INFORMATION HANDOUT

For Contract No. 05-1A7004
At 05-SLO-1-73.7/74.0

Identified by
Project ID 0512000009

PERMITS

Coastal Development

MATERIALS INFORMATION

Foundation Recommendation

MANUFACTEROR DRAWINGS

Alternative In Line Terminal Systems

SKT-MGS, ET 31 and 31" X-Tension

PRODUCT INFORMATION

Temporary Alternative Crash Cushions

ADIEM, Guardguard II CZ, ABSORB, ACZ 350 and SLED

DETAIL FOR X-TENSION TERMINAL SYSTEM TRANSITION TO MGS

SAN LUIS OBISPO COUNTY
DEPARTMENT OF PLANNING AND BUILDING

June 23, 2014

California Dept. of Transportation
Attn: Paula Huddleston
50 Higuera St.
San Luis Obispo, CA 93401

NOTICE OF FINAL COUNTY ACTION

HEARING DATE: June 12, 2014

SUBJECT: CALIFORNIA DEPARTMENT OF TRANSPORTATION
County File Number: DRC2013-00052
Minor Use Permit / Variance, and Coastal Development Permit

LOCATED WITHIN COASTAL ZONE: YES

The above-referenced application was approved by the Planning Commission, based on the approved Findings and Conditions, which are attached for your records. This Notice of Final Action is being mailed to you pursuant to Section 23.02.033(d) of the Land Use Ordinance.

Appeal to the Board. This action is appealable to the Board of Supervisors within 14 days of this action. If there are Coastal grounds for the appeal there will be no fee. If an appeal is filed with non-coastal issues there is a fee of $850.00.

Appeal to the Coastal Commission. This coastal development permit action is appealable to the California Coastal Commission pursuant to regulations contained in Coastal Act Section 30603 and the County Coastal Zone Land Use Ordinance 23.01.043. These regulations contain specific time limits to appeal, and the criteria and procedures that must be followed to appeal this action. If this action is not appealable to the Coastal Commission, then the County's coastal development permit action is effective subject to its terms and conditions. If this action is appealable to the Coastal Commission, then the Coastal Commission's 10-working day appeal period begins the first working day after the Coastal Commission receives adequate notice of this action from San Luis Obispo County. The action and coastal development permit are not effective until the Coastal Commission's appeal period has expired and no appeal has been filed. This means that no construction permits can be issued until both the County appeal period and the additional Coastal Commission appeal period have expired without an appeal being filed. If an appeal is filed with the Coastal Commission, then the County's coastal development permit action is stayed and you will need to contact the Commission directly for details on next steps. Potential appellants must exhaust County appeal avenues prior to appeal to the Coastal Commission.

Appeals and/or questions about the Commission's appeal process should be directed to: California Coastal Commission Central Coast District Office, 725 Front Street, Suite 300, Santa Cruz, CA, 95060; phone (831) 427-4863; fax: (831) 427-4877.

If the use authorized by this Permit approval has not been established or if substantial work on the property towards the establishment of the use is not in progress after a period of twenty-four (24) months from the date of this approval or such other time period as may be designated through conditions of approval of this Permit, this approval shall expire and become void unless an extension of time has been granted pursuant to the provisions of Section 23.02.050 of the Land Use Ordinance.

If the use authorized by this Permit approval, once established, is or has been unused, abandoned, discontinued, or has ceased for a period of six (6) months or conditions have not been complied with, such Permit approval shall become void.

If you have questions regarding your project, please contact Megan Martin at (805) 781-5600. If you have any questions regarding these procedures, please contact me at (805) 788-2947.

Sincerely,

R. Hedges

Ramona Hedges, Secretary
San Luis Obispo County Planning Commission

(Planning Department Use Only)

Date NOFA copy mailed to Coastal Commission: after 6/27/14

Enclosed: __X__ Staff Report
__X__ Findings and Conditions

PLANNING COMMISSION
COUNTY OF SAN LUIS OBISPO, STATE OF CALIFORNIA

Thursday, June 12, 2014

PRESENT: Commissioners Ken Topping, Eric Meyer, Don Campbell, Jim Irving, and Chairman Tim Murphy

ABSENT: None

PLANNING COMMISSION RESOLUTION NO. 2014 - 013
RESOLUTION RELATIVE TO THE GRANTING
OF A
MINOR USE PERMIT / VARIANCE
AND
COASTAL DEVELOPMENT PERMIT

WHEREAS, the County Planning Commission of the County of San Luis Obispo, State of California, did, on the 12th day of June, 2014, grant a Minor Use Permit, Variance and Coastal Development Permit, County File Number: DRC2013-00052 to the CALIFORNIA DEPARTMENT OF TRANSPORTATION, and relies on the previously approved Mitigated Negative Declaration adopted June 19, 2013. The site is in the Rural Lands, Cal Trans Right of Way land use category and is located adjacent to Hwy. 1 in San Luis Obispo approximately 0.7 miles north of the Ragged Point Inn (Post Mile 73.7 to 73.9) on Highway 1, in the North Coast planning area. Assessor Parcel Number(s); APN(s): 011-011-005.

WHEREAS, the Planning Commission, after considering the facts relating to such application, approves this Permit based on the Findings listed in Exhibit A.

WHEREAS, the Planning Commission, after considering the facts relating to such application, approves this Permit subject to the Conditions listed in Exhibit B.

NOW, THEREFORE, BE IT RESOLVED, that the Planning Commission of the County of San Luis Obispo, State of California, in a regular meeting assembled on the 12th day of June, 2014, does hereby grant the aforesaid Permit No. DRC2013-00052.

This land use permit is valid for a period of 24 months from its effective date unless time extensions are granted pursuant to Land Use Ordinance/Coastal Zone Ordinance Section 22.64.070/23.02.050 or the land use permit is considered vested. This land use permit is considered to be vested once a construction permit has been issued and substantial site work has been completed. Substantial site work is defined by Land Use Ordinance/Coastal Zone Ordinance Section 22.64.080/23.02.042.

If the use authorized by this Permit approval, once established, remains vacant and unused for its authorized purpose, or is abandoned or discontinued for a period greater than 12 consecutive months, such Permit approval shall become void.

On motion of Commissioner Ken Topping, seconded by Commissioner Eric Meyer, and on the following roll call vote, to-wit:

AYES: Commissioners Topping, Meyer, Campbell, Irving, and Chairman Murphy

NOES: None

ABSENT: None

the foregoing resolution is hereby adopted.

/s/ Tim Murphy
Chairperson of the Planning Commission

ATTEST:

/s/ Ramona Hedges
Secretary, Planning Commission

EXHIBIT A - FINDINGS

Environmental Determination

A. The County, as a Responsible Agency, has reviewed the Negative Declaration and Addendum (June 2013 and April 2014) previously prepared by the California Department of Transporation and finds that this determination is appropriate (pursuant to Public Resources Code Section 21000 et seq., and CA Code of Regulations Section 15000 et seq.).

Minor Use Permit

B. The proposed project or use is consistent with the San Luis Obispo County General Plan and Local Coastal Plan because the the road realignment and soldier-pile wall install is an allowed use within the land use category and as conditioned is consistent with all of the General Plan policies.

C. As conditioned, the proposed project or use satisfies all applicable provisions of Title 23 of the County Code.

D. The establishment and subsequent operation or conduct of the use will not, because of the circumstances and conditions applied in the particular case, be detrimental to the health, safety or welfare of the general public or persons residing or working in the neighborhood of the use, or be detrimental or injurious to property or improvements in the vicinity of the use because approval of the variance to grade on slopes greater than 30 percent, the road widening, and installation of the 1,000 foot soldier-pile wall does not generate activity that presents a potential threat to surrounding property and buildings. The project will be conditioned to provide replacement of all impacted plant species in the project vicinity and will minimize impacts to surrounding resources. This project is subject to Ordinance and Building Code requirements designed to address health, safety and welfare concerns.

E. The proposed project or use will not be inconsistent with the character of the immediate neighborhood or contrary to its orderly development because approval of the variance to grade on slopes greater than 30 percent, the road widening, and installation of the 1,000 foot soldier-pile wall will be similar to, and will not conflict with, the surrounding lands and uses.

F. The proposed project or use will not generate a volume of traffic beyond the safe capacity of all roads providing access to the project, either existing or to be improved with the project because the proposed project is intended to facilitate traffic flow and create a safer route for travelers along Highway 1. Implementation of the proposed project would not result in an increase in trip generations or traffic-related noise, and would not result in a significant change to the existing road service or traffic safety level.

Variance

G. The variance does not constitute a grant of special privileges inconsistent with the limitations upon other properties in the vicinity. Highway 1 traverses existing slopes in excess of 30%; any work in the area would require work on slopes where a variance would be required by County ordinance. The purpose of the project is to minimize risk to human life by stabilizing the landslides, damage and hazards along Highway 1 at the Elephant Trunk Slide location. The project site and Highway has been exposed to repeated slides and if left unrepaired would result in further undermining and sliding.

H. The project site and surrounding vicinity consists of steep topography with slopes in excess of 30 percent. Highway 1 traverses the existing 30 percent slopes and has been damaged by active landslides at the Elephant Trunk Slide location. Without stabilizing and repair, additional damage to Highway 1 may occur. The strict application of this Title would deprive the property privileges to repair those damages as the applicant would not be allowed to grade on slopes in excess of 30 percent.

I. Grading is allowed in the Rural Lands land use category. Application of a variance allows for grading on slopes greater than 30 percent adjacent to Highway 1. Similar development in this area would require working on slopes in excess of 30 percent and would therefore require a variance.

J. The Variance is consistent with the Local Coastal Program. The purpose of the project is to provide structural stability and repair damage caused by landslides along Highway 1 at the Elephant Trunk Slide location. Repair of Highway 1 and installation of the soldier-pile wall will minimize future risk to human life and property. Furthermore, Highway 1 is an important visitor serving and transportation link recognized in the Local Coastal Program. The project is to rebuild and stabilize a section of that important link to avoid a major slide and future potential road closures.

K. The variance will not adversely affect health or safety of persons, is not materially detrimental to the public welfare, and is not injurious to nearby property or improvements for the following reasons:

- Grading will be engineered to ensure required standards to stability;
- Grading and construction will be inspected and verified for compliance with requirements by a certified engineering geologist and soils and/or civil engineer;
- In order to address polluted runoff, a drainage plan, including Best Management Practices (BMPs), will ensure the project does not increase or redirect runoff that would worsen existing conditions; and
- A registered civil engineer will verify the recommendations of the approved drainage plan, as well as the required sedimentation and erosion control plan are implemented.
- The proposed project will improve safety for travelers along Highway 1.

Coastal Access

L. The proposed use is in conformity with the public access and recreation policies of Chapter 3 of the California Coastal Act, because the project will not provide public access to the shoreline due to the inconsistency with public safety and the protection of fragile coastal resources.

Sensitive Resource Area

M. The development will not create significant adverse effects on the natural features of the site or vicinity that were the basis for the Sensitive Resource Area designation, and will preserve and protect such features through the site design, because *development has been sited and designed to protect the habitat and following construction will be restored to be compatible with the continuance of the habitat.*

N. Natural features and topography have been considered in the design and siting of all proposed physical improvements and the project has been conditioned to avoid and minimize impacts to the sensitive resources within the construction area. Best management practices will be implemented during construction to avoid spills and leaks,

erosion, and other forms of disturbance to the SRA. Erosion control measures and revegetation will restore temporarily disturbed areas. The long term impacts will be minimized and avoided through the design and siting of the project.

O. The proposed clearing of topsoil and trees, is the minimum necessary to achieve safe and convenient access and siting of proposed structures, and will not create significant adverse effects on the identified sensitive resource, because best management practices will be implemented during construction to minimize impacts and disturbance to the SRA. Erosion control measures and revegetation will restore temporarily disturbed areas. The long term impacts will be minimized and avoided through the design and siting of the project.

P. The soil and subsoil conditions are suitable for any proposed excavation and site preparation and drainage improvements have been designed to prevent soil erosion, and sedimentation of streams through undue surface runoff, because best management practices will be applied to the project to limit potential drainage impacts including but not limited to erosion control measures and revegetation to restore temporarily disturbed areas.

Environmentally Sensitive Habitat

Q. There will be no significant negative impact on the identified sensitive habitat and the proposed use will be consistent with the biological continuance of the habitat because the project, as conditioned, will restore the existing habitat and setting to ensure the biological continuance of the habitat following construction.

R. The proposed use will not significantly disrupt the habitat because to the maximum extent feasible, sensitive resources including Smith's blue butterfly, it's host plant seacliff buckwheat, an adjacent stream and wetlands will be protected and/or restored to the site following construction.

Wetlands

S. The proposed project is a permitted use within a wetland setback. The purpose of the project is to minimize risk to human life by stabilizing the Elephant Trunk landslide, damage and hazard along Highway 1 at the project location; no other alternative routes are feasible as the damage and hazard exists at the subject site and is required to limit further damage to the Highway; no alternative location for development is feasible. The project, as conditioned, is the least environmentally damaging option and will restore the onsite wetlands following construction.

T. Adverse environmental effects are minimized to the maximum extent feasible as conditioned and the project following construction will restore the onsite wetlands where all material to be temporarily excavated at the existing wetland area will be stockpiled and retained until it can be replaced. The retention and reuse of the native parent material will allow for the existing hydrophytic vegetation seed bank within the soil to passively revegetate the wetland.

U. The site would be physically unusable for the principal permitted use unless the setback is reduced because the location of proposed project is not adjustable.

V. The setback reduction is the minimum that would enable the principle permitted use to be established on the site after all practical design modifications have been considered.

