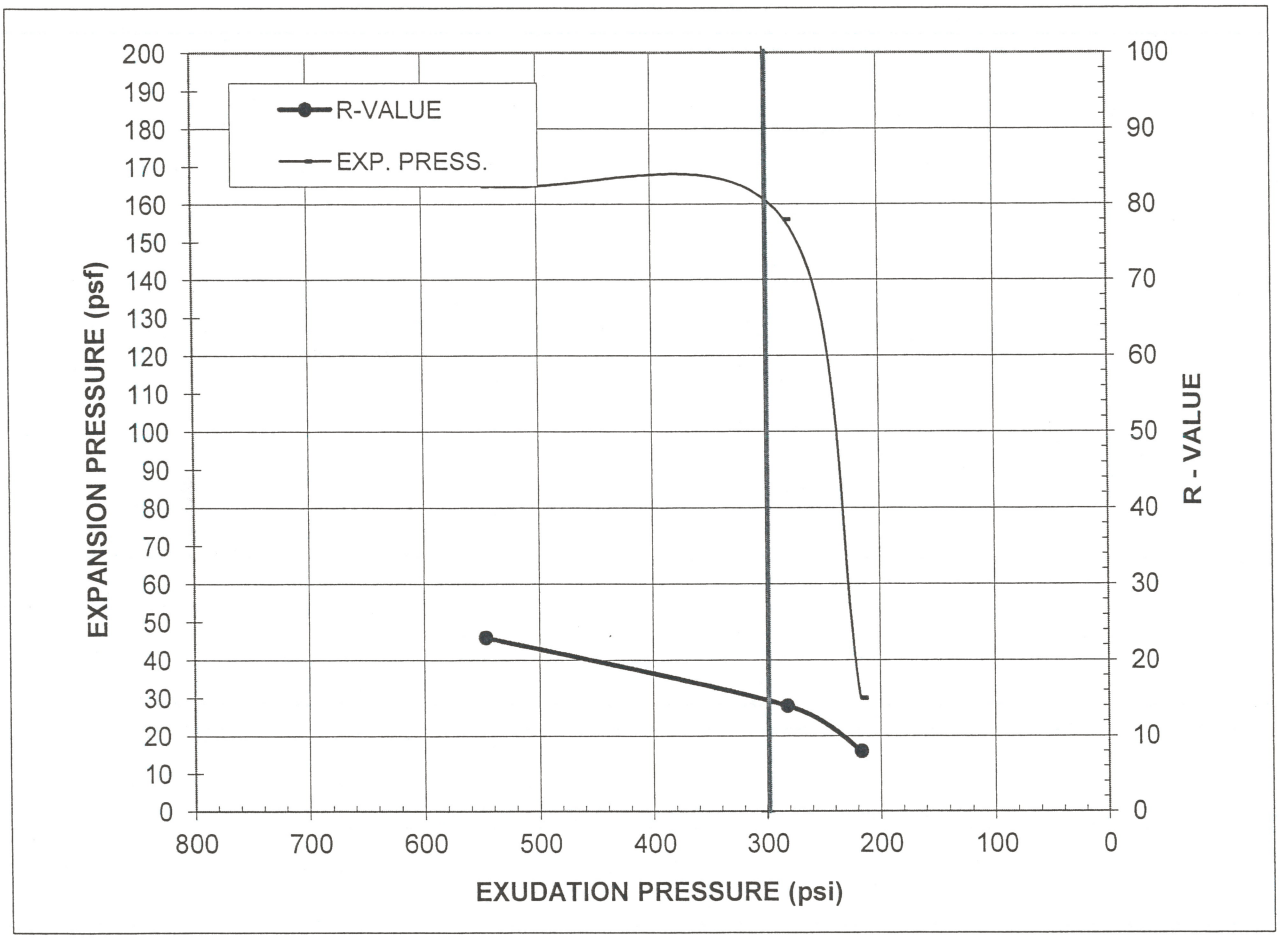
RVALUE with calcs pdp

PLATE NO. B-4C

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/25/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-107	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	217	282	547
Expansion Pressure, psf	30	156	165
R-Value	8	14	23
Moisture Content at Test, %	21.3	19.6	17.3
Dry Density at Test, pcf	101.8	105.5	110.8

R-Value @ 300 psi Exudation Pressure = 15

Expansion Pressure @300 psi Exudation, psf = **160**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

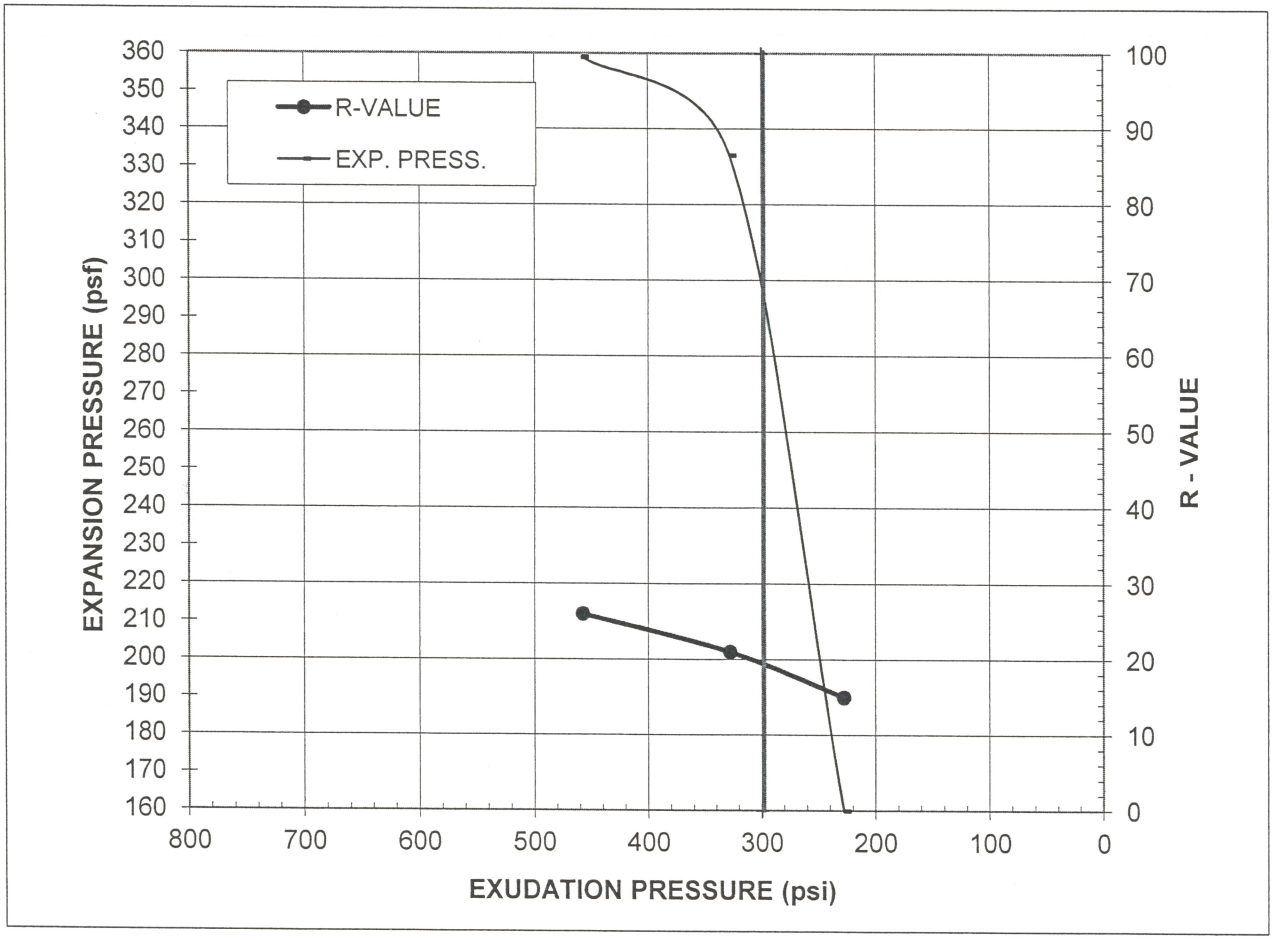
RVALUE with calcs pdp

PLATE NO. B-4D

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/25/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-109	Depth:	0'-5'	Lab #:	M834
Location / Source:	On-Site / Native			Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	228	328	458
Expansion Pressure, psf	160	333	359
R-Value	15	21	26
Moisture Content at Test, %	20.5	19.5	18.5
Dry Density at Test, pcf	104.0	106.1	108.9