Streams and Riparian Vegetation

W. The proposed project consists of the widening of Highway 1, which is an allowable use, will be located adjacent to a mapped coastal stream. No alternative location or route is feasible as the purpose of the project is to minimize risk to human life by stabilizing the landslide, damage and hazard along Highway 1 at the Elephant Trunk Slide location. The project site and Highway has been exposed to repeated slides and if left unrepaired would result in further undermining and sliding.

X. Adverse environmental effects have been minimized to the maximum extent feasible and have been sited and designed to protect the habitat and be compatible with the continuance of such habitat.

Y. The adjustment to the riparian setback is necessary because the project location is not adjustable nor would an alternative location be considered as the slipout and landslide damage must be repaired in the existing location to prevent future damage to the Highway and prevent impacts to travelers along Highway 1.

Z. The adjustment to the riparian setback is the minimum that would allow for the purposes of the project to repair the existing Elephant Trunk landslide.

EXHIBIT B - CONDITIONS OF APPROVAL

Approved Development

1. This approval authorizes a Variance/Coastal Development permit to allow for the construction of a 1,000 foot-long soldier pile wall on slopes greater than 30 percent. The roadway width would also be brought up to current design standards and widened to accommodate a 12-foot lane with 4-foot shoulder in each direction. The project will result in the disturbance of approximately 6,900 cubic yards of cut (4,300 cubic yards of roadway excavation and 2,600 cubic yards of structure excavation) and 6,900 cubic yards of fill across 1.4 acres on an approximately 70-acre parcel.

Site Development

2. **At the time of construction,** plans shall show all development consistent with the approved site plan, project description, and revegetation/landscape plan.

The following general avoidance and minimization measures shall be implemented:

3. **Prior to construction and ground disturbance**, the applicant shall delineate and establish the Environmentally Sensitive Areas. The Environmentally Sensitive Areas will ensure that unnecessary disturbance does not occur outside of the project limit area. The applicant shall show the Environmentally Sensitive Area limits on the final layout plans.

4. **Prior to construction and ground disturbance**, the Resident Engineer and Project Biologist shall meet five days prior to the beginning of work, in the field at the project site for the identification of select locations where Environmentally Sensitive Area fence and flagging shall be incorporated.

5. **Prior to construction and mobilization to the site**, the applicant shall inspect all equipment staging and material storage, stockpile, disposal, and borrow sites for potentially sensitive biological resources. If sites are selected other than those already designated on the approved project plans, the Resident Engineer shall contact the environmental planning Construction Liaison or Project Biologist no less than two weeks prior to use of equipment staging and material storage, stockpile, disposal, and borrow sites. If sensitive biological resources are found at such sites, then new locations shall be selected.

6. **During construction**, the applicant shall avoid temporary effects to water quality by implementing the Best Management Practices from Caltrans' National Pollution Discharge Elimination System Permit. These standard best management practices will be employed by onsite personnel to prevent direct or indirect impacts to the Pacific Ocean.

Visual / Aesthetics

To maintain the visual quality elements in the project area and to decrease the visual impact caused by the project, the following measures would avoid or minimize impacts. Implementation of these measures would reduce visual impacts of the proposed project to less than significant:

7. Soldier-pile wall – The shotcrete covering the soldier piles will be integrally colored to complement the adjacent ground. The design requires concrete blocks at the allense

and a 6" high curb the length of the wall for a railing pedestal; they will be integrally colored to match the shotcrete. Native buckwheat shrubs will be planted along the edge of bench in front of the wall with a temporary irrigation system, and a year of plant establishment work is included in the contract. All disturbed soil area will be contour graded to appear natural and seeded with native grasses and shrubs, then covered with compost to provide erosion control and to camouflage the disturbance.

Air Quality

The following measures are provided pursuant to the Caltrans Standard Specifications, Chapter 7, and measures from the San Luis Obispo County Air Pollution Control District 1997 CEQA Air Quality Handbook. These measures would apply to all construction activities associated with the project.

8. Reduce the amount of disturbed area where possible.

9. Use water trucks or sprinkler systems in sufficient quantities to prevent airborne dust from leaving the site. Increase watering frequency when wind speeds exceed 24 kilometers per hour (15 miles per hour). Use reclaimed water whenever possible.

10. Spray all stockpiles daily as needed.

11. Implement permanent dust control measures identified in the approved landscape and re-vegetation plans as soon as possible following completion of any soil-disturbing activities.

12. Sow fast-germinating grass seed on all exposed ground areas that would be reworked at dates greater than one month. Water seed until it is established. Stabilize all disturbed areas not subject to re-vegetation with soil binders, jute netting, or other methods approved in advance by the San Luis Obispo County Air Pollution Control District.

13. Pave all disturbed soil areas as soon as possible unless seeding or soil binders are used.

14. Reduce speeds of all construction vehicles to 24 kilometers per hour (15 miles per hour) on any unpaved surface at the construction site.

15. Install wheel washers where vehicles enter and exit unpaved roads onto streets, or wash off trucks and equipment leaving the site.

16. Sweep streets at the end of each day if visible soil material is carried onto adjacent paved roads. Water sweepers should use reclaimed water whenever feasible.

17. Cover all trucks hauling dirt, sand, or loose materials or maintain at least five centimeters (two inches) of freeboard (minimum vertical distance between load and top of trailer) in accordance with California Vehicle Code Section 23114.

Biological Resources

The following avoidance and minimization measures shall be implemented for Smith's blue butterfly:

18. **During project construction**, Caltrans shall follow defined procedures to avoid effects to the Smith's blue butterfly.

19. **Throughout the life of the project**, Caltrans will prohibit mowing and broadcast spraying of herbicide in stands of buckwheat. Within areas that contain buckwheat,

control of invasive weeds, which is beneficial to buckwheat, will be achieved by spot spraying herbicide and/or hand clearing.

20. **Prior to and during construction**, Caltrans shall use only biologists approved by the U.S. Fish and Wildlife Service (Service) to participate in the capture, handling, and monitoring of the Smith's blue butterfly in all of its life stages and the handling of buckwheat plants.

21. **Prior to and during construction**, Caltrans shall ensure that ground disturbance for maintenance or project activities will not begin within stands of buckwheat until a Service-approved biologist is on site.

22. **During construction**, service-approved biologists will verify that the proposed work activity within stands of buckwheat meets all criteria established by the Service.

23. For maintenance work or project activity within stands of buckwheat, a Service approved biologist will survey the work site no more than 30 days before the onset of ground disturbance. If any life stage of the Smith's blue butterfly or its host plant, seacliff buckwheat, is found and is likely to be killed or injured by work activities, the approved biologist will be allowed sufficient time to relocate seacliff buckwheat plants, duff, and/or soil from the site before work activities begin. The seacliff buckwheat plants, duff, and/or soil will be hand removed and placed as close as possible to, but not on, living seacliff buckwheat plants. The Service-approved biologist will relocate the seacliff buckwheat plants, duff, and/or soil the shortest distance possible to a location that contains suitable habitat and will not be affected by activities associated with the proposed project. The Service-approved biologist will maintain detailed records of the number of seacliff buckwheat plants that are moved.

24. Before any maintenance or project activity work begins within stands of buckwheat, a Service-approved biologist will provide training to all field personnel. At a minimum, the training will include a description of the Smith's blue butterfly and its habitat, the specific measures that are being implemented to conserve the Smith's blue butterfly, and boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

25. A Service-approved biologist will be present at the work site for maintenance or project activity within stands of buckwheat until all Smith's blue butterflies and seacliff buckwheat plants that are at risk due to project activities have been removed, workers have been instructed, and disturbance to habitat has been completed. After this time, Caltrans will designate a person to monitor on-site compliance with all minimization measures. The Service-approved biologist will ensure that this monitor receives the training outlined in measure 11 and in the identification of the Smith's blue butterfly and seacliff buckwheat. If the monitor for the Service-approved biologist recommends that work be stopped because the Smith's blue butterfly or seacliff buckwheat would be affected to a degree that exceeds the levels anticipated by Caltrans and the Service during review of the proposed action, they will notify the Resident Engineer immediately. The Resident Engineer will either resolve the situation by eliminating the unanticipated effect(s) immediately, or require that all actions causing these effects be halted. If work is stopped, the Service will be notified as soon as is reasonably possible.

26. An assemblage of native species will be used for revegetation of project sites. Seacliff buckwheat seed or plants will be placed outside the vegetation control areas only. The

spread of invasive weeds during revegetation efforts will be controlled according to the vegetation Management Guidelines developed as part of the Big Sur Coast Highway Management Plan.

27. The number of access routes, size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Environmentally Sensitive Areas will be established to confine access routes and construction areas to the minimum area necessary to complete construction, and minimize impact to Smith's blue butterfly and seacliff buckwheat.

28. If feasible, the contractor will avoid clearing and grubbing coastal scrub in the areas for temporary road access. Coastal scrub vegetation will be cut down to ground level, to allow for regrowth of natural vegetation and reduce the potential for invasive species.

29. Caltrans will ensure that best management practices are implemented according to the most current approved guidelines to control erosion and sedimentation during and after project implementation. Weed-free hay and straw bales would be used for erosion control measures when they become available.

The proposed project must be designed and scheduled to have no net impacts to American peregrine falcon. The following avoidance and minimization measures shall be implemented for this species:

30. **Prior to construction**, a biologist approved by the California Department of Fish and Wildlife (California Fish and Wildlife) with experience conducting American peregrine falcon surveys will conduct protocol-level surveys for American peregrine falcons at the project site. The focus of pre-construction surveys will be to determine presence, locate nest site(s), determine breeding phenology, and establish nest site productivity (if nesting occurs). Protocol-level pre-construction surveys will be completed annually until the project begins construction.

31. No work will be permitted within 500 feet of an active American peregrine falcon nest from February 15 to August 31 (the raptor breeding season). No work will be permitted within 0.5 mile of an active nest site for the duration of the incubation period; between egg-laying and hatching, which lasts approximately six weeks. Nesting phenology will be determined by the pre-construction surveys and/or the biological monitor. Nesting phenology may vary from year to year, but generally the six-week incubation period spans from mid-March to mid-April or mid-April to mid-May in central California. Work may resume within 0.5 mile of an active nest when the project biologist determines the falcons are no longer incubating eggs or that the nest has failed and there is no possibility of a replacement clutch (secondary nesting attempt).

32. A California Fish and Wildlife-approved biologist with experience observing breeding American peregrine falcons will be selected to monitor peregrines during construction of the project.

33. The California Fish and Wildlife-approved biologist will monitor peregrines at the project site from February 15 to August 31. Monitoring will require an average of 8 to 12 hours of observation per week to determine the effect of construction and determine whether peregrine falcons are exhibiting normal breeding behavior. This level of effort will continue as long as incubating peregrines or nestlings under the care of adults occupy the nesting site. If the young fledge, then the observations will continue for a minimum of 30 work days after the last young leaves the nest ledge. All monitoring will be conducted

with the use of binoculars and/or spotting scope from a minimally invasive distance and document all American peregrine falcon activity in the vicinity of the project.

34. Quarterly reports summarizing monitoring observations of nesting American peregrine falcons, including breeding behavior, nest data, disturbances, and reproductive success, will be prepared by the biological monitor and submitted during construction of the project. Monitoring reports shall be submitted to the California Fish and Wildlife Regional Representative, Laura Peterson-Diaz, via email at lpdiaz@dfg.ca.gov. Fish and Wildlife may at any time increase or decrease the timing and number of monitoring reports required under this condition depending on the results of previous surveys or reports.

The following avoidance and minimization measures shall be implemented for all nesting birds:

35. **Prior to construction**, vegetation removal shall be scheduled to occur between September 1 and February 14 (outside of the typical nesting season) if possible, to avoid potential impacts to nesting birds within the project area.

36. **Prior to construction**, if construction activities are proposed to occur between February 15 and August 31 (the typical nesting season) within potential nesting habitat within the project area, a nesting bird survey shall be conducted by a qualified biologist at least two weeks prior to construction to determine presence/absence of nesting birds within the project area. Work activities shall be avoided within 100 feet of active bird nests until a qualified biologist has determined that young birds have fledged. Readily visible exclusion zones shall be established in areas where nests must be avoided. The U.S. Fish and Wildlife Service and California Department of Fish and Wildlife shall be contacted for additional guidance if nesting birds are observed within or near the boundaries of the project site. Active nests shall not be disturbed and eggs, or young of birds covered by the Migratory Bird Treaty Act and California Fish and Wildlife Code shall not be killed, injured, or harassed at any time.

The following avoidance and minimization measures shall be implemented for wetlands and coastal streams:

37. The temporary wetland impacts must be restored at a 1:1 ratio in approximately the same locations as the wetlands exist now. The catchment basin proposed for the toe of the inland slope will continue to provide similar hydrology to support wetland vegetation.

38. All material to be temporarily excavated at the existing wetland area will be stockpiled and retained until the catchment basin construction is completed and the material can be replaced. The retention and reuse of the native parent material will allow for the existing hydrophytic vegetation seed bank within the soil to passively revegetate the wetland.

39. **Prior to construction**, the applicant shall contact the California Department of Fish and Wildlife to determine whether the project will require the issuance of a 1601-1603 agreement.

Noise

The following measures are provided to minimize construction noise disturbances. These measures would apply to all construction activities associated with the project:

40. To the extent practicable, local noise ordinances must be observed, in accordance with the County of San Luis Obispo General Plan "Noise Element" requirements. In addition,

measures included to address situations when the above measures were not practicable. These would include one or more of the following:

- Notifying the public of the construction schedule
- Coordinating with affected residents
- Constructing a temporary barricade between the noise source and the receptor(s)
- Temporarily relocating affected individuals.

41. To the extent practicable, during evening hours of 10:00 p.m. to 7:00 a/m., the job site should not exceed a maximum hourly equivalent sound level of 45 decibels or a maximum sound level of 65 decibels at the property line of nearby receptors.

42. All construction vehicles shall use manufacturer recommended mufflers. The mufflers shall be fitted to all equipment in use.

On-going conditions of approval (valid for the life of the project)

43. This land use permit is valid for a period of 24 months from its effective date unless time extensions are granted pursuant to Land Use Ordinance Section 23.02.050 or the land use permit is considered vested. This land use permit is considered to be vested once it has been demonstrated that construction has been initiated and substantial site work has been completed. Substantial site work is defined by Land Use Ordinance Section 23.02.042 and in this instance would include grading and completion of structural infrastructure..

44. All conditions of this approval shall be strictly adhered to, within the time frames specified, and in an on-going manner for the life of the project. Failure to comply with these conditions of approval may result in an immediate enforcement action by the Department of Planning and Building. If it is determined that violation(s) of these conditions of approval have occurred, or are occurring, this approval may be revoked pursuant to Section 23.10.160 of the Land Use Ordinance.

State of California Business, Transportation and Housing Agency

M e m o r a n d u m ***Flex your power!***

Be energy efficient!

To: DON NGUYEN-TAN
Acting Branch Chief
Division of Engineering Services, Structure Design
Office of Bridge Design – Central, Branch 6

Attn: Mike Cullen

Date: September 10, 2013

File: 05-SLO-1-73.0/74.1
0512000009 (EA 05-1A7001)
Br. No. 49E-0022
Elephant Trunk Retaining Wall

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: **FOUNDATION REPORT FOR ELEPHANT TRUNK RETAINING WALL**

Scope of Work

A Foundation Report (FR) is provided for the Elephant Trunk Retaining Wall, a timber lagged soldier pile wall with subhorizontal ground anchors. Work performed for this report includes a literature search, field mapping, a subsurface investigation, and installing and monitoring instrumentation.

Project Description and Background

The project area is located in a rural part of northern San Luis Obispo County on Route 1. State Route 1 in the project area is a two-lane conventional highway with sharp curves and steep grades. The highway closely follows the Pacific Coast between Cambria and Carmel. Route 1 is designated a rural minor arterial and federal aid primary route. It serves regional and interregional traffic, and is shared by recreational users, commuters, cyclists, and limited commercial traffic.

The Elephant Trunk Slide consists of two sections of unstable roadway. The slide areas are below the roadway on the westerly side of the highway. Longitudinal cracks in the roadway delineate the upper limits of the slides at both locations. The southerly location is approximately 600 feet long and covers parts of both the northbound and the southbound lanes. The northerly location is approximately 150 feet long and is confined to the southbound lane. The landslides creep at a variable rate; movement appears to coincide with sustained periods of precipitation. Movement was pronounced during the winter of 2010/2011, with settlement of the roadway resulting in vertical offsets of up to 9 inches. Caltrans Maintenance has been keeping the road traversable by periodically paving the affected areas with cold-mix asphalt concrete.

During the winter of 1998 a portion of the southbound lane between the two slide areas failed catastrophically. The slipout was repaired by removing the highway embankment and

reconstructing it with geogrid reinforcement. That section of roadway has remained stable, although some of the geogrid has been exposed due to erosion.

A project was constructed during late 2009/early 2010 to install horizontal drains and landslide monitoring instrumentation in the two unstable areas. Eight arrays of four 100-foot horizontal drains were installed, five arrays in the cut slopes above the roadway, and three arrays in the fill slopes below the roadway. Two slope inclinometer casings with attached Time Domain Reflectometry (TDR) cables were grouted into 110-foot, six-inch diameter vertical borings to monitor future landslide movement. Five 80-foot deep open standpipe observations wells were constructed as part of the project to monitor groundwater elevations. It was hoped that the horizontal drains would lower the groundwater table sufficiently to halt further movement of the landslides. The project was not successful. Only two of the horizontal drains intercepted water and landslide movement has not slowed perceptibly.

It is now proposed to construct a timber lagged soldier pile retaining wall with subhorizontal ground anchors across both areas of instability to mitigate existing damage to the roadway and to prevent further movement of the landslides onto the highway.

The following datum was used to reference horizontal and vertical positions of the proposed structure:

- Horizontal: North American Datum of 1983 (NAD83 (1991.35))
- Vertical: North American Vertical Datum of 1988 (NAVD88)

Pertinent Reports and Investigations

The following publications were used to assist in the assessment of site conditions:

1. *Caltrans ARS Online (v2.1.06).*
2. *Caltrans Seismic Design Criteria, Version 1.6,* November 2012.
3. *Geologic Map of San Luis Obispo County, California,* Compiled by Lew Rosenberg.
4. *Preliminary Foundation Report,* Caltrans Office of Geotechnical Design – South 2, Branch B, July 7, 2011.
5. *Preliminary Geotechnical Report for Elephant Trunk Bend Landslide,* Caltrans Office of Geotechnical Design – West, Branch B, March 23, 2007.

Field Investigation and Testing Program

A subsurface investigation consisting of eight vertical borings and two horizontal borings was conducted by Caltrans Office of Geotechnical Design – South 2, Design Branch B during April 2011 through June 2011 to determine soil and rock conditions, depth to landslide movement, and groundwater elevations. Eight slope inclinometer casings were installed, one in each of the vertical borings. Continuous soil and rock samples were obtained from the borings using a core barrel apparatus retrieved via wire line. Rock and soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010). A supplemental subsurface investigation consisting of two vertical borings was conducted by Caltrans Office of Geotechnical Design – North, Design Branch D in October 2012. Two additional slope inclinometer casings were installed to better define the landslide failure surface

Table 1: 2011/2012 Subsurface Investigation Summary

Boring No.	Completion Date	Drill Rig Type	Hammer Type	Hammer Efficiency (%)	Location		Ground Surface Elevation (ft)	Boring Depth/ Length[1] (ft)
					Station ("CL" Line)	Offset		
R-11-001	4/22/2011	CME 85	Automatic	68	502+17	1' Rt	412.8	95
R-11-002	4/25/2011	CME 85	Automatic	68	504+24	2' Lt	425.4	62
R-11-003	4/27/2011	CME 85	Automatic	68	505+08	CL	430.9	77
R-11-004	5/5/2011	CME 85	Automatic	68	501+59	CL	410.2	99
R-11-005	5/7/2011	CME 85	Automatic	68	509+47	2' Lt	462.4	90.5
R-11-006	5/8/2011	CS-2000	Automatic	84	502+21	56' Lt	388.2	80
R-11-007	5/10/2011	CME 85	Automatic	68	507+81	16' Rt	450.8	92.2
R-11-008	5/11/2011	CS-2000	Automatic	N/A	502+12	35' Lt	394.9	99
R-11-009	5/19/2011	CS-2000	Automatic	N/A	504+05	65' Lt	386.4	90
R-11-010	6/16/2011	CS-2000	Automatic	84	508+64	5' Lt	456.1	88
R-12-001	10/9/2012	CS-2000	Automatic	84	501+58	29' Lt	406.9	55
R-12-002	10/4/2012	CS-2000	Automatic	84	503+95	78' Lt	381.0	75.5

[1] R-11-008 and R-11-009 are horizontal borings

A seismic refraction study was performed in the project area to better understand the subsurface conditions and to correlate the geotechnical borings. Five existing piezometers and/or slope inclinometer casings were utilized for a tomography seismic survey designed to image beneath the roadway and adjacent embankment. Two additional profiles were acquired parallel to and below the roadway on a bench cut into the hillside. A summary of the study results is presented in the attachments to this report.

Laboratory Testing Program

Soil samples obtained during the subsurface investigation were submitted to the Headquarters Geotechnical Laboratory for corrosion potential testing. Rock samples were submitted for unconfined compressive strength testing.

Site and Subsurface Conditions

Topography and Drainage

The project area is located along the Pacific coast in the Santa Lucia Range of the Coast Ranges geomorphic province. Terrain consists of sparsely to moderately vegetated, steep sided mountains with steeply incised drainages.

There are three minor drainages within the project limits. Water from the drainages is conveyed across the roadway in 18" culverts that drain to the Pacific Ocean.

Climate

The project area has a mild marine climate. The average minimum temperatures vary from the low to mid 40's (degrees Fahrenheit) in the early winter to the low 50's in late summer/early fall. The average maximum temperatures vary locally from the high 50's in the winter near Point Piedras Blancas to the south to the mid 70's in the late summer at Big Sur State Park to the north. Average annual precipitation is approximately 20 inches at Point Piedras Blancas, and approximately 41 inches at Big Sur State Park. Almost all of the precipitation falls between November and April. It is not uncommon for the area to experience high intensity, short duration rainfall events that deposit as much as 4 inches of rain in a 24 hour period.

Regional Geology

The geology of the area is a product of subduction, where an oceanic crustal tectonic plate descends beneath a continental plate. During subduction of the sea floor, the relatively dense basalt and underlying rocks were pushed beneath the edge of the North American continent. However, the sediments above the basalt were resistant to subduction due to their relatively low density. These sediments instead collected at the upper surface of the subduction zone. Some rocks were carried deep into the subduction zone and then returned to the upper surface by the

pressure-induced flow of lower density rocks. The result of this activity was the formation of a mélange, now known as the Franciscan Formation (also known as the Franciscan Group and Franciscan Series). A typical mélange is composed of a sheared matrix of shale containing blocks of basalt, chert, serpentinite, gabbro, and metamorphic rocks. The blocks range from pebble size to many miles in length.

Site Geology

The project area is underlain by landslide deposits and Franciscan Formation. A geologic map of the project area is included in the attachments to this report.

Soil Conditions

The subsurface investigations in the project area generally encountered fill and landslide debris overlying metamorphic rock. The fill and landslide debris varies in thickness across the site, ranging from about 4 feet thick in boring RC-11-007, located near the head scarp of the northerly slide, to about 58 feet thick in boring RC-11-004, located within the southerly slide area. The fill and landslide debris consists generally of very loose to very dense clayey sand with gravel and cobbles, sandy silt, and poorly graded gravel with clay.

Underlying the fill and landslide debris is metamorphic bedrock consisting predominantly of massive, fine-grained meta sandstone with scattered thin interbeds of meta shale. The meta sandstone ranges from slightly weathered to decomposed, from very hard to very soft, and from slightly fractured to very intensely fractured.

Groundwater

Table 2 summarizes the highest measured groundwater levels and the dates they were recorded. Records of all groundwater measurements are included in the attachments to this report. Groundwater monitoring will continue until permanent mitigation for the landslide is in place.

Groundwater levels are highly variable across the project site. Rather than being confined to an aquifer, groundwater appears to migrate through fractures in rock and along the interface between the landslide deposits and bedrock.

Table 2: Groundwater Levels

Instrument ID	*Station ("CL" Line)*	*Offset*	*Date*	*Surface Elevation (feet)*	*Depth to Groundwater (feet)*	*Groundwater Elevation (feet)*
P1-10	502+05	12' Lt.	3/28/2011	410.7	35.2	375.5
P2-10	503+76	11' Lt.	3/28/2011	422.9	37.0	385.9
P3-10	507+19	2' Lt.	3/28/2011	445.2	65.9	379.3
P4-10	509+55	5' Lt.	3/28/2011	463.0	36.5	426.5
P5-10	511+18	11' Lt.	5/17/2011	473.5	36.5	437.0
SI1-10	503+97	10' Lt.	12/18/2012	423.5	Dry	--
SI2-10	510+88	11' Lt.	12/18/2012	471.7	86.2	385.5
SI3-11	502+17	1' Rt.	4/27/2011	412.8	32.8	380.0
SI4-11	504+24	2' Lt.	4/27/2011	425.4	26.4	399.0
SI5-11	505+08	CL	5/3/2011	430.9	52.3	378.6
SI6-11	501+59	CL	5/11/2011	410.2	27.2	383.0
SI7-11	509+47	2' Lt.	5/17/2011	462.4	66.8	395.6
SI8-11	502+21	56' Lt.	5/17/2011	388.2	5.8	382.4
SI9-11	507+81	16' Rt.	5/17/2011	450.8	71.2	379.6
SI10-11	508+63	5' Lt.	3/8/2012	456.1	70.2	385.9

Scour Evaluation

Scour is not an issue of concern at the project location.

Corrosion Evaluation

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water 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
- The pH is 5.5 or less

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

Table 3: Corrosion Test Summary

Boring	Depth	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
R-11-002	7'-48'	1315	7.42	N/A	N/A
R-11-003	7'-38'	2156	7.67	N/A	N/A
R-11-004	4'-25'	1348	6.85	N/A	N/A
R-11-005	1'-20'	1404	7.90	N/A	N/A
R-11-006	0'-50'	3049	6.76	N/A	N/A
Corrosive if:		**≤ 1000**	**≤ 5.5**	**≥ 500**	**≥ 2000**

Based on corrosion test results, the project site would be considered non-corrosive. However since the project area is located within 1000 feet of the Pacific Ocean, the site is considered corrosive.

Seismic Recommendations

The project site is potentially subject to strong ground motions from nearby earthquake sources. Table 4 lists the active and potentially active faults in the project vicinity as described in *Caltrans 2012 Fault Database*. Corresponding Moment Magnitudes and distances to the project site are also given. A fault map is included in the attachments to this report.

Table 4: Active and Potentially Active Faults

Fault	***Fault ID[2]***	***Moment Magnitude of Maximum Credible Earthquake[3]***	***Type of Fault[4]***	***Distance to Fault from Project Area (kilometers)***
San Gregorio fault zone (Sur Region section-Sur fault)	178	7.4	SS	1.1
San-Simeon fault zone (Arroyo Laguna section)	418	7.3	SS	1.1
Oceanic-West Huasna	223	6.9	R	6.4

[2] *Caltrans 2012 Fault Database* Identifier
[3] According to Caltrans *2012 Fault Database*
[4] SS strike-slip fault; R=reverse fault; N=normal fault

A design response spectrum for the project area was estimated using *Caltrans ARS Online (v2.1.06)*, a web-based tool that calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in Appendix B of *Caltrans Seismic Design Criteria*. The procedure used by ARS Online was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the *2008 USGS Seismic Hazard Map* for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the *2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool* is used to develop the probabilistic spectrum.