R-Value @ 300 psi Exudation Pressure = 19

Expansion Pressure @300 psi Exudation, psf = **295**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

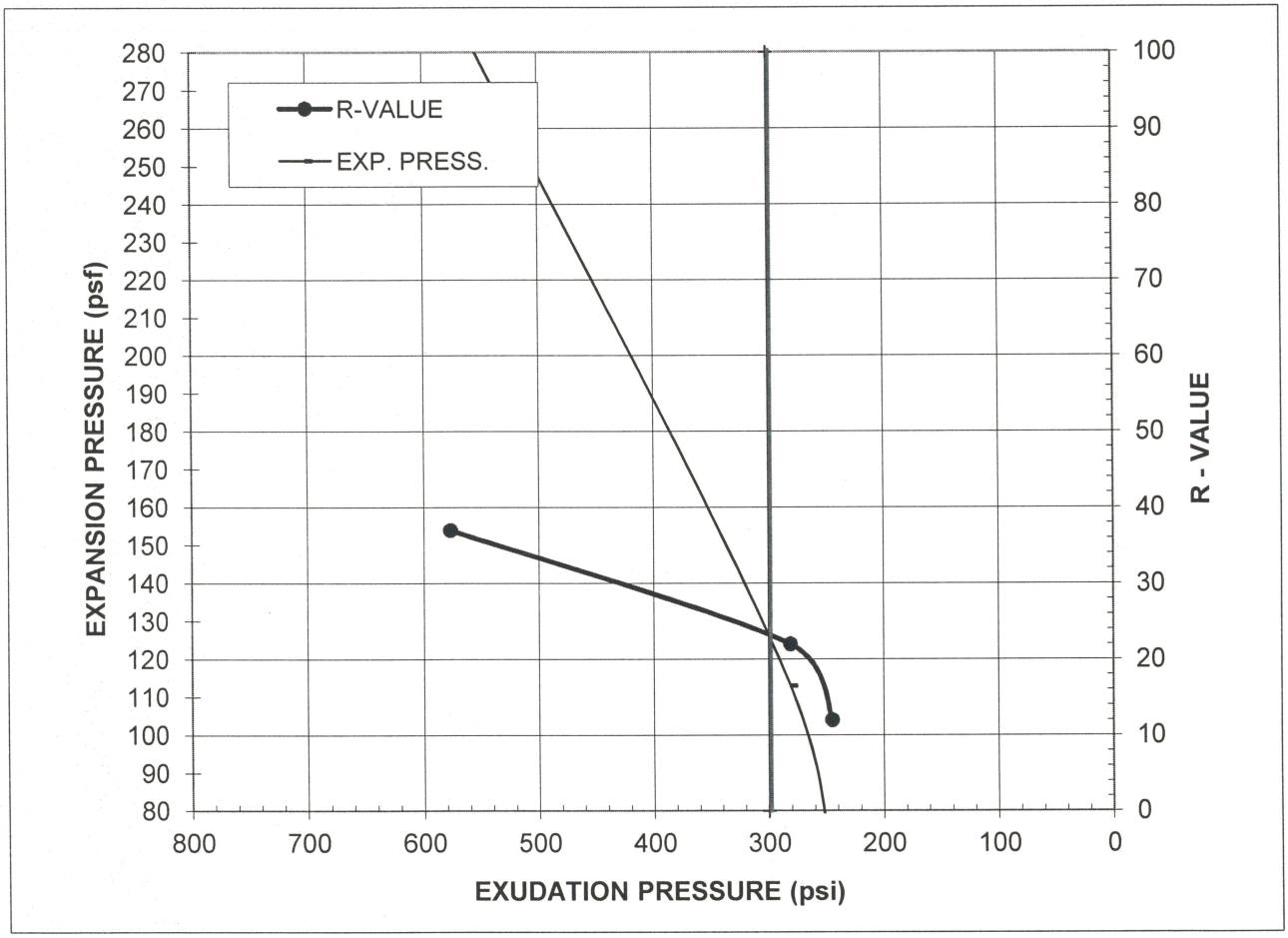
RVALUE with calcs pdp

PLATE NO. B-4E

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/20/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-112	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	245	281	577
Expansion Pressure, psf	48	113	294
R-Value	12	22	37
Moisture Content at Test, %	12.9	11.9	10.8
Dry Density at Test, pcf	129.2	132.8	135.8

R-Value @ 300 psi Exudation Pressure = 23

Expansion Pressure @300 psi Exudation, psf = **121**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

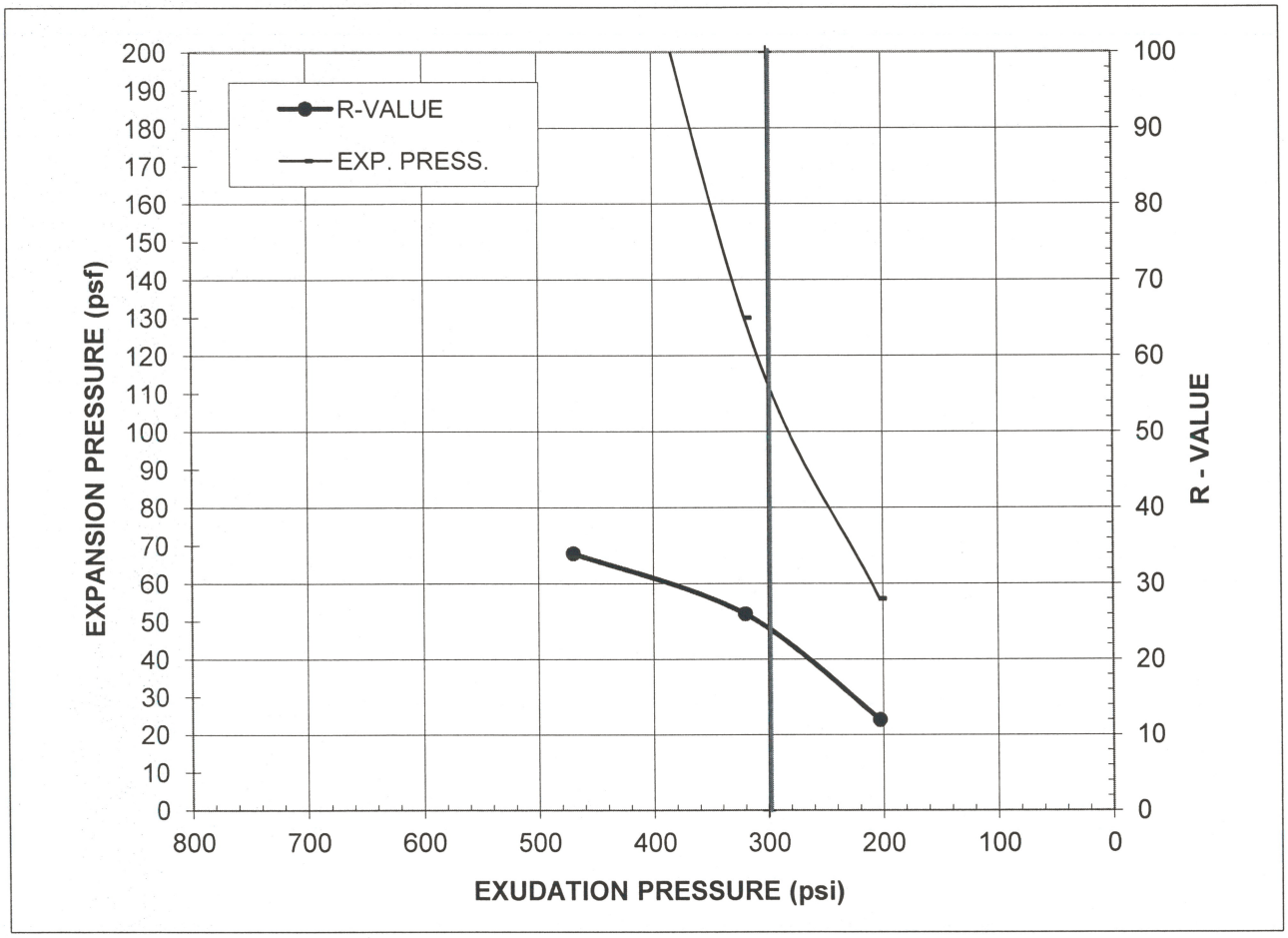
RVALUE with calcs pdp

PLATE NO. B-4F

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/21/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-114	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	203	320	470
Expansion Pressure, psf	56	130	307
R-Value	12	26	34
Moisture Content at Test, %	16.5	15.1	14.2
Dry Density at Test, pcf	114.7	118.7	121.3