The design response spectrum is the envelope of the deterministic spectrum for the San Gregorio fault zone (Sur Region section-Sur fault) and the probabilistic spectrum. Soil amplification factors for a V_{S30} of 270 meters per second were used in the analysis. The 270 meters per second V_{S30} value is an average shear wave velocity for Type D soils. The peak ground acceleration at the project site is estimated to be 0.5 g (gravity).

No known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is low potential for surface fault rupture to occur and no mitigation efforts are necessary.

Based on inspection of the boring records from the 2011 and 2012 subsurface investigations, liquefaction potential at the project site is estimated to be low. For liquefaction to occur, three elements in combination are necessary: loose granular soils, saturated soil conditions, and strong ground shaking. Loose granular soils were not encountered at an elevation where they would be saturated with ground water.

Geotechnical Analysis

Slope stability analyses were performed using SLOPE/W 2007 to model a cross section taken at approximately “CL” Station 502+20. Four points were used to estimate the existing failure surface: the location of the longitudinal cracking on the roadway surface, the estimated failure

elevation in SI3-11 (25 feet below original grade), the estimated failure elevation in SI8-11 (50 feet below original grade), and the toe of the slide. The toe of the slide was visually located on the slope, and was mapped using a Global Position Satellite (GPS) survey. The SLOPE/W model was a simplified three layer model in which soil strength parameters of the landslide material were back calculated using an interpreted piezometic groundwater surface and a factor of safety of 1.0. The estimated geotechnical parameters of the site soils/rock are as follows:

Table 5: Soil/Rock Properties

Location	Phi	Cohesion (psf)	Total Unit Weight (pcf)	Earth Pressure Coefficient	
				Active	Passive
Above Dredge Line	26°	0	125	0.39	3.81
Below Dredge Line	35°	0	130	0.27	9.69

The ground anchor forces required to resist the landslide forces were evaluated in accordance with *FHWA Geotechnical Engineering Circular No. 4* and Section 5.5.5.7.1 of *Caltrans' Bridge Design Specifications* (BDS). Per BDS 5.5.5.7.1, the required horizontal resisting force provided by the retaining wall (P_{TOTAL}) shall be the greater of 1.44 times the resultant of the active earth pressure, calculated using Coulomb's theory with the soil parameters listed above and ignoring wall friction (δ), or the force required to resist landslide forces and provide a global slope stability factor of safety of 1.3, as determined in a slope stability analysis. Required horizontal resisting forces were calculated for retaining wall design heights of 20 feet, 30 feet, 40 feet and 50 feet. The slope stability analyses were executed using the Normal Method of Slices performed by hand solutions. The wall was assumed to be free draining in the analyses. The slope stability P_{TOTAL} was taken as the greater of the horizontal resisting force required for a factor of safety of 1.3 in a static analysis, or the required horizontal resisting force to achieve a 1.1 factor of safety in a pseudo-static analysis. The pseudo-static analysis is intended to model seismic loading by applying a horizontal force to the wall equal to the weight of the retained soil multiplied by one-third of the peak ground acceleration. The slope stability analysis and the active earth pressure analysis both considered a traffic surcharge of 240 pounds per square foot on the roadway. Analyses results are listed in Table 6.

Table 6: Wall Loading

Analysis Method for Force Determination	*P_{TOTAL} (kips/ft)*			
	H = 20 ft	*H = 30 ft*	*H = 40 ft*	*H = 50 ft*
Coulomb Active Earth Pressure Resultant x 1.44	16.7	35.6	61.6	94.5
Limit Equilibrium Slope Stability	15.4	29.8	55.2	85.9

Foundation Recommendations

It is proposed to stabilize the highway against landslide forces by constructing an anchored soldier pile wall. Recommended design lagged heights are 50 feet between "CL" Station 501+55 and Station 503+25, 30 feet between Station 503+65 and Station 506+30, 10 feet between Station 506+30 and Station 506+70, and 30 feet between Station 507+80 and Station 510+25. See the attached General Plan (GP) for an elevation view of the proposed retaining wall.

Pile sections will consist of side-by-side W14 X 53 steel piles centered in 36" diameter drilled holes. Subhorizontal ground anchors will be installed through the space between the flanges of adjacent steel pile sections. Four rows of ground anchors are recommended for the 50-foot design height, with a maximum horizontal spacing between piles of 8' 0". Three rows of ground anchors are recommended for the 40-foot design height, with a maximum horizontal spacing between piles of 8' 0". Two rows of ground anchors are recommended for the 30-foot design height, with a maximum horizontal spacing between piles of 9' 4". One row of ground anchors is recommended for the 20-foot design height, with a maximum horizontal spacing between piles of 9' 4". Recommended ground anchor unbonded lengths are presented in Table 7. Unbonded lengths were calculated to extend a minimum of 10 feet past the estimated landslide failure plane to ensure construction of the bonded zone in competent material.

Table 7: Ground Anchor Recommendations

Ground Anchor Row	*Unbonded Length (ft)*			
	Design H = 20'	*Design H = 30'*	*Design H = 40'*	*Design H = 50'*
A	32	33	34	40
B	N/A	28	29	36
C	N/A	N/A	25	32
D	N/A	N/A	N/A	28

Soil excavated from in front of the wall to facilitate installation of lagging and subhorizontal ground anchors may be replaced at a maximum slope inclination of 1.5:1 (H:V), sloping up from the bottom of the excavation to a minimum 8-foot wide bench. The bench should slope away from the wall at approximately 5% to drain surface water away from the wall. The ends of the bench should be sloped up to highway elevation at a maximum slope of 1.5:1.

It is recommended that a chimney drain be constructed in front of the wall to provide an outlet for any water that moves through the buried portion of the lagging. Fully encapsulate a two-foot wide layer of Class 1, Type B or Class 3 permeable material in Class B geosynthetic filter fabric from the bench down to the bottom of lagging. Place an 8" diameter slotted pipe 6" above the base of the permeable material to collect and convey water from the permeable layer. Outlet the slotted collector pipe with a solid pipe section sloped to drain through the slope in front the wall.

Pile axial loads consist of the vertical component of the ground anchor forces plus the tributary load from the concrete barrier and barrier slab at each pile. Piles are assumed to obtain their axial resistance in side resistance only. The contribution of skin friction from the top 5 feet and bottom 1-hole diameter of pile were neglected in the calculation of required pile embedment. Pile lengths below the bottom of lagging required to resist axial loads are listed in Table 8. Due to the potential for continued movement of the soil replaced in front of the lagging, consideration of the development of passive pile resistance is recommended to begin at 5 feet below the bottom of lagging elevation. Negligible pile settlement is anticipated.

Table 8: Solider Pile Recommendations

Lagged Height (feet)	Pile Type	Service Load (Compression) (kips)	Required Nominal Axial Compression Resistance: φ =0.45 (kips)	Recommended Pile Length Below Lagging (feet)
20	36" Drilled Hole	110	244	26
30	36" Drilled Hole	151	336	32
40	36" Drilled Hole	215	478	42
50	36" Drilled Hole	290	644	54

Construction Considerations

Global stability of the proposed anchored soldier pile wall with Service 1 Limit State loads controls the required force to be applied to the wall by the ground anchors. As such, the lock-off loads (LL's) specified on the plans should equal 1.0 times the Factored Design Loads (FDL's) specified on the plans to ensure that the full resisting force required for adequate global stability is applied to the wall. Factored Test Load (FTL) should equal 1.5 times the Factored Design Load (FDL) to verify anchor resistance, establish load-deformation behavior, and verify the unbonded length.

Caving conditions may be encountered during drilling for the piles and subhorizontal ground anchors due to the presence of loose soils near the surface and the intensely fractured nature of the rock underlying the fill and landslide deposits. The use of temporary casings, placement of tremie seals, or other methods may be required to maintain excavation stability.

Difficult drilling can be expected for the piles and the subhorizontal ground anchors due to the presence of hard rock. Unconfined compressive strengths of intact rock samples taken from the geotechnical borings ranged from approximately 1,500 psi to over 17,000 psi.

Due to the narrow width of the roadway in the project area, complete closures of the highway may be necessary to facilitate drilling for the soldier piles. It should be anticipated that road closures will only be permitted at night.

Construction of a working bench in front of the wall may be difficult due to the steep slopes and narrow roadway width. Excavation of the southbound lane may be required to gain access to the slopes in front of the proposed retaining wall layout line, resulting in the need to backfill behind the soldier piles and lagging. Proper compaction of the retaining wall backfill prior to stressing of ground anchors is essential to prevent deflection of the solider piles into the backfill. Per Standard Specification Section 19-3.03E(3), a minimum backfill height behind the lagging of 5 feet above the level of ground anchors shall be provided prior to drilling and installing the ground anchors.

Difficult excavation can be expected in front of the retaining wall between approximate "CL" Stations 506+30 and 508+00 due to the presence of geogrid reinforcement in the existing slope. Difficult excavation can also be expected near the bottom of the lagging between Stations 501+25 and 506+30 and between Stations 507+80 and 510+25 because the lower portions of the wall within those limits may be lagged into hard rock.

Depending on the time of year of construction and the amount of precipitation received, groundwater may be encountered while drilling the pile and subhorizontal ground anchor holes. Soldier pile and subhorizontal ground anchor installations may require dewatering before placing concrete. The contractor shall propose provisions to control groundwater in pile excavations and ground anchor borings in the pile installation plan and in the shop drawings for the ground anchors.

Grout loss may occur during the installation of subhorizontal ground anchors due to the intensely fractured nature of the rock. Controlling measures such as the use of "grout socks" might reduce the potential for grout loss.

Supplemental Project Information

Standard Specification 2-1.06B "Supplemental Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the Addressee of this report via electronic mail.

Data and information attached with the project plans are:

A. Log of Test Borings.

Data and information included in the Information Handout provided to the Bidders and Contractors are:

A. Foundation Report for Elephant Trunk Slide Retaining Wall dated September 10, 2013.

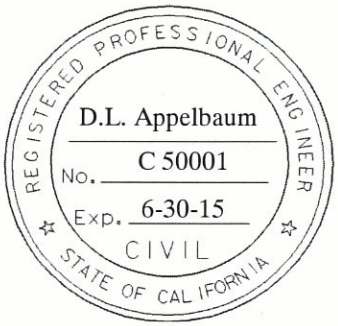
Data and information available for inspection at the District Office:

A. Borehole core samples.

The District Office is located at 50 Higuera Street, San Luis Obispo, California, 93401. Contact Sam Nimri at (805) 549-3116 to arrange for inspection of the borehole core samples.

Closure

The recommendations contained in this report are based on specific project information that has been provided by Central Region Project Development. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.



Supervised by,

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

c: Reza Mahallati / GDN Records (E-copy)
Steve Wyatt – Design Engineer (E-copy)
GeoDOG - Digital Archive of Geotechnical Data (E-copy)
Lisa Lowerison – Project Manager (E-copy)
Structure Construction R.E. Pending File (email RE_pending_file@dot.ca.gov)
Doug Lambert – District Materials Engineer (E-copy)
Craig Whitten – DES Office Engineer, Office of PS&E (E-copy)
Job File / Branch D Records

LIST OF ATTACHMENTS

ATTACHMENT 1 **VICINITY MAP**

ATTACHMENT 2 **GEOLOGIC MAP**

ATTACHMENT 3 **EARTHQUAKE FAULTS**

ATTACHMENT 4 **SEISMIC REFRACTION SURVEY REPORT**

ATTACHMENT 5 **GROUNDWATER MONITORING**

ATTACHMENT 6 **LANDSLIDE MONITORING**

ATTACHMENT 7 **SLOPE INCLINOMETER PLOTS**

ATTACHMENT 8 **MATERIALS PROPERTIES SUMMARY**

ATTACHMENT 9 **GENERAL PLAN**

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	73.0/74.1	1	

STATE OF CALIFORNIA

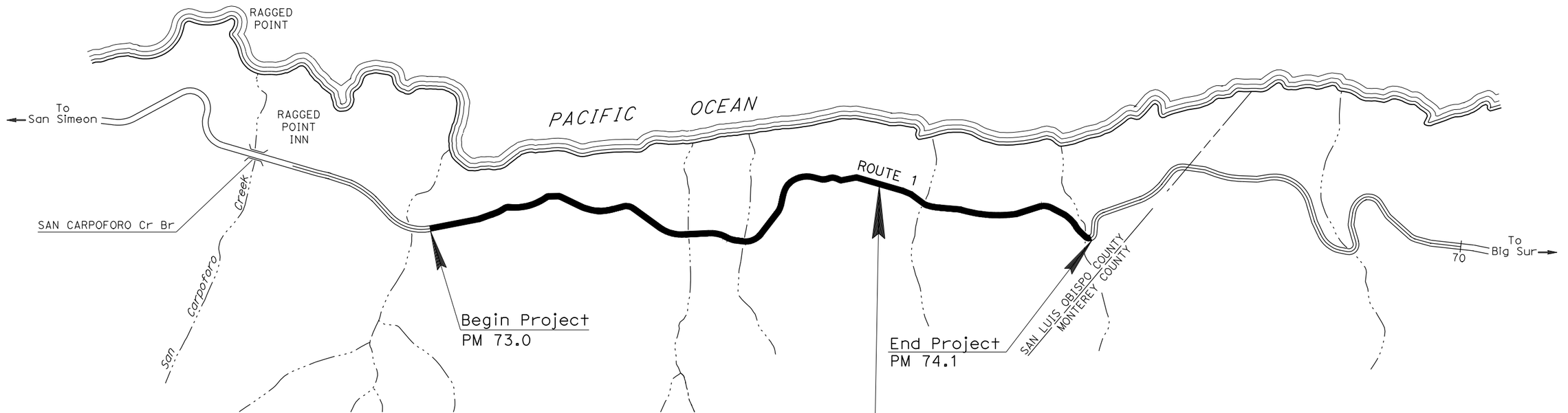
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN SAN LUIS OBISPO COUNTY
NEAR RAGGED POINT
FROM 1.6 MILES NORTH OF SAN CARPOFORO CREEK BRIDGE
TO 2.7 MILES NORTH OF SAN CARPOFORO CREEK BRIDGE

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2010



LOCATION OF CONSTRUCTION

VICINITY MAP
NO SCALE

ATTACHMENT 1

PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
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.