R-Value @ 300 psi Exudation Pressure = 24

Expansion Pressure @300 psi Exudation, psf = **110**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

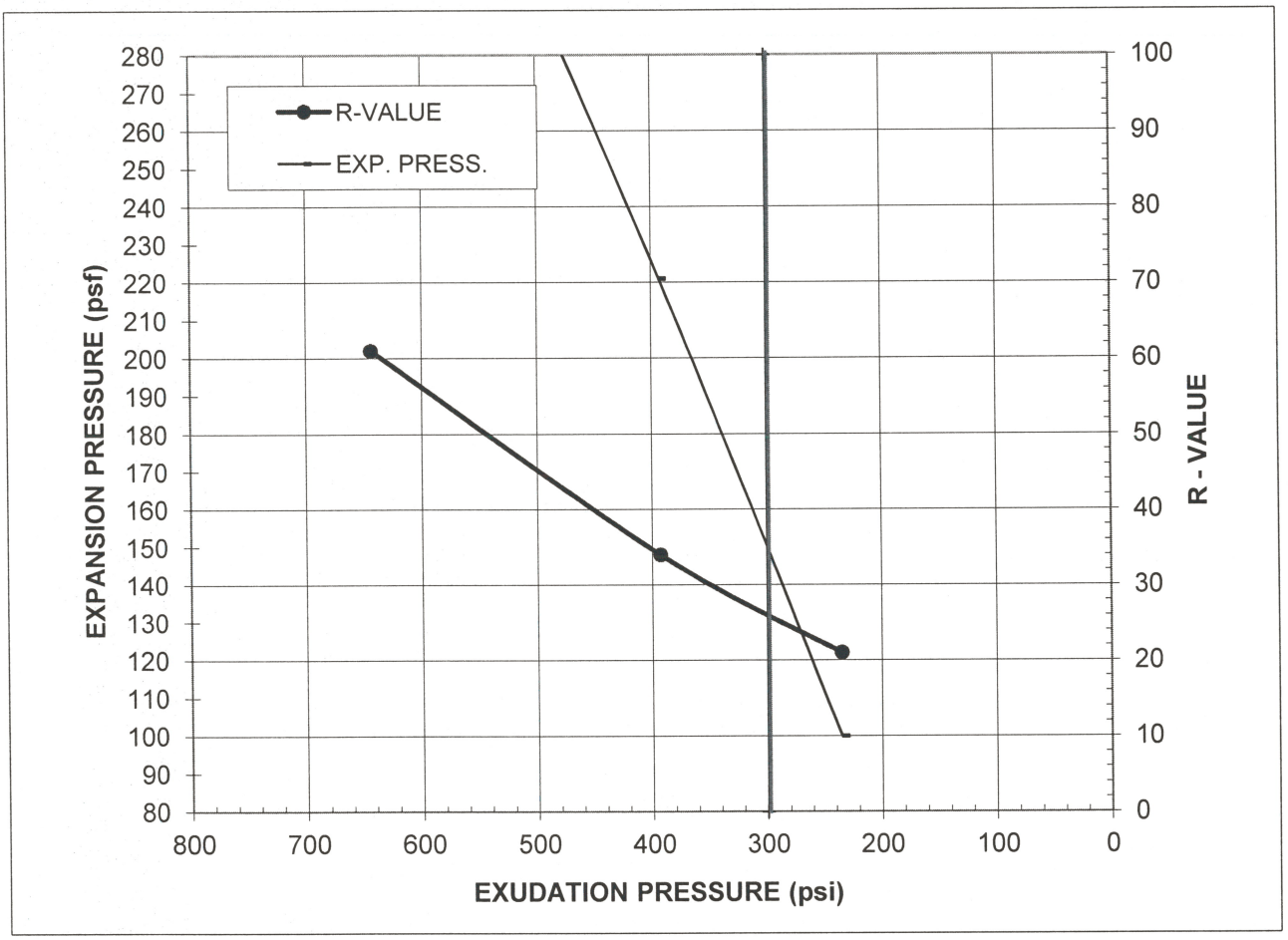
RVALUE with calcs pdp

PLATE NO. B-4G

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/20/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-115	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	235	393	644
Expansion Pressure, psf	100	221	398
R-Value	21	34	61
Moisture Content at Test, %	10.7	9.8	8.9
Dry Density at Test, pcf	132.1	134.3	135.3

R-Value @ 300 psi Exudation Pressure = 25

Expansion Pressure @300 psi Exudation, psf = **148**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

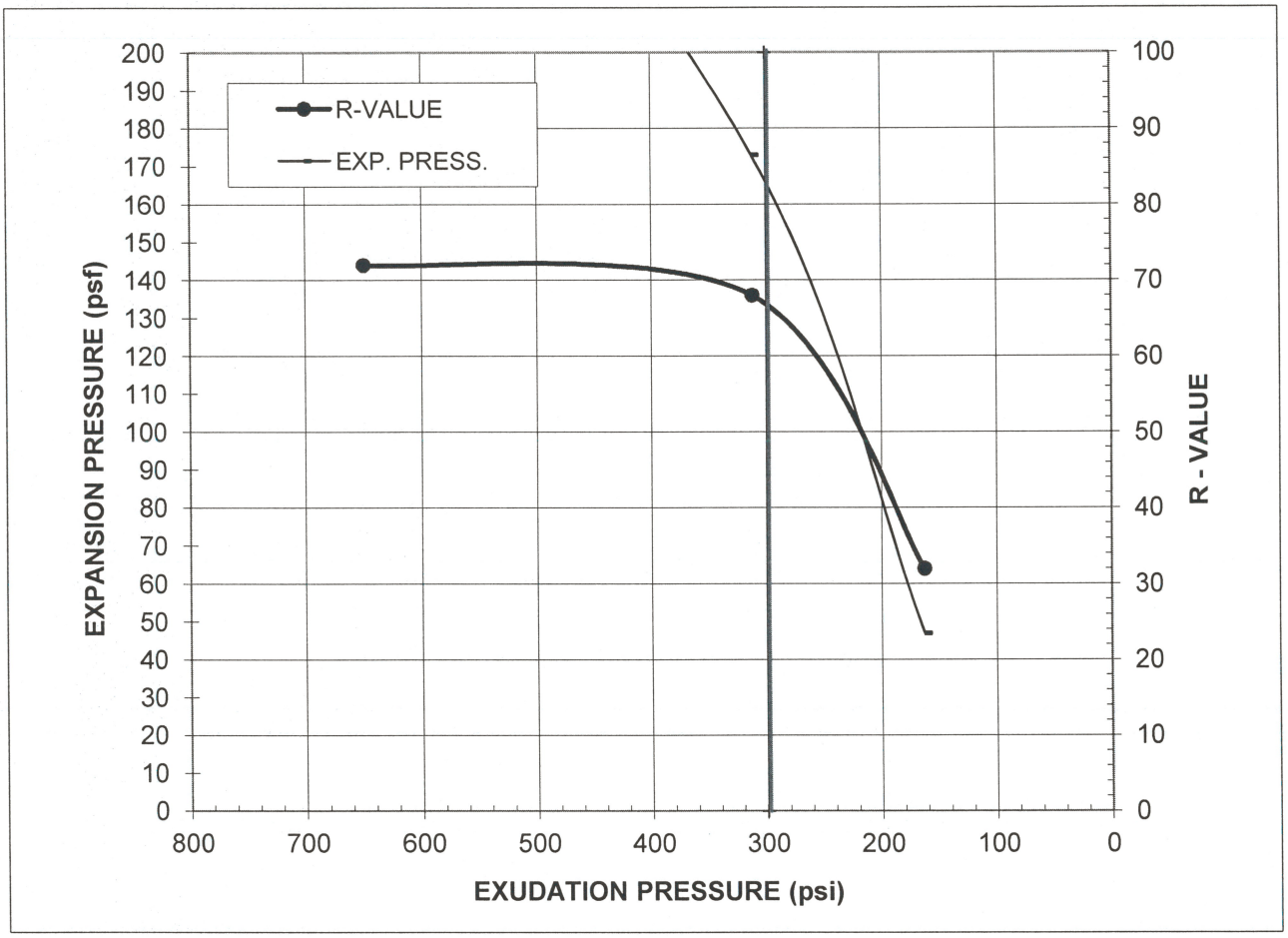
RVALUE with calcs pdp

PLATE NO. B-4H

R-VALUE REPORT

Parikh Consultants, Inc. **ASTM D2844 or CTM 301** (408) 452-9000

Project Name:	MSN A3			Date:	10/20/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-117	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Clay with Gravel, gray			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	163	312	650
Expansion Pressure, psf	47	173	316
R-Value	32	68	72
Moisture Content at Test, %	10.1	8.7	8.5
Dry Density at Test, pcf	131.8	132.5	133.1