CONTRACT No.	05-1A7004
PROJECT ID	0512000009

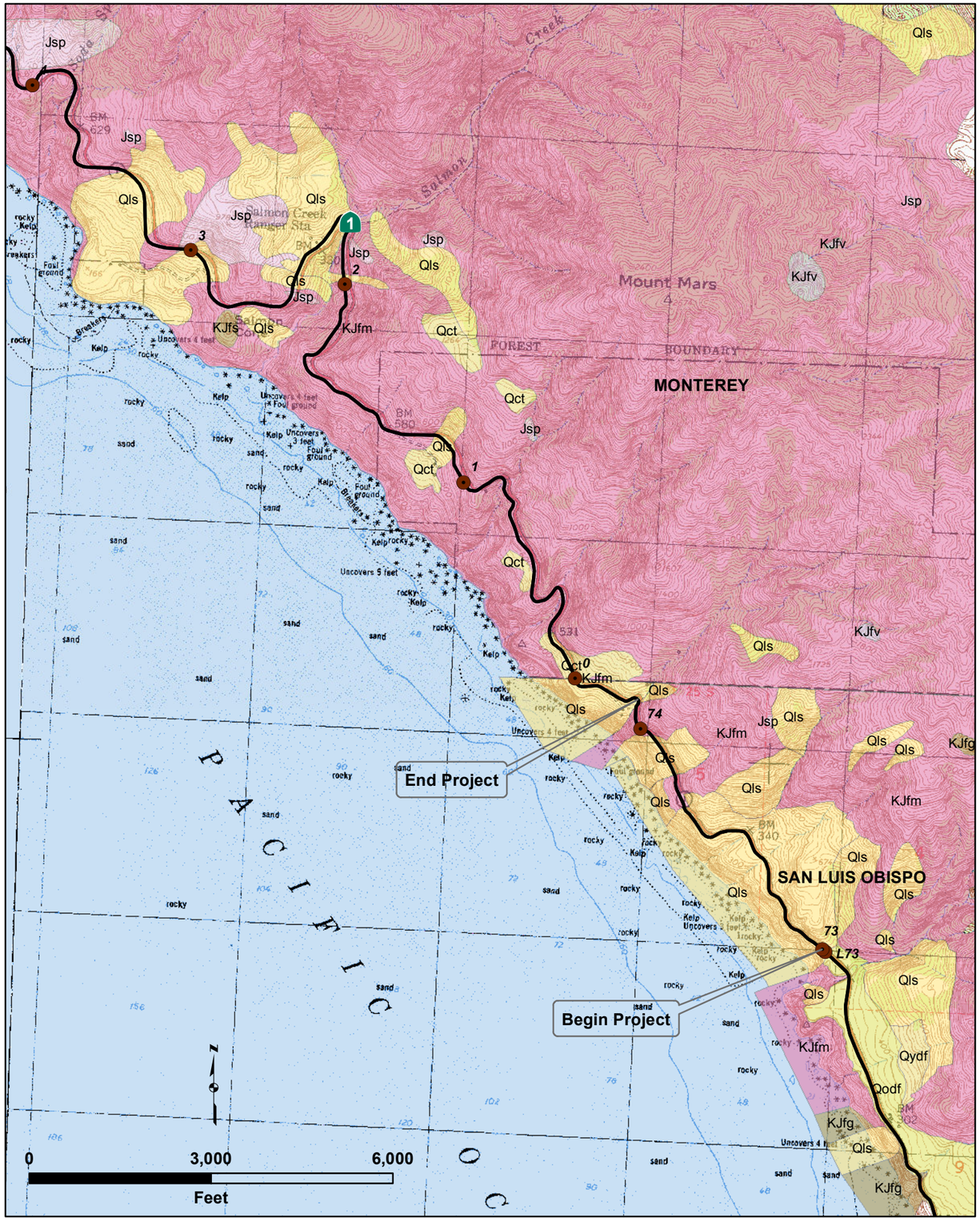
PROJECT MANAGER	LISA LOWERISON
DESIGN ENGINEER	STEVE WYATT

LAST REVISION | PLOT DATE = 21 JAN 2017

RELATIVE BORDER SCALE 0 1 2 3 | USERNAME => s108940

Geologic Map

Elephant Trunk Retaining Wall
05-SLO-1-73.0/74.1
EA 05-1A7001



- Whole Postmiles

Geologic Mapping

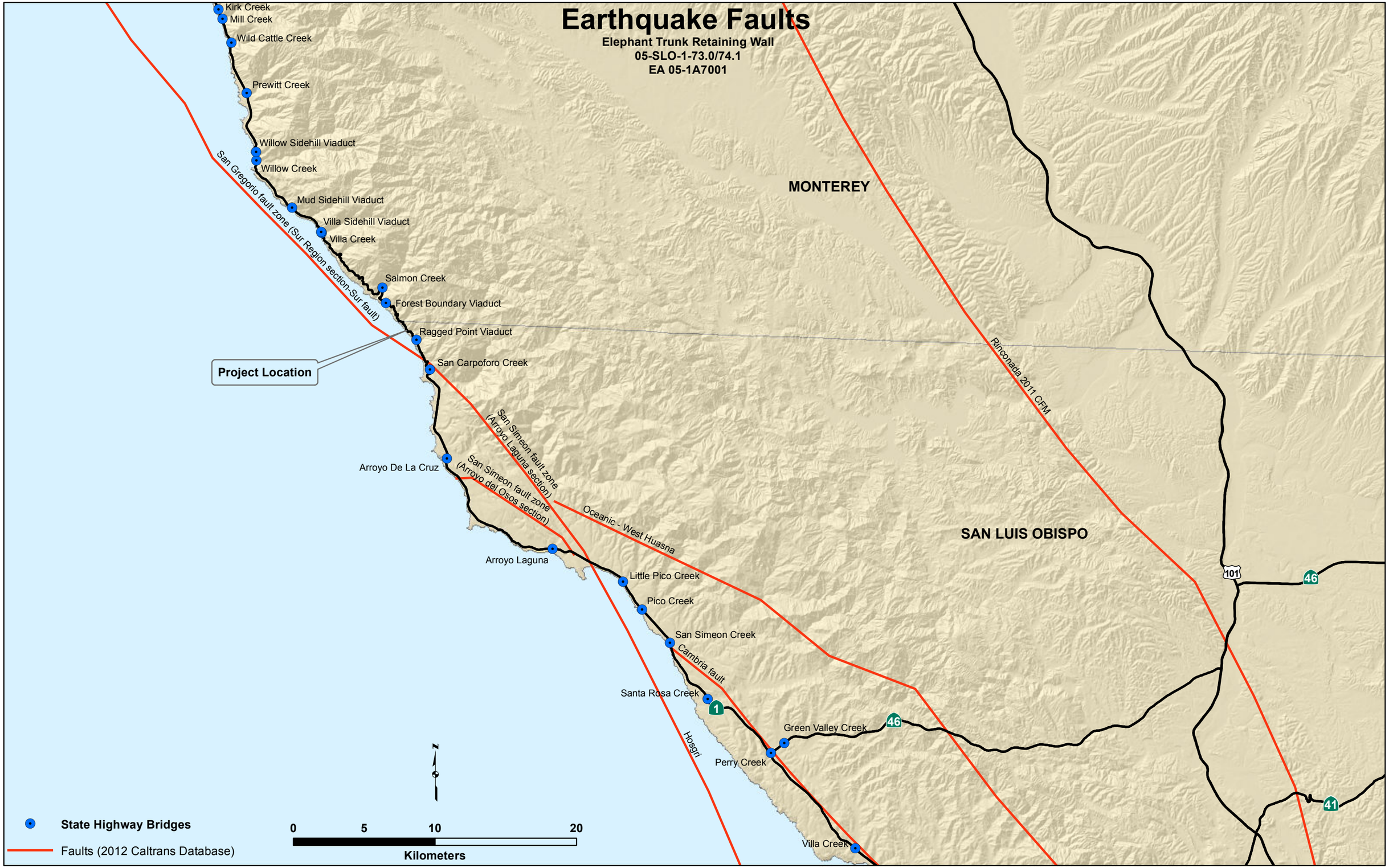
UNIT

- Qls: Landslide Deposits
- Qodf: Landslide Deposits
- Qydf: Landslide Deposits
- Qct: Marine Terrace Deposits
- KJfv: Franciscan Complex, Mafic Volcanic Rocks
- KJfg: Franciscan Complex, Graywacke
- KJfm: Franciscan Complex, Melange
- Jsp: Serpentinite

ATTACHMENT 2

Earthquake Faults

Elephant Trunk Retaining Wall
05-SLO-1-73.0/74.1
EA 05-1A7001



ATTACHMENT 3

ATTACHMENT 4

Foundation Report
Elephant Trunk Slide Retaining Wall
05-SLO-1-73.0/74.1
EA 05-0A7001, Project ID 0512000009

Seismic Refraction Survey Report

(12 Pages)

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: **Mike Finegan**
Geotechnical Design South
Division of Engineering Services

Date: December 12, 2012

File: 05-SLO-1-73/74.1
Project 05-1200-0009

Attention: Dan Applebaum

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES-MS#5

Subject: Seismic Refraction Survey, Elephant Trunk Slide Retaining Wall

Introduction

This memo documents the results of a refraction seismic survey to assist in the design of roadway improvements at Elephant Trunk Slide on Highway 1 in San Luis Obispo County. The project involves repair of failing retaining walls at that location. The survey was employed to assist in assessing the engineering characteristics of soil and rock at that location. Five existing piezometers were utilized for a tomography seismic survey designed to image beneath the roadway and adjacent embankment. Two additional profiles were acquired parallel to and below the roadway on a bench cut. Seismic profile locations are shown on Plate 1.

Results and Discussion

Line SI-2-10

Plate 2 shows the results of our findings at SI-2-10. Both the velocity model and pseudo ray path ("hit plot") model are presented. This was the only profile that did not have an associated Log of Test Boring (LOTB). An LOTB was not available for this piezometer. The velocity model indicates three primary velocity units, interpreted as landslide and sidecast debris over an older, possibly saturated slide deposit. Both slide units appear to overlie unconformably the higher-velocity material interpreted as weathered metamorphic rock. The model has excellent ray path coverage, according to the ray path model. The minimum velocity presented is 428 m/s (1404 ft/s) and the maximum velocity was 2978m/s (9770 ft/s).

Line SI-10-11

Plate 3 shows the results of our findings at SI-10-11. The velocity model indicates landslide and sidecast debris thickening about 14 meters (45.93 ft.) down slope of the boring, and overlying older landslide material and weathered bedrock. The tie with SI-10-11 indicates the contact between older slide material and weathered metamorphic rock is not well delineated in this model, implying insufficient velocity contrast between the two units. The basal unit is

interpreted as competent metamorphic rock. The ray path model indicates excellent ray path coverage.

Line SI-9-11

Plate 4 shows the results of our findings at SI-9-11. Three velocity units are shown, consisting of landslide debris over weathered and intensely fractured metamorphic rock, grading to fractured and very hard metamorphic bedrock. The LOTB for RC-11-007 describes metamorphic rock beginning 3 ft (.91 m) below the ground surface. This zone has a seismic velocity of 2000 m/s (6561 ft/s) and higher, indicative of rock at the upper limits of rippability. LOTB indicates fracturing is intense and rock appears slightly weathered. The higher velocities are interpreted as less weathered and fractured, very hard, metamorphic rock. Some uncertainty exists in this model due to lack of ray path coverage, and is indicated by stippled areas where it occurred. Ray path coverage was not satisfactory within the stippled regions. Unlike the other profiles, the borehole was located in the northbound lane, so the distance from the borehole to the first geophone was 9.0 meters (29.5ft)

Line SI-5-11

Plate 5 shows the results of our findings at SI-5-11. The velocity model indicates three velocity units, interpreted as landslide and sidecast debris about 5 meters (16.4 ft) thick over older landslide material, in turn overlying higher velocity metamorphic rock. The LOTB describes rock beginning at 34 feet (10.36 m) below ground surface (bgs). Rock velocity is variable and equals or exceeds 2000 m/s (6561 ft/s), the upper limit of rippability. The ray path model indicates incomplete coverage within the high velocity zone, as shown by the stippled regions in the model.

Line SI-6-11

Plate 6 shows the results of our findings at SI-6-11, the southern most boring on this project. The velocity model indicates three primary velocity units. The first unit is recent landslide and sidecast debris about 3.0 to 5.0m (9.8- 16.4 ft) thick. The second unit is older landslide debris approximately 15.0 m (49.0ft) thick with an average seismic velocity of 1500m/s (4921ft/s). The third velocity unit is interpreted as meta-sandstone described in the LOTB at 17.8 m (58.4 ft) bgs. Its seismic velocity is > 2000m/s (6562 ft/s). Below the bedrock elevation, the LOTB describes soft zones and decomposed material indicative of slower seismic velocity and correlates with the velocity model. The hit plot for this model indicates acceptable ray path coverage except for one significant zone of anomalously low velocity approximately 13 m (42.6 ft) west of the roadway (indicated by the stippled zone). Although poorly constrained in this zone, the excellent tie with Line ETS-2 at that location supports the existence of the low velocity zone. (Note: ETS-2 surface elevations were not tied to a benchmark and were estimated, resulting in a mis-tie between Line SI-6-11 and Line ETS-2 of about 2 meters. We corrected this manually at the tie point shown in Plates 6 and 8.)

Seismic Refraction Lines ETS-1& ETS-2

Plates 7 and 8 show the results of our findings for seismic refraction lines ETS-1 and ETS-2, located on a narrow bench below the existing highway. These seismic lines overlap by 10 meters (32.80 ft). Based on LOTB descriptions for RC-11-003 and the seismic velocities encountered, a three-layer model is indicated consisting of sidecast and recent landslide debris over an older landslide, which lies unconformably over metamorphic bedrock. The quality of the ray path coverage is acceptable on both profiles. We note that the low velocity

zone on Line SI-6-11 also appears on Line ETS-2 (Plate 8). (Note: ETS-2 surface elevations were not tied to a benchmark and were estimated, resulting in a mis-tie between Line SI-6-11 and Line ETS-2 of about 2 meters. We corrected this manually at the tie point shown in Plates 6 and 8.)

Data Acquisition and Processing

Interpretation of the downhole survey results used SeisOpt Pro (www.optimsoftware.com). The program utilizes a quasi-tomographic, controlled Monte-Carlo inversion to develop a globally optimized velocity model of the subsurface (Pullammanappallil and Louie, 1994). The methodology uses only first arrival time data and profile geometry as input. No initial assumptions of velocity structure or layering are required. As such, the method is well suited for investigation of areas dominated by complex shallow structure, significant velocity gradients and variable topography.

In general, seismic tomography inversion techniques develop "best-fit" velocity models by iteratively comparing observed arrival data to calculated arrival times derived from generated velocity structures. A final model is produced when the calculated times match observed data within a specified error. An advantage of tomography is that it produces a minimum-curve envelope (a boundary defined by those ray paths traversing the maximum shot-receiver distances in the shortest time) that defines a maximum depth of investigation--no information is available below the envelope--whereas only estimates of investigation depth are possible using traditional layer analysis.

In cases where insufficient data exist, the inversion process may generate false models. Therefore, as with any refraction interpretation technique, multiple shotpoints along a survey profile provide greater data coverage for analysis and aid in generating a more accurate model.

Data were acquired using a Geometrics Strataview 24 channel seismograph with 14 Hz land geophones. Geophone spacing for the profiles was 1 meter (3.208 feet). Within the piezometers, small explosive charges were utilized as seismic sources. At the surface, a hammer and striker plate was used. Use of the piezometer shots provided better constraint to the bedrock geometry. During data acquisition, profile geometry (shot and phone locations) and waveform data from each geophone were recorded and stored in seismograph memory. Both profile geometry and refraction data were backed-up to paper printouts after each shot, and all data were backed-up to electronic storage media upon completion of the survey. The refraction data were processed to determine first arrival times and prepared for input to SeisOpt Pro. Profile geometry, P-wave arrival times and ground surface elevations were assigned for each profile.

The final models used for interpretation are presented in this report. Both velocity models and hit count plots are presented. The velocity models differ from traditional refraction profiles in that velocities are presented by pixel rather than by layer. The hit count plot is a pseudo ray-trace model showing the number of seismic rays crossing each pixel. More evenly distributed hits (ray crossings) and higher hits per cell are positively correlated with improved accuracy in the model.

The seismic refraction profiles in this report are presented in terms of velocity units. A velocity unit is a three-dimensional unit, which due to its elastic properties and density, propagates seismic waves at a characteristic velocity or within a characteristic velocity range.

At least one velocity is present within a geological rock unit. In addition, each zone of weathering or fracturing within that geological unit can constitute its own velocity unit. Conversely, when two rock units propagate seismic waves at the same velocity and are adjacent to each other (e.g., saturated sand and weathered rock), both units would be part of the same velocity unit. Lastly, discontinuous velocities might result from variation in the degree of alteration within a rock unit (i.e., physical and chemical weathering) and should be considered in the interpretation of the data.

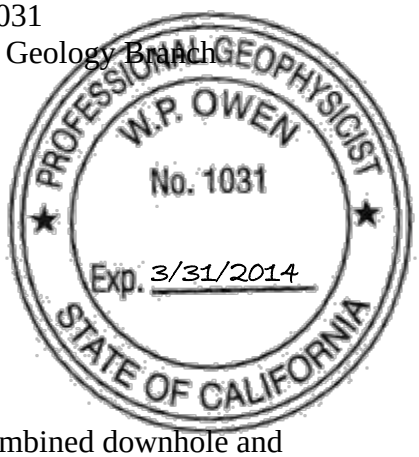
Thank you for the opportunity to work on this project. If you have any questions or need additional assistance, please contact me at (916) 227-1307 or Mr. Bill Owen at (916) 227-0227.

Report by:

Dennison Leeds
Engineering Geologist
Geophysics and Geology Branch

Reviewed By:

William Owen, PGP 1031
Chief, Geophysics and Geology Branch



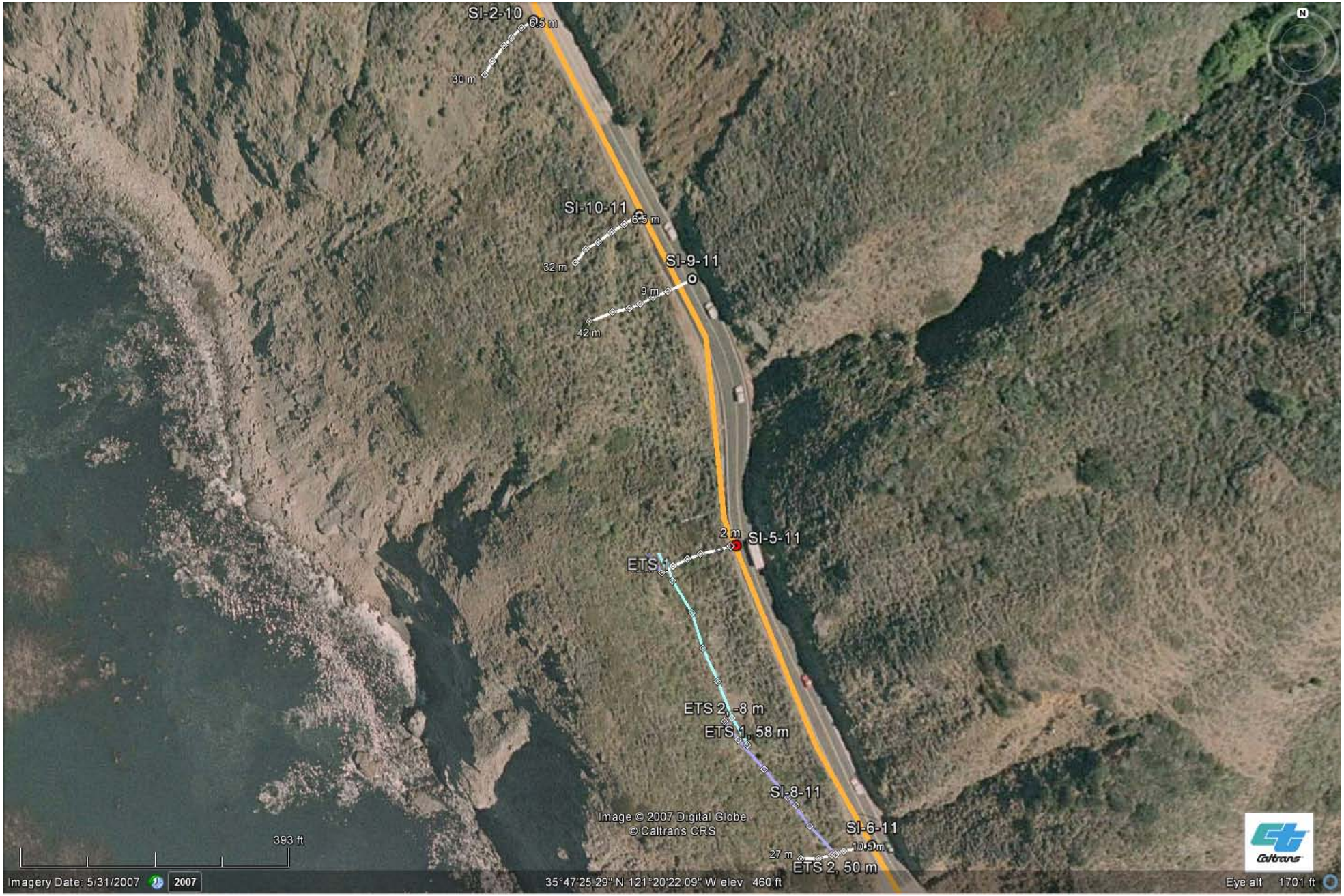
DL/WO
Project File: 05_SLO_001_73-74.1_2012_SEI

References

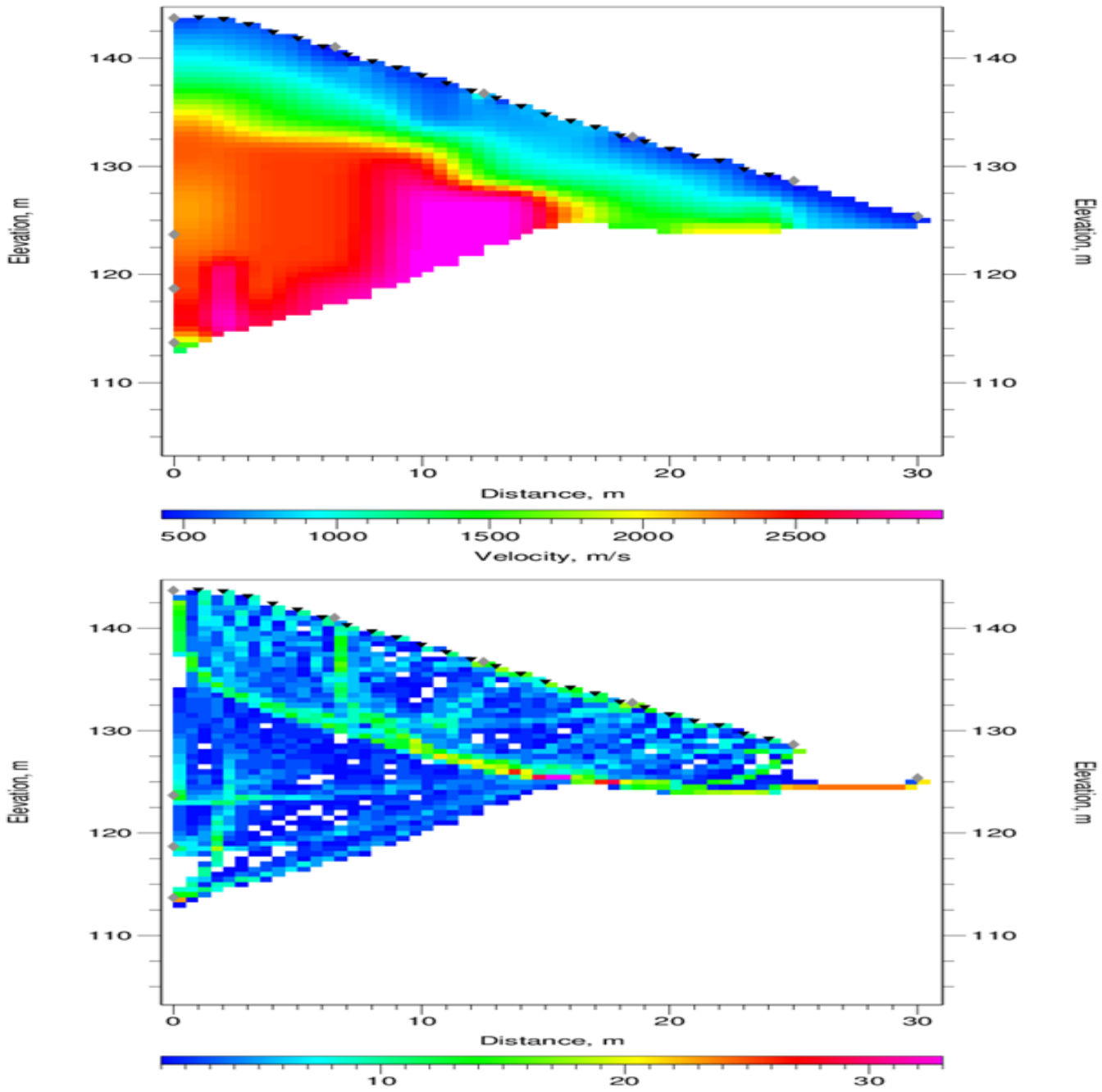
Owen, W.P., 2006, Examples of subsurface velocity imaging via combined downhole and surface source and receiver arrays, *2006 Highway Geophysics—NDE Conference Proceedings*, St. Louis, Missouri, p. 253-268

Palmer, D., 1980, The generalized reciprocal method of seismic refraction interpretation, Society of Exploration Geophysicists, Tulsa, Oklahoma, 104 p.