R-Value @ 300 psi Exudation Pressure = 66

Expansion Pressure @300 psi Exudation, psf = **165**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

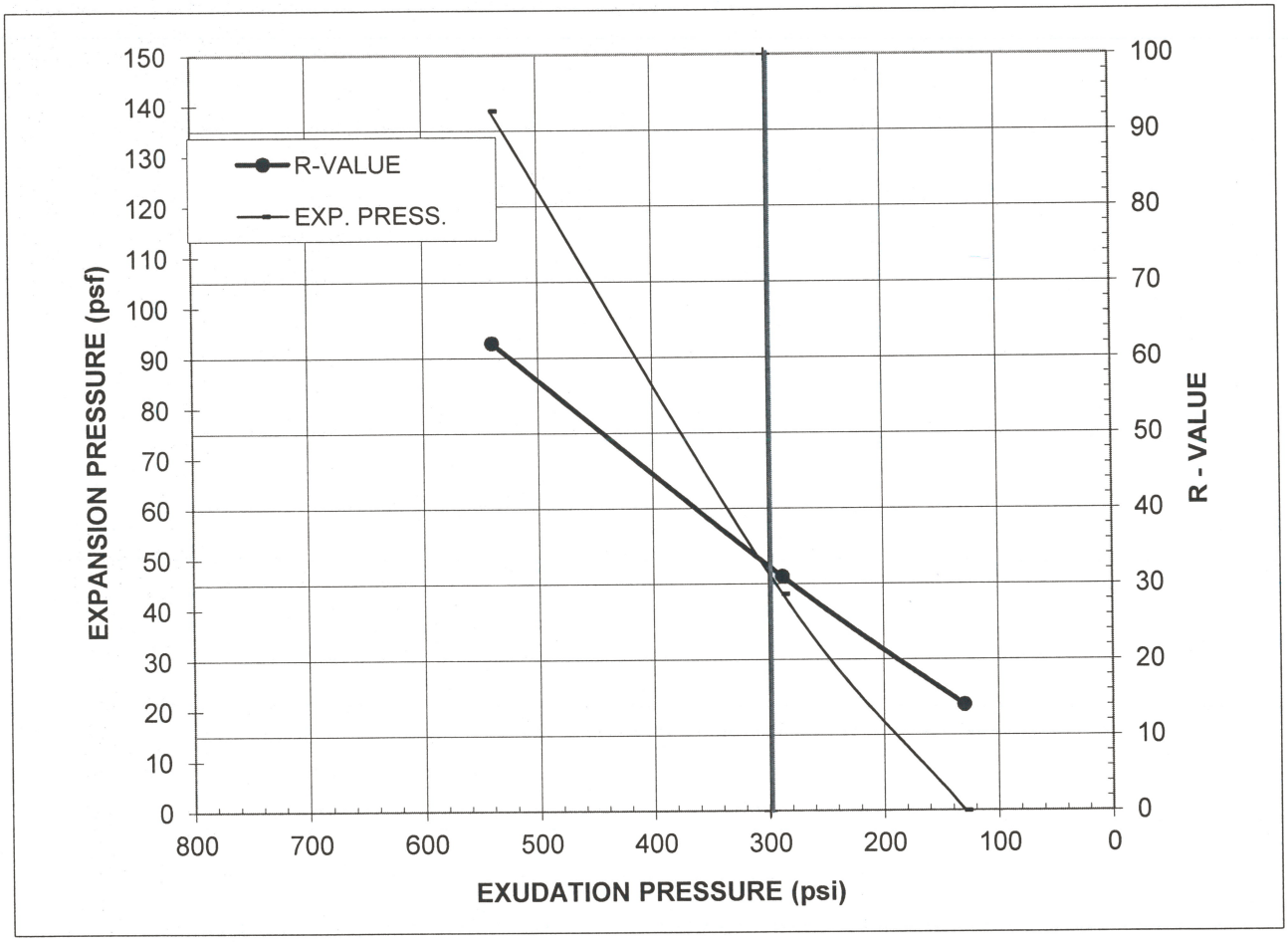
RVALUE with calcs pdp

PLATE NO. B-4I

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/18/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-120	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Clay with Gravel, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	130	288	540
Expansion Pressure, psf	0	43	139
R-Value	14	31	62
Moisture Content at Test, %	13.2	10.9	9.8
Dry Density at Test, pcf	123.3	128.1	130.5

R-Value @ 300 psi Exudation Pressure = **32**

Expansion Pressure @300 psi Exudation, psf = **45**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

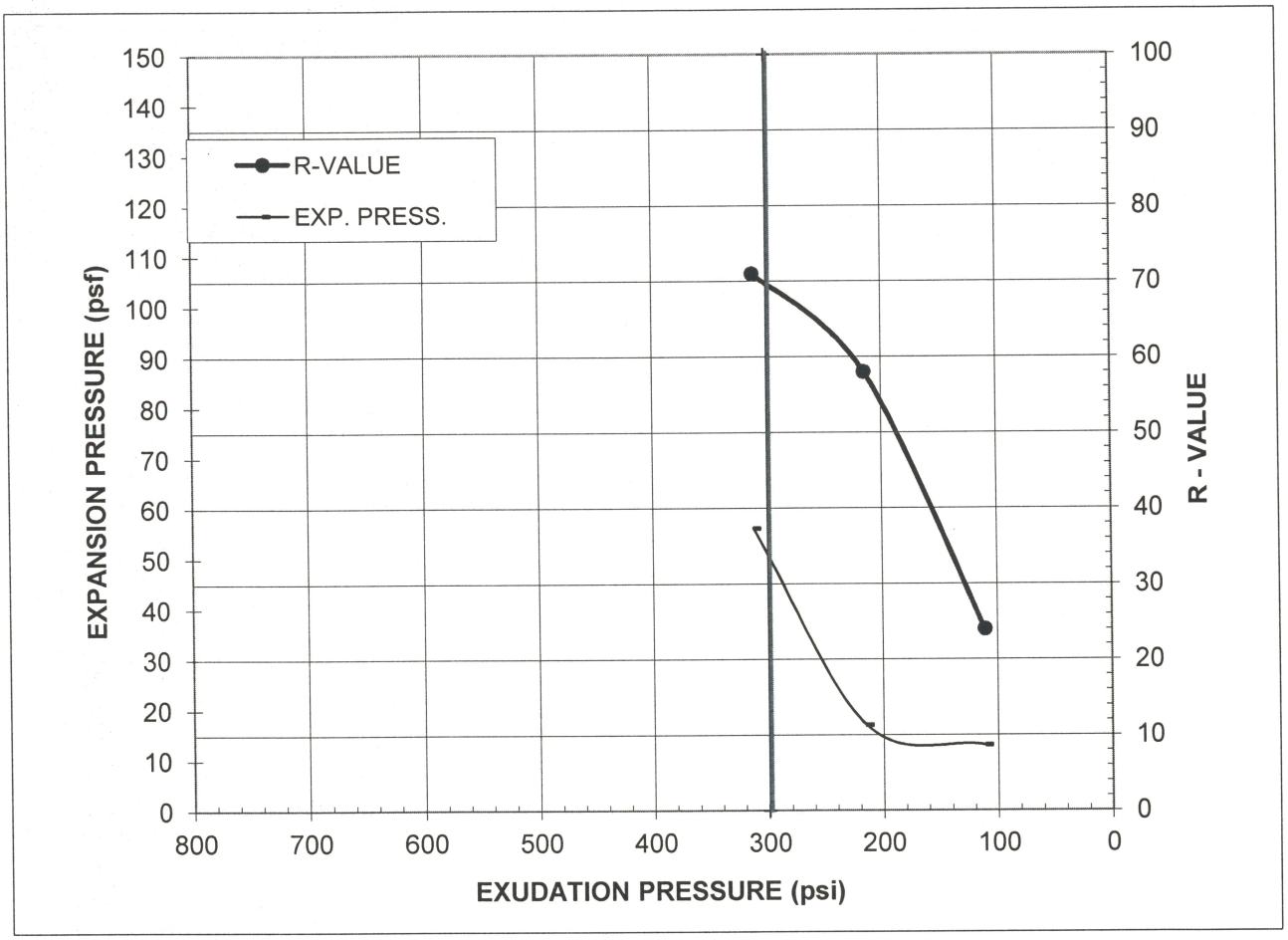
RVALUE with calcs pdp

PLATE NO. B-4J

R-VALUE REPORT

Parikh Consultants, Inc. | ASTM D2844 or CTM 301 | (408) 452-9000

Project Name:	MSN A3			Date:	10/18/11
Client:	BKF Engineering			Project #:	2011-145-GDR
Sample #:	A-11-121	Depth:	0'-5'	Lab #:	M834
Location / Source:		On-Site / Native		Sample Date:	
Material :	Sandy Lean Clay, brown			Sampled By:	



Specimen No.	A	B	C
Exudation Pressure, psi	111	215	312
Expansion Pressure, psf	13	17	56
R-Value	24	58	71
Moisture Content at Test, %	12.2	10.8	10.2
Dry Density at Test, pcf	127.0	128.4	128.7

R-Value @ 300 psi Exudation Pressure = 68

Expansion Pressure @300 psi Exudation, psf = **50**

Minimum R-Value Requirement:

Comments:

Report By: Prav Dayah

RVALUE with calcs pdp

PLATE NO. B-4K

APPENDIX C

CALTRANS “ALTPIPE” PROGRAM INPUT/OUTPUT RECOMMENDED MINIMUM COATING THICKNESS FOR CULVERTS

AltPipe

Project EA: **04120003371**
Project Engineer: **Dat Nguyen**
Location: **Novato**
Description: **MSN A3**

Steel Pipes

DSN/U		16i	20b	20d	20e	21f	21e	22c	22j	22f	22i
Pipe Diameter (in)		**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Pipe Type	**Coat**	**Minimum Thickness (in)**									
Corrugated Steel Pipe Helical Corrugations 2 2/3" x 1/2" Corrugations	AL2	0.052							0.052	0.052	0.052
	BC	0.064							0.064	0.064	0.064
	BCI	0.052							0.052	0.052	0.052
	PA	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
	PS	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
Corrugated Steel Pipe 2 2/3" x 1/2" Annular Corrugations	AL2	0.064							0.064	0.064	0.064
	BC	0.064							0.064	0.064	0.064
	BCI	0.064							0.064	0.064	0.064
	PA	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
	PS	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064

Aluminum Pipes

DSN/U	16i	20b	20d	20e	21f	21e	22c	22j	22f	22i
Pipe Diameter (in)	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Pipe Type	**Minimum Thickness (in)**									
Corrugated Aluminum Pipe Annular Corrugations 2 2/3" x 1/2" Corrugations	0.060							0.060	0.060	0.060
Corrugated Aluminum Pipe Helical Corrugations 2 2/3" x 1/2" Corrugations	0.060							0.060	0.060	0.060

Plastic Pipes

DSN/U	16i	20b	20d	20e	21f	21e	22c	22j	22f	22i
Pipe Diameter (in)	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Pipe Type	**Availability**									
PVC Corrugated	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable
HDPE Corrugated - Type S	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable
HDPE Corrugated - Type C	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable	Allowable

Reinforced Concrete Pipes

DSN/U	16i	20b	20d	20e	21f	21e	22c	22j	22f	22i
Pipe Diameter (in)	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Steel Cover (in)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Sacks of Cement	5	5	5	5	5	5	5	5	5	5
Percentage Water	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1

Other Information

DSN/U	16i	20b	20d	20e	21f	21e	22c	22j	22f	22i
Soil pH	7.43	7.11	7.11	7.11	7.11	7.11	7.11	7.88	7.88	7.88
Minimum Soil Resistivity (ohm-cm)	2280	910	910	910	910	910	910	2410	2410	2410
Sulfate Concentration (ppm)	13.6	1022.4	1022.4	1022.4	1022.4	1022.4	1022.4	37.4	37.4	37.4
Chloride Concentration (ppm)	41.2	61	61	61	61	61	61	21.5	21.5	21.5
Abrasion Level	1	1	1	1	1	1	1	1	1	1
2–5 Year Flow Velocity (ft/sec)	3.2	3.2	3.2	3.2	2.6	2.6	2.2	2.2	2.2	2.2
Design Service Life (years)	50	50	50	50	50	50	50	50	50	50
Height of Cover (ft)	2.5	3.6	3.2	3.2	3.9	3.7	4.12	4.12	3.14	2.75

AltPipe Version 7 © State of California

STRUCTURAL PAVEMENT DESIGN

PAVEMENT DESIGN

PER HIGHWAY DESIGN MANUAL, CHAP. 600

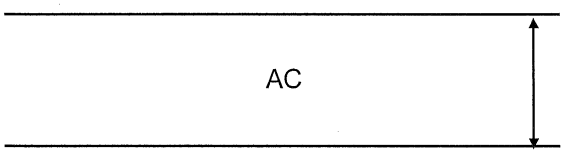
PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: Full depth AC

Design TI= ***14***
R_{BS}= ***15***

$GE_{AC} = 0.0032*TI*(100-R_{BS}) =$			3.81	
	=>	GE'_{AC}=	3.91	(add 0.1 ft safety factor)
	=>	AC Thickness=	1.74	
	=>	AC Thickness=	**1.75**	ft (round up to the nearest 0.05 ft)

Design Section:



1.75 ft

Base Soil

PAVEMENT DESIGN

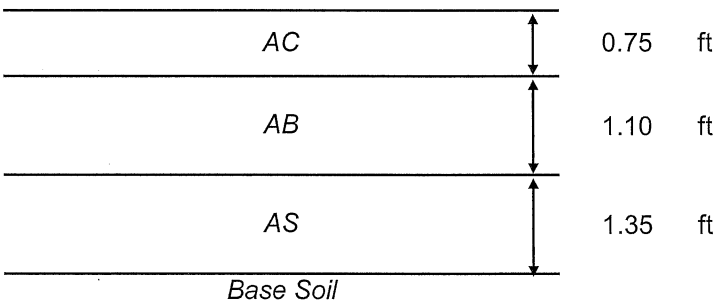
PER HIGHWAY DESIGN MANUAL, CHAP. 600

PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: AC over AB over AS

Design TI=	***14***		
R_{BS}=	***15***		
R_{AB}=	78		
R_{AS}=	50		
$GE_{TOTAL} = 0..0032*TI*(100-R_{BS}) =$		3.81	
$GE_{AC} = 0.0032*TI*(100-R_{AB}) =$		0.99	
=>	GE'_{AC} =	1.19	(add 0.2 ft safety factor)
	AC thickness =	0.71	ft
=>	AC Thickness=	**0.75**	ft (round up to the nearest 0.05 ft)
	$G_{f, AC}$=	1.70	
	GE_{AC}=	1.27	
$GE_{AB+AC} = 0.0032*TI*(100-R_{AS}) =$		2.24	
=>	GE_{AC+AB}=	2.44	(add 0.2 ft safety factor)
$GE_{AB} = GE_{AC+AB} - GE_{AC} =$		1.17	
=>	AB thickness=	1.06	
=>	AB Thickness=	**1.10**	ft (round up to the nearest 0.05 ft)
	GE_{AB}=	1.21	$G_{f, AB}$=1.1
$GE_{AS} = GE_{TOTAL} - GE_{AB} - GE_{AC} =$		1.32	
=>	AS Thickness=	**1.35**	ft (round up to the nearest 0.05 ft)

Design Section:



0.75 ft

1.10 ft

1.35 ft

PAVEMENT DESIGN

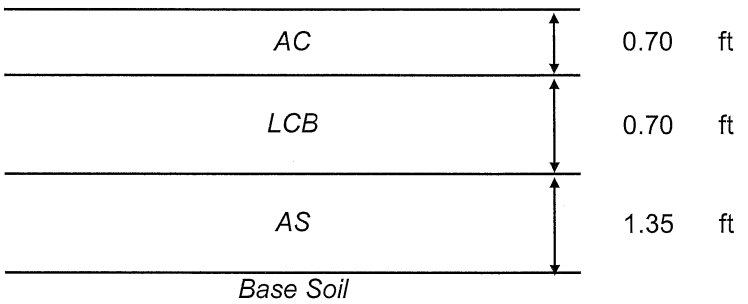
PER HIGHWAY DESIGN MANUAL, CHAP. 600

PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: AC over LCB over AS

Design TI=	***14***		
R_{BS}=	***15***		
R_{AB}=	78		
R_{AS}=	50		
$GE_{TOTAL} = 0.0032*TI*(100-R_{BS})$ =		3.81	
$GE_{AC+LCB} = 0.0032*TI*(100-R_{AS})$ =		2.24	
$GE_{AC} = 0.4*GE_{AC+LCB}$ =		0.90	
=>	GE'_{AC} =	1.10	(add 0.2 ft safety factor)
	AC thickness =	0.67	ft
=>	AC Thickness=	**0.70**	ft (round up to the nearest 0.05 ft)
	$G_{f, AC}$=	1.66	
	GE_{AC}=	1.16	
$GE_{LCB} = (GE_{AC+LCB})-GE_{AC}$ =		1.08	
=>	GE_{AC+AB}=	1.28	(add 0.2 ft safety factor)
	$G_{f, LCB}$=	1.90	
	LCB thickness=	0.67	
=>	LCB Thickness=	**0.70**	ft (round up to the nearest 0.05 ft)
	GE_{LCB}=	1.33	
$GE_{AS} = GE_{TOTAL}-GE_{LCB}-GE_{AC}$ =		1.32	
=>	AS Thickness=	**1.35**	ft (round up to the nearest 0.05 ft)