Pullammanappallil and Louie, 1994. A Generalized Simulated-Annealing Optimization for Inversion of First-Arrival Times, Bulletin of the Seismological Society of America, Vol. 84, No. 5, pp. 1397-1409,

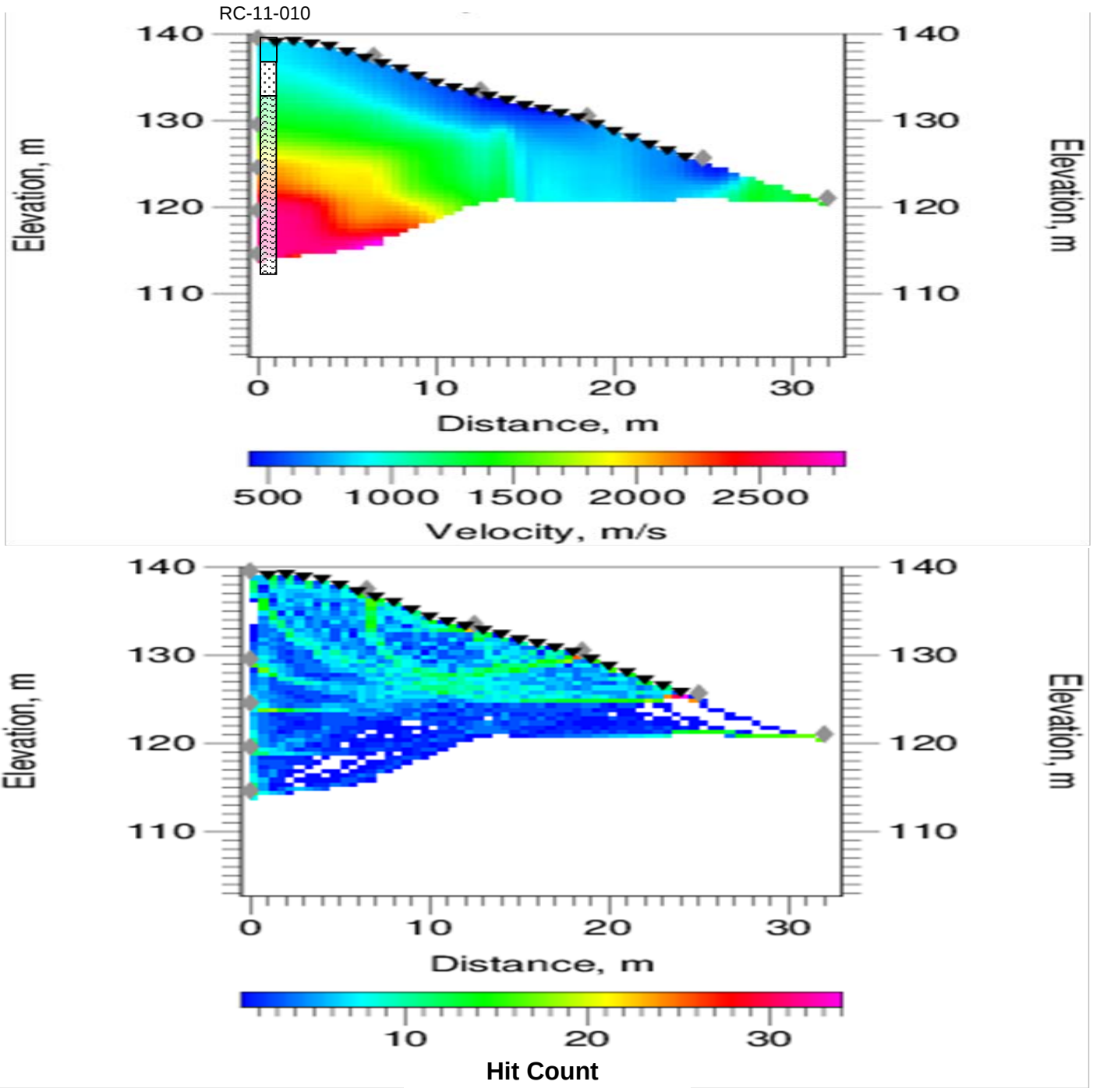


Caltrans	Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project 0512000009	Site Map Showing Locations of Seismic Lines	Plate 1
		Date: Nov. 30, 2012	05-SLO-001-PM 73-74.1	



Final velocity model and pseudo ray path model for Line SI-2-10. Shots (gray diamonds) and geophone locations (black triangles) are shown. Model is interpreted as three velocity units. Blue colored zone is slide debris approximately 5.0 m (16.4 ft) thick with a seismic velocity of approximately 900 m/s (2952 ft/s). Green zone is interpreted as older slide material or intensely-weathered metamorphic rock, with seismic velocity between 1500-1700 m/s (4921-5577 ft/s). The yellow and red colored zone is interpreted as metamorphic rock with a seismic velocity range of 2300 m/s to 2900 m/s (7545 ft/s to 9512 ft/s). The hit plot indicates subsurface ray path coverage is excellent.

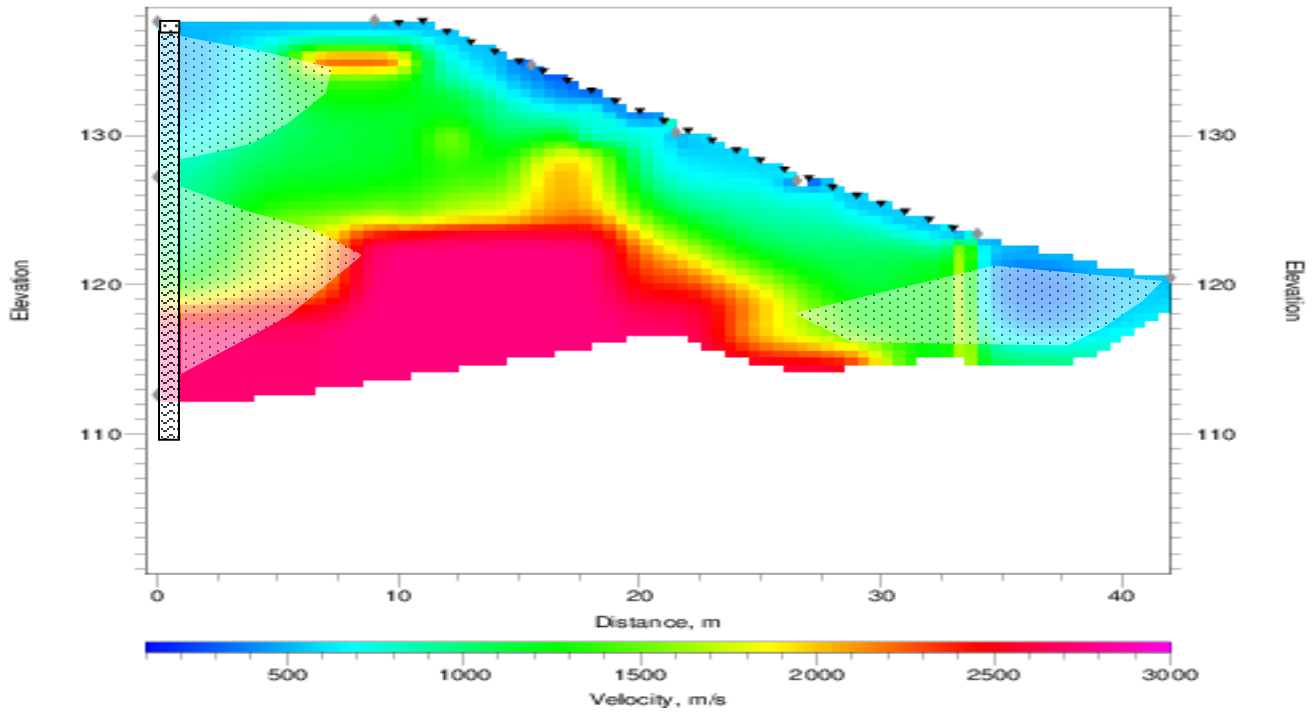
Caltrans Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov.30, 2012	SI-2-10 **Velocity and Hit Count Models**	Plate 2
		05-SLO-001-73-74.1 Elephant Trunk Slide	

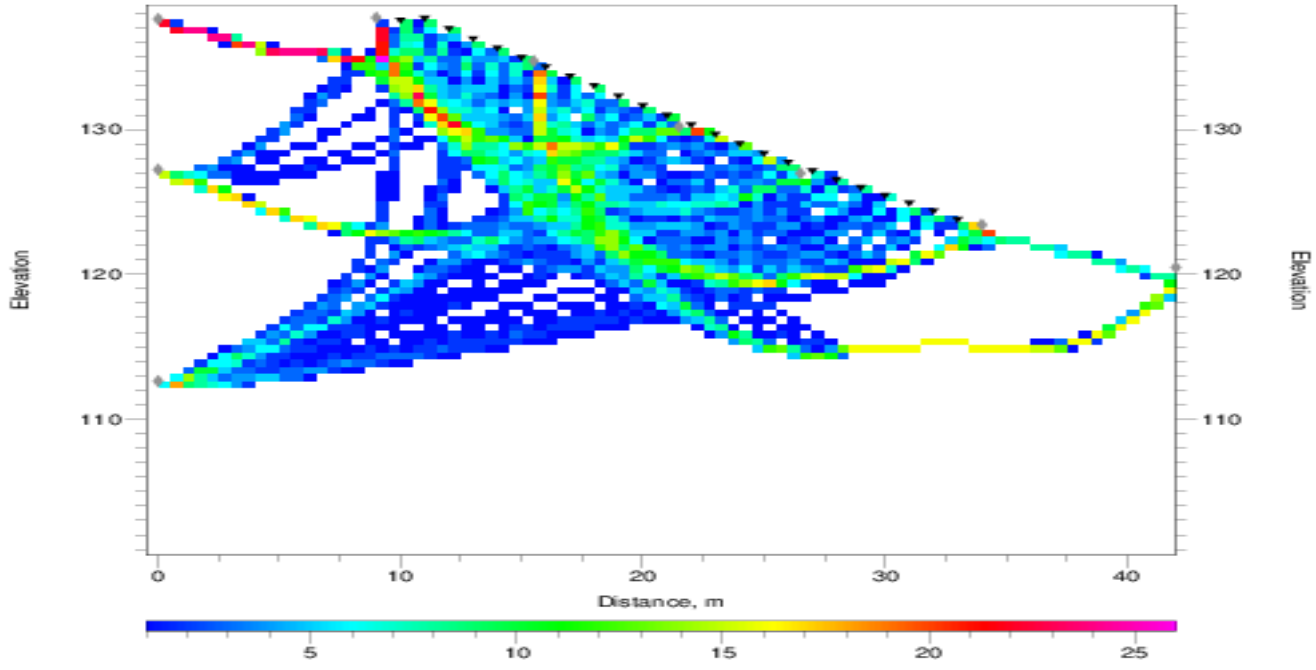


Final velocity model for SI-10-11(top) and pseudo ray path model(bottom). Interpreted borehole log and tie with line SI-11-010 also shown. Shots (gray diamonds) and geophones locations (black triangles) shown. Model is interpreted as three velocity units. The blue zone is interpreted as landslide debris varying in thickness from 6.0 m (19.6 ft.) to more than 10.0m (32.8 ft.) with a seismic velocity approximately 800 m/s (2624 ft/s). The green zone is interpreted as undifferentiated older landslide material over weathered metamorphic rock, ranging in thickness from 9.0m (29.5ft.) to 11.0 m (36.0ft) and seismic velocity ranging from 1250m/s (4101 ft/s) to 2000 m/s (6562 ft/s). This zone appears truncated about 13 meters (42.65ft) from the boring. The red colored zone is interpreted as metamorphic rock with a seismic velocity of 2600 m/s (8530 ft/s). The hit plot model indicates excellent ray path coverage.

Caltrans Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov. 30, 2012	SI-10-11 Velocity and Hit Count Models	Plate 3
		05-SLO-001-73-74.1 Elephant Trunk Slide	