Design Section:



PAVEMENT DESIGN

PER HIGHWAY DESIGN MANUAL, CHAP. 600

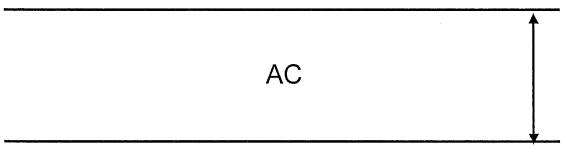
PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: Full depth AC

Design TI= ***14***
R_{BS}= ***20***

$GE_{AC} = 0.0032*TI*(100-R_{BS}) =$		3.58	
=>	GE'_{AC}=	3.68	(add 0.1 ft safety factor)
=>	AC Thickness=	1.66	
=>	AC Thickness=	**1.70**	ft (round up to the nearest 0.05 ft)

Design Section:



1.70 ft

Base Soil

PAVEMENT DESIGN

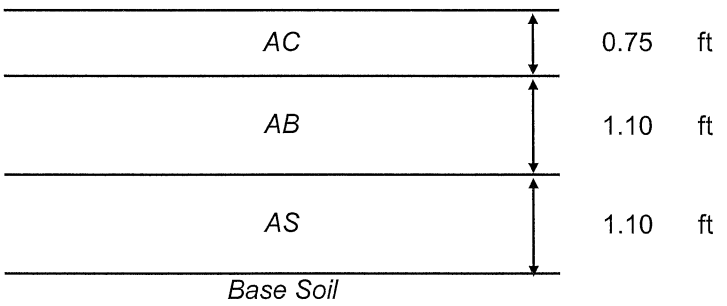
PER HIGHWAY DESIGN MANUAL, CHAP. 600

PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: AC over AB over AS

Design TI=	***14***		
R_{BS}=	***20***		
R_{AB}=	78		
R_{AS}=	50		
$GE_{TOTAL} = 0..0032*TI*(100-R_{BS}) =$		3.58	
$GE_{AC} = 0.0032*TI*(100-R_{AB}) =$		0.99	
=>	GE'_{AC} =	1.19	(add 0.2 ft safety factor)
	AC thickness =	0.71	ft
=>	AC Thickness=	**0.75**	ft (round up to the nearest 0.05 ft)
	$G_{f, AC}$=	1.70	
	GE_{AC}=	1.27	
$GE_{AB+AC} = 0.0032*TI*(100-R_{AS}) =$		2.24	
=>	GE_{AC+AB}=	2.44	(add 0.2 ft safety factor)
$GE_{AB} = GE_{AC+AB} - GE_{AC} =$		1.17	
=>	AB thickness=	1.06	
=>	AB Thickness=	**1.10**	ft (round up to the nearest 0.05 ft)
	GE_{AB}=	1.21	$G_{f, AB}$=1.1
$GE_{AS} = GE_{TOTAL} - GE_{AB} - GE_{AC} =$		1.10	
=>	AS Thickness=	**1.10**	ft (round up to the nearest 0.05 ft)

Design Section:



PAVEMENT DESIGN

PER HIGHWAY DESIGN MANUAL, CHAP. 600

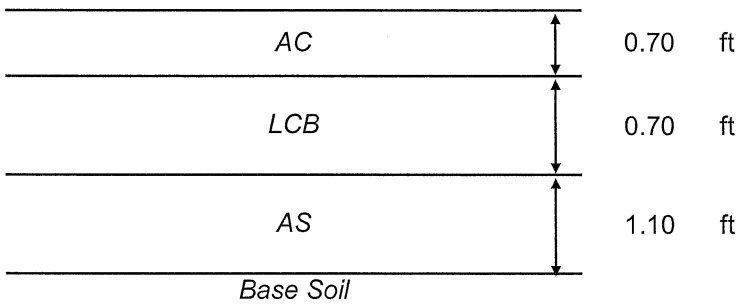
PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: AC over LCB over AS

Design TI=	***14***
R_{BS}=	***20***
R_{AB}=	78
R_{AS}=	50

$GE_{TOTAL} = 0.0032*TI*(100-R_{BS}) =$		3.58	
$GE_{AC+LCB} = 0.0032*TI*(100-R_{AS}) =$		2.24	
$GE_{AC} = 0.4*GE_{AC+LCB} =$		0.90	
	=> GE'_{AC} =	1.10	(add 0.2 ft safety factor)
	AC thickness =	0.67	ft
	=> AC Thickness=	**0.70**	ft (round up to the nearest 0.05 ft)
	$G_{f, AC}$=	1.66	
	GE_{AC}=	1.16	
$GE_{LCB} = (GE_{AC+LCB})-GE_{AC} =$		1.08	
	=> GE_{AC+AB}=	1.28	(add 0.2 ft safety factor)
	$G_{f, LCB}$=	1.90	
	LCB thickness=	0.67	
	=> LCB Thickness=	**0.70**	ft (round up to the nearest 0.05 ft)
	GE_{LCB}=	1.33	
$GE_{AS} = GE_{TOTAL}-GE_{LCB}-GE_{AC} =$		1.09	
	=> AS Thickness=	**1.10**	ft (round up to the nearest 0.05 ft)

Design Section:



PAVEMENT DESIGN

PER HIGHWAY DESIGN MANUAL, CHAP. 600

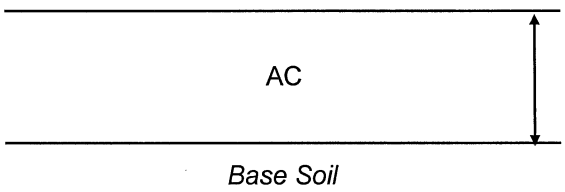
PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: Full depth AC

Design TI= ***6.5***
R_{BS}= ***15***

$GE_{AC} = 0.0032*TI*(100-R_{BS}) =$		1.77	
=>	GE'_{AC}=	1.87	(add 0.1 ft safety factor)
=>	AC Thickness=	0.75	
=>	AC Thickness=	**0.75**	ft (round up to the nearest 0.05 ft)

Design Section:



PAVEMENT DESIGN

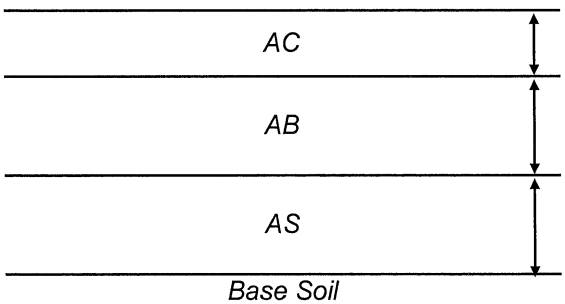
PER HIGHWAY DESIGN MANUAL, CHAP. 600

PROJECT NAME: *MSN A3 - NB HOV LANE WIDENING PROJECT*
PROJECT NO.: *2011-145-GDR*

Design Case: AC over AB over AS

Design TI=	***6.5***		
R_{BS}=	***15***		
R_{AB}=	78		
R_{AS}=	50		
$GE_{TOTAL} = 0..0032*TI*(100-R_{BS}) =$		1.77	
$GE_{AC} = 0.0032*TI*(100-R_{AB}) =$		0.46	
=>	GE'_{AC}=	0.66	(add 0.2 ft safety factor)
	AC thickness =	0.30	ft
=>	AC Thickness=	**0.30**	ft (round up to the nearest 0.05 ft)
	$G_{f, AC}$=	2.22	
	GE_{AC}=	0.67	
$GE_{AB+AC} = 0.0032*TI*(100-R_{AS}) =$		1.04	
=>	GE_{AC+AB}=	1.24	(add 0.2 ft safety factor)
$GE_{AB} = GE_{AC+AB}-GE_{AC} =$		0.57	
=>	AB thickness=	0.52	
=>	AB Thickness=	**0.55**	ft (round up to the nearest 0.05 ft)
	GE_{AB}=	0.61	$G_{f, AB}$=1.1
$GE_{AS} = GE_{TOTAL}-GE_{AB}-GE_{AC} =$		0.50	
=>	AS Thickness=	**0.50**	ft (round up to the nearest 0.05 ft)