RC-11-007

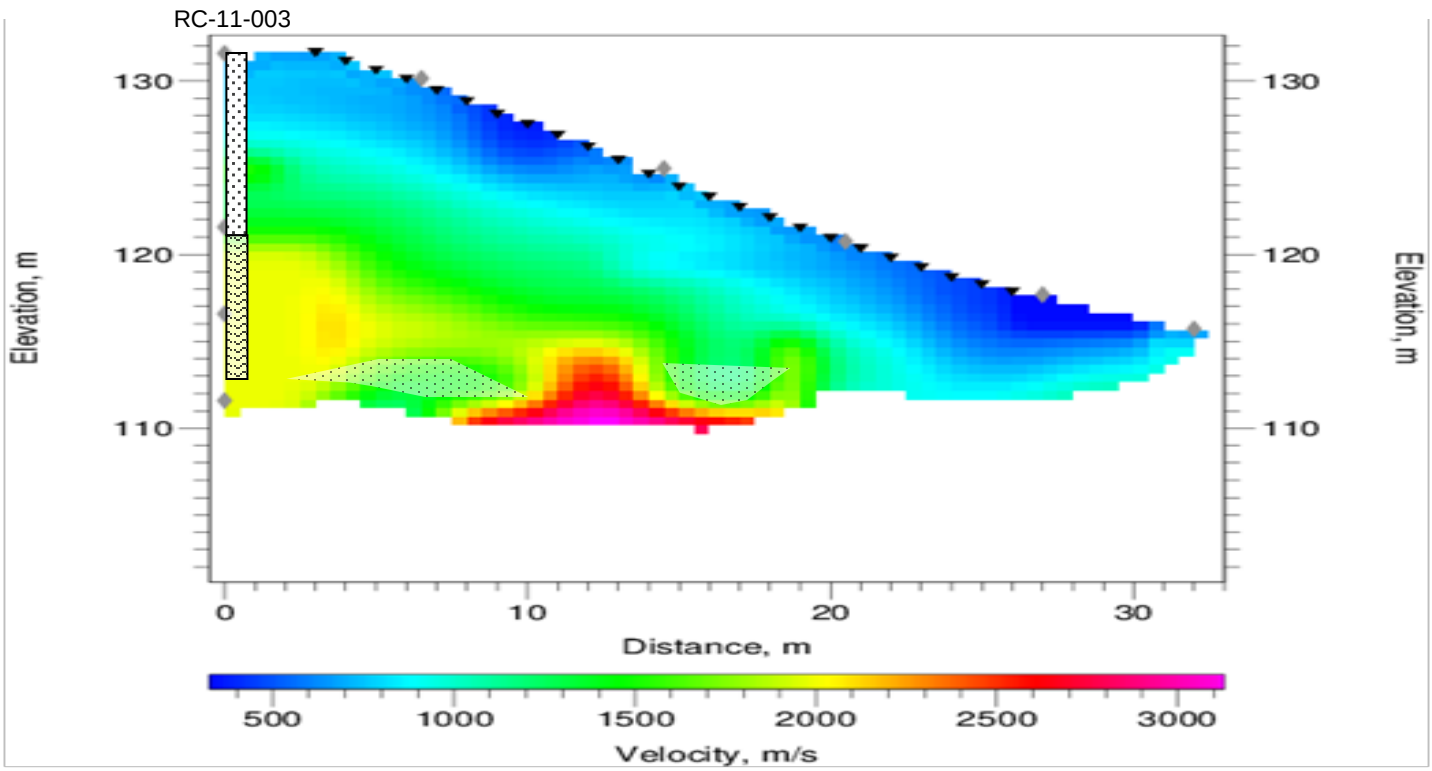


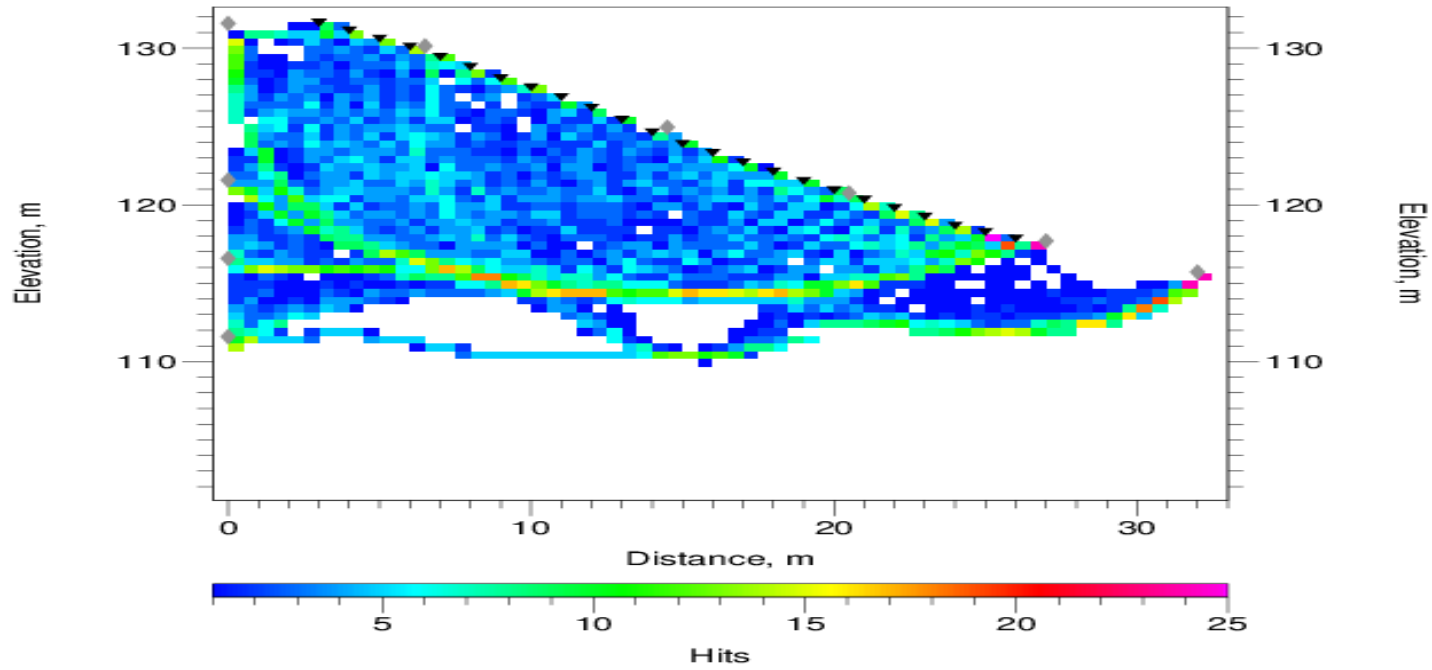


Hit Count

Final velocity and pseudo ray path models for Line SI-9-11. Shots (gray diamonds) and geophone locations (black triangles) are shown. Stippled areas represent regions of suboptimal model constraint. LOTB and tie with RC-11-007 shown. LOTB notes slightly weathered, very hard rock at 87.4 ft bgs (26.7 m bgs). ,.Blue unit interpreted as landslide debris, green unit is weathered and intensely fractured metamorphics. Red unit is moderately fractured and very hard metamorphic rock.

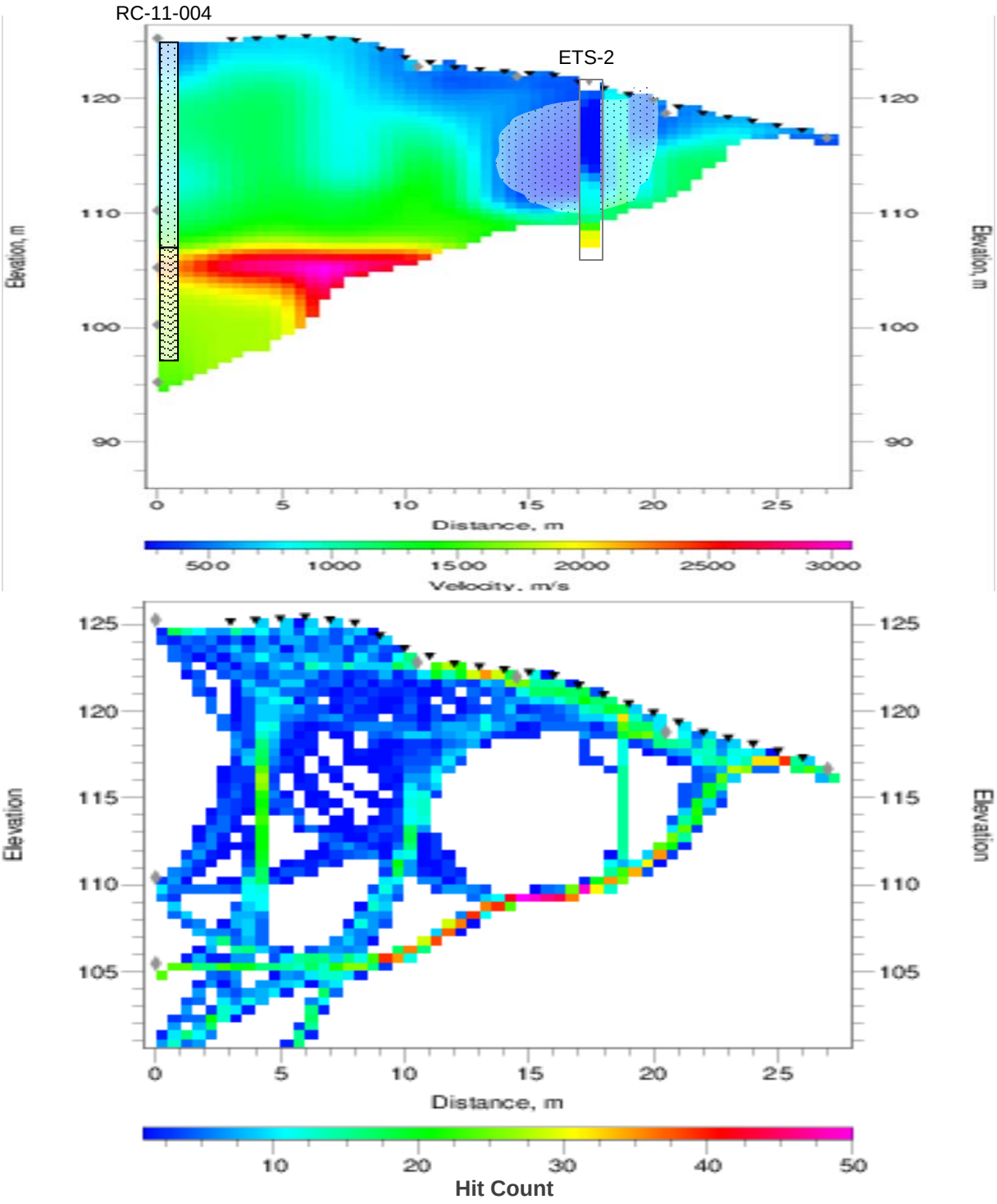
Caltrans Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov.15, 2012	SI-9-11 Velocity and Hit Count Models	Plate 4
		05-SLO-001-73-74.1 Elephant Trunk Slide	





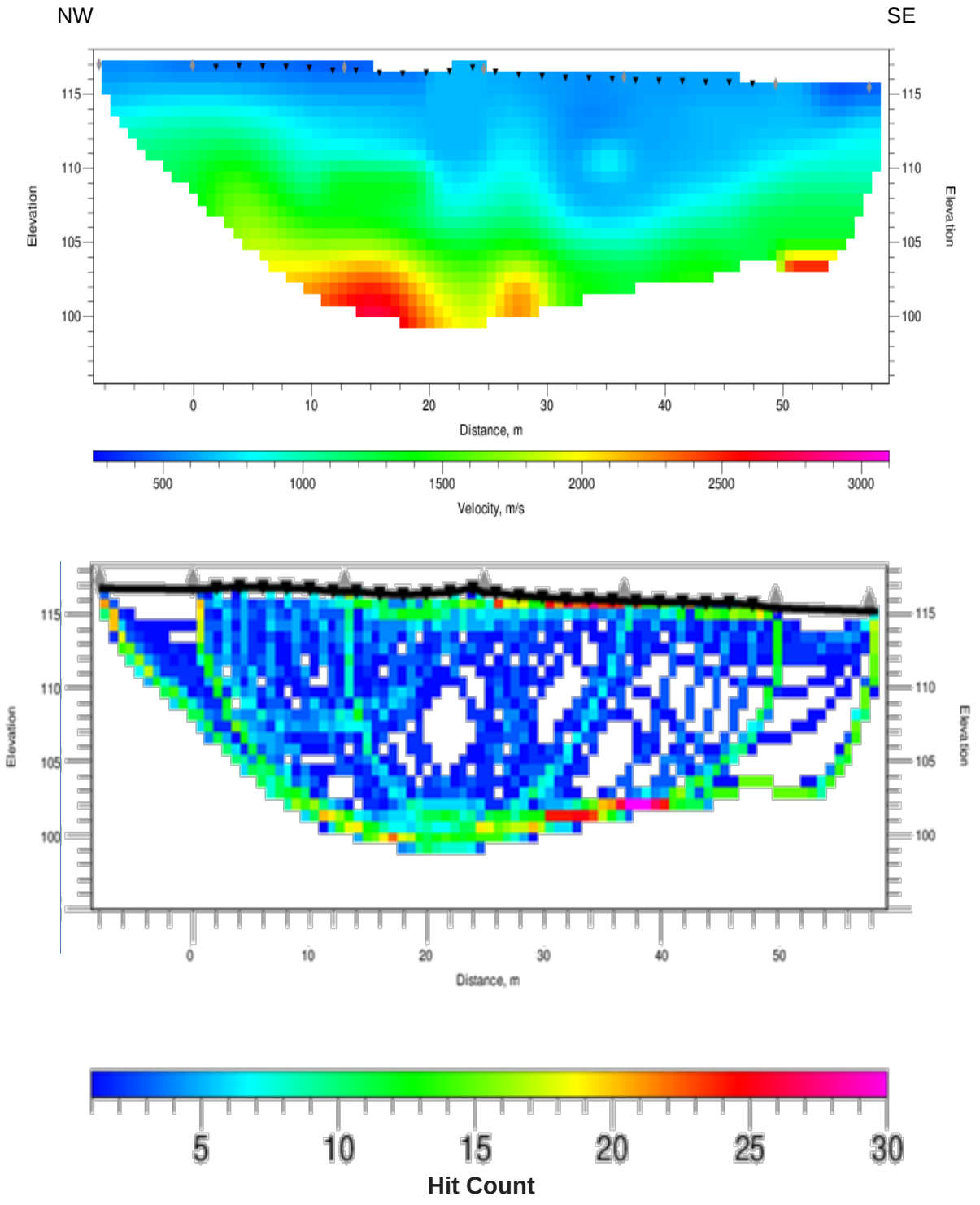
Final velocity model and pseudo ray path model for Line SI-5-11. Shots (gray diamonds) and geophone locations (black triangles) are shown. Interpreted borehole log and tie with RC-11-003 shown. Blue colored zone is slide debris approximately 5.0 m (16.4 ft)thick with a seismic velocity of approximately 600 m/s (1968 ft/s). Green zone is interpreted as weathered metamorphic rock with a seismic velocity of approximately 1500-1700 m/s (4921-5577 ft/s). The yellow and red colored zone is interpreted as metamorphic rock with a seismic velocity range of 2000 m/s to 3000 m/s (6561 ft/s to 9842 ft/s). The hit plot indicates subsurface ray path coverage was acceptable, two small regions of suboptimal coverage within the high velocity rock are shown as stippled areas.

Caltrans Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov.30, 2012	SI-5-11 Velocity Plot and Hit Count	Plate