Design Section:



0.30 ft

0.55 ft

0.50 ft

APPENDIX D

Marin/Sonoma Narrows – Segment A3
Redwood Landfill Interchange Project (EA 04-2640L1)

Agency:	Caltrans	**Responded By:**	Parikh Consultants and BKF Engineers
Review Unit:	Geotechnical Design	**Date Responded:**	**4/16/12**
Comments By:	Betty Lee / Mahmood Momenzadeh	**JRT Meeting Date:**	
Contact Info:	B. Lee (510) 286-4825 / M. Momenzadeh (510) 286-5732		
Date Reviewed:	01/24/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E	**Submittal: 95% GDMR and PS&E Submittal**	

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
Geotechnical Materials Report						
1	Pg. 17, Sec 7.2	The first sentence is unclear. Please rewrite.	Comment has been incorporated. Sentence has been rewritten.	A	A	A
2	Pg 21, Section 7.4.3	The 2nd paragraph is unclear. Please rewrite.	Comment has been incorporated. Sentence has been rewritten.	A	A	A
3	Page 21	Liquefaction Potential: Since borings were drilled only to a shallow depth of 5 ft., it appears that there is insufficient data to conclude that liquefaction potential is low/high.	Comment has been incorporated. Impact of liquefaction potential has been discussed.	A	A	A
4	Pg 26, Section 12.1	Construction Advisories, 1st paragraph: "The field investigation performed by PARIKH primarily addresses design issues and was not planned specifically to identify construction issues." What is the meaning of this sentence?	The intent of this sentence is a standard language to clarify the purpose of our investigation in the geotechnical report. The language is not a specification, but it is meant for the designer to use this information to incorporate into the specifications.	G	G	G
5		The Log of Test Borings (LOTBs) are missing.	Comment has been incorporated. LOTB was not prepared for the 5-foot deep soil borings. The LOTBs for the North Novato Overhead (Widen) have been included as reference LOTB.	A	A	A
6	Pg 18, Table 2	If borings are 5 ft deep, why are soil descriptions only up to 2-3 ft deep?	Comment has been incorporated. This has been clarified in the revised Table 2.	A	A	A
7	Page 28	last sentence: Please rewrite.	Comment has been incorporated. Sentence has been rewritten.	A	A	A
8	Section 7.2	Subsurface Conditions and Table 2: Description of the subsurface conditions is incomplete. Please provide the	Comment has been incorporated. Consistency of cohesive soils and the apparent density of cohesionless	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants and BKF Engineers
Review Unit:	Geotechnical Design	**Date Responded:**	**4/16/12**
Comments By:	Betty Lee / Mahmood Momenzadeh	**JRT Meeting Date:**	
Contact Info:	B. Lee (510) 286-4825 / M. Momenzadeh (510) 286-5732		
Date Reviewed:	01/24/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E	**Submittal: 95% GDMR and PS&E Submittal**	

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		consistency of cohesive soils and the apparent density of cohesionless soils. (R. Karpowicz, Geology)	soils has been included in Table 2			

Marin/Sonoma Narrows – Segment A3
Redwood Landfill Interchange Project (EA 04-2640L1)

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E | **Submittal: 95% GDMR AND PS&E Submittal**

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		GEOTECHNICAL MATERIALS REPORT				
1	Pg 10	MRN 101 at PM 22.2 is a 3 lane Hwy with no HOV lane, at approximately PM 22.8, the roadway narrows down to 2 lanes.	Comment has been incorporated.	A	A	A
2	Pg 23	The structural sections are wrong from "JIR" Sta. 411+83 to 436+50 and Sta 394+00 to 397+40.68. Contract 12074 built in 1971 shows the mainline section as 0.4' to 0.5' AC(A) / 0.8'to 0.9' CTB(A) /1.3' to 1.1'AS(4) and the inside shoulder as 0.25'AC(A) / 0.8' AB(2) /1.3' AS(4) and the outside shoulder as 0.35' AC(A) / 0.9' AB(2) /1.1' AS(4).	Comment has been incorporated. "Table 5: Summary of As-built Structural Pavement Section" will be revised; however, between Sta 394+00 to 397+40.68 includes a 0.10' HMA-O overlay shown in Contract 04-264064.	A	A	A
3	Pg 23	None of the structural sections have RAC(O). Delete the RAC(O).	Comment has been incorporated. RAC (O) will be deleted. Plans (Sheet X-1) has been revised.	A A	A A	A A
4	Pg 23	The PCC thicknesses are 0.67'	Comment has been incorporated.	A	A	A
5	Pg 23	The shoulders are paved in all sections. Even in the description on page 10, paved shoulders are acknowledged.	Comment has been incorporated.	A	A	A
6	Pg 25	According to an e-mail sent from Derek Mann with Advanced Planning on April 18, 2008, the TI for all lanes in this section of Hwy 101 is 14. Please update the structural sections using the correct TI.	Comment has been incorporated. TI of 14 will be used in the structural pavement design.	A	A	A
7	Pg 33	Change the EA to the appropriate EA.	Comment has been incorporated. Appropriate EA will be used in "Project Location Map".	A	A	A
		PLANS				

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E	**Submittal: 95% GDMR AND PS&E Submittal**	

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
8	X-1	Caltrans, in the Open Graded Friction Course Usage Guide recommends placing the OGFC layer from edge of pavement to edge of pavement to provide a cross-section with uniform frictional properties and appearance and a I foundation for possible future OGFC overlays.	FYI – the VA Study during the 2006 PA&ED prepared by Caltrans recommended (as part of its findings) to abridge the 0.10' AC overlay between ETWs only. This was an FHWA discussing during the Audit in 2008/09. MSN A1 proposed overlay paving 3' beyond ETW; MSN A3 followed suit. Regardless – based on your request and Traffic, the overlay limits have been revised and now extend from EP to EP where we are proposing overlays.	A	A	A
2	X-1	Notes: a. Add a note stating: Seal all cracks 1/4" or wider, and remove and replace failed existing AC pavement prior to the specified overlays.	Note has been added.	A	A	A
3	X-1	According to section 610-9 of the Highway Design Manual, all new or Reconstructed shoulders should match the pavement structure of the adjacent traffic lane, except the thickness of the HMA can vary to account for the difference in cross slop between the T/W and shoulder. This will minimize maintenance and ease construction.	Comment had been discussed between Parikh Consultants (Alston Lam) and CT Materials (Paula Kindinger-Wilcox), and no change is required.	G	G	G

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E	**Submittal: 95% GDMR AND PS&E Submittal**	

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
4	X-1	Pavement Structural Sections: RHMA-G cannot be used for leveling, use HMA-A.	Revised. RHMA-G layer will match adjacent lanes. HMA-A will be used for cross slope correction.	A	A	A
5	X-1	Under Abbreviation change PFR to PRF, Pavement Reinforcing Fabric	PFR could be renamed to PRF, but since PRF is a standard abbreviation, it has been removed from the sheet's abbreviation list.	G	G	G
6	X-4	Add a note to the dike to see Constructions Details.	A note has been added to reverence the Std Plan and the Construction Details.	A	A	A
7	X-5	Show sidewalk section here or in Construction Details; sidewalk should be 4" PCC over 6" AS(4).	Side walk section has been added to the X-Sheets.	A	A	A
8	C-2	Show a detail for the HMA dike which need a modified dike detail because the dike cannot be placed on OGFC.	HMA dike placement detail has been added to sheet C-4.	A	A	A
9	Stage Construction	The existing shoulders are inadequate to carry traffic; they must be reconstructed or overlaid prior to carrying traffic.	Comment had been discussed with CT Materials and a TI of 9.0 for temporary pavement has been provided, as well as a 2" grind and replace AC on the existing shoulder. A temp section has been included in the GDMR and Detour Plans.	A	A	A
10	Q-3	Add Cold Plane Asphalt Concrete Quantities for all conform areas.	This comment was discussed on the phone with CT Materials (Paula Kindinger-Wilcox); Cold Plane AC	G	G	G

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E | **Submittal: 95% GDMR AND PS&E Submittal**

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
			Pavement quantities are found on sheet Q-2.			
11	Q-3	Show quantities for Seal Random Cracks. All cracks must be sealed prior to any overlay.	This comment was discussed on the phone with CT Materials (Paula Kindinger-Wilcox); this quantity was provided on sheet Q-2. It is listed as "CRACK TREATMENT" (BEEs Item 374207) measured per lane-mile.	G	G	G
12	Q-3	Show quantities for Replace Asphalt Concrete Surfacing on the mainline, these digouts must be done prior to overlaying.	As discussed on the phone between BKF and CT Materials (Paula Kindinger-Wilcox), Segment A3 project is not a rehabilitation project; digout areas were not identified during the GDMR investigations. However, to identify a bid item, quantity, and insure spec coverage, we have agreed to assume approximately 15% of the A3 overlay area will receive Replace AC Surfacing (MSN A1 used around 12%). Depth is assumed at 6". Limits will be defined by the begin and end (mainline) stationing. RE will direct the contractor in the field for actual locations	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E | **Submittal: 95% GDMR AND PS&E Submittal**

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
			and depths.			
		SPECIFICATIONS				
13	SSP 15-2.02B	Paragraph 2: Add the word days after 7		A	A	A
14	SSP 39-1.01	Paragraph 4: RHMA-G should use the standard method as there is less than 10,000 tons.		A	A	A
15	SSP 39-1.02C	Asphalt Binder for HMA-O should be PG58-34 PM.		A	A	A
16	SSP 39-1.03B	Paragraph 1: Only HMA-A is using the QCQA process.		A	A	A
17	SSP 39-1.03B	Cross out Paragraph 3		A	A	A
18	SSP 39-1.11	Paragraph 6: Edit HMA to HMA-O		A	A	A
19	SSP 39-1.11	Paragraph 8: Cross Out		A	A	A
20	SSP 39-1.18	Paragraph 1: Only HMA -A is part of the QCQA process		A	A	A
21	SSP 39-1.18	Paragraph 2: Cross out		A	A	A
22	SSP 39-1.18	Paragraph 19: Cross out		A	A	A
23	SSP 31-1.19	Paragraph 2. Delete according to the directions		A	A	A
24	SSP 39-1.21	Add this SSP for "dig-outs" or Replace Asphalt Concrete Surfacing which must be performed prior to overlay.	Added.	A	A	A
24	SSP 39-6.01	Paragraph 2 should kept.		A	A	A
25	SSP 39-1.22	This SSP is not necessary.	Removed	A	A	A
		BEES				
26	Item 390095	Add Item number 390095 Replace Asphalt Concrete Surfacing.	Added	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants Inc. and BKF Engineers
Review Unit:	Engineering Services I - Materials	**Date Responded:**	**4/16/12**
Comments By:	Paula Kindinger-Wilcox	**JRT Meeting Date:**	
Contact Info:	510-286-4692		
Date Reviewed:	01/20/2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

File: MSN A3 PS&E	**Submittal: 95% GDMR AND PS&E Submittal**	

Revision Action Code:

A-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-Caltrans to Evaluate; **E** - TAM to Evaluate; **F –** City or County to Evaluate; **G** - N/A (No Action Required at this Time)

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
27	Items 390010	Add Items 390010, Prepaving Profilograph and 390020, Prepaving Grinding Day for the SSP 39-1.12.		A	A	A
28	Item 260201	Change Item 260201 Class 2 AB to 260203, this is the items number for 2010 SSPs which covers Class 2 AB, unit pay in CY.		A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		Geotechnical Materials Report				
1	Section 8.3 Page 23	Corrosion Investigation – please include and explicitly state Caltrans' Corrosion Guidelines in your discussion about corrosion. The reader should have the guidelines readily available in the report so as to make an informed comparison of the values in Table 4 and the guidelines.	Comment has been incorporated. The guidelines are included in the report.	A	A	A
2	Section 9.0 Page 23	Structural Pavement Sections - Please insure that District 04 – Materials has reviewed this section.	CT Materials has reviewed the structural pavement sections and has concurred.	A	A	A
		Project Plans				
3	Sheets S-1 through S-8	Sign Plan – It is indicated on the plans that five signs are to be relocated. Have changes in site conditions been considered? No mention of sign relocation has been made in the geotechnical materials report.	As shown in the sign plans, there are no overhead sign structures involved in MSN A3. The detail shown on SD-1 has been removed	C	C	C

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
			(will not be mounting signs on barriers), and instead, the roadside signs will be installed on wooden posts embedded with granular backfill per CSP RS2 and RS 3 in the adjacent unpaved median. It is our opinion that the foundation for the roadside sign is not a geotechnical concern.			
	GDMR	***GDMR dated April 2012 - Comments from Rifaat Nashed***				
1	P1 Title Page	1- Consistency is required : - The project limits in title sheet is PM 22.2/22.**4**	Comment clarified. The project limits shown in	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		- The project limits in Introduction sheet is PM 22.2/22.**2** - The project limits in Plate 1 is PM 22.2/22.**3** Please correct	the Geotechnical Materials Report (GDR) have been changed to match the PS&E plans which reflect R22.2/24.3			
2	P13, Section 4.5 Regional Geology and Seismicity	1- Under regional geology, you should describe the regional geologic setting of the project area, including geomorphic province, major geologic features (such as mountain ranges and valleys) and major characteristics such as depth of alluvium over basement rock, geomorphology, basic rock types,…etc. 2- How could the project have "a moderate to high potential surface rupture" when no active fault intersects or passes through the project area? (Please refer to item 7.4.2 – Ground Rupture).	1. Comment has been incorporated. 2. Comment clarified. The potential for ground surface rupture due to	A C	A C	A C

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		.	faulting within the project limits is considered low as described in Section 7.4.2 of the GDR.			
3	P16 Section 7.1 Site Geology	1- Please discuss the constituents and the engineering characteristics of each geologic unit underlies the project area. 2- The authors of the geologic map used are : **M.C. Blake**, Jr. R. W. Graymer, and D.L. Jones (please correct)	1. Comment has been incorporated. The constituents and the engineering characteristics of each geologic unit underlies the project area has been described in the report. 2. Comment has been incorporated.	A A	A A	A A
4	P17	1- Under this item you should discuss the characteristics of the	Comment has been	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
	Section 7.1.1 Lithology	metamorphic rocks included in the project site, such as rock types, bedding , shearing, fracturing…etc.	incorporated. The characteristics of the metamorphic rocks have been described in the report.			
5	P18 Table 2	1- It looks little odd that all soils encountered in 22 borings are either medium dense or medium stiff, although the two boreholes (R-11-NO-001 and R-11-NO-002) that were drilled just south of the 22 boreholes indicated very stiff lean clay in the top 5 feet of the borings.	1. Comment has been incorporated. The sample has already been disturbed for the bulk sample and the density or the consistency cannot be defined. The density or the consistency will be removed for the soils encountered in 22	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
		2- It is not clear which method or measurements used to define the density or the consistency of the soils encountered in the 22 boreholes.	boreholes described in Table 2. 2. Same response to comment of Item 1 above. The density or consistency is not defined for the bulk samples.	A	A	A
6	P19 Section 7.3.2 Groundwater	1- According to the borings R-11-NO-001 and R-11-NO-002, that were drilled at North Novato Overhead located at the southern limit of the project site, the groundwater elevation is ranging between 1.0 and 21.0 ft	Comment has been incorporated. The description of the groundwater (including perched water in the embankment) has been clarified/revised and the groundwater measured	A	A	A

Agency:	Caltrans	**Responded By:**	Parikh Consultants
Review Unit:	Geotechnical Design - West	**Date Responded:**	6/8/12
Comments By:	John Moore and Rifaat Nashed	**JRT Meeting Date:**	
Date Reviewed:	05 - 07- 2012		

TECHNICAL COMMENT REVIEW AND RESPONSE

Title:	Submittals: **Geotechnical Materials Report** – MSN NB HOV Lane Widening Project, Novato, Marin County, California, 04-MRN-101, PM R22.0/24.4, dated April 13, 2012, written by Parikh Consultants, Inc. of San Jose, CA for BKF Engineers of Pleasanton, CA. **Project Plans 04-2640L1**, dated April 16, 2012, drawn by BKF Engineers of Pleasanton, CA for the Transportation Authority of Marin (TAM), San Rafael, CA **Standard Special Provisions** for 04-2640L1, dated April 16, 2012, compiled by BKF Engineers.	

Revision Action Code: **A**-Will Comply; **B**-Consultant to Evaluate; **C**-Will Not Incorporate; **D**-TAM or CT to Evaluate

Item No.	Drawing or Page No.	Review Comments	Design Responses	Revision Action	JRT Disp.	Final Disp.
			in Borings R-11-NO-001, R-11-NO-002 and R-12-NO-003 has been included in the report.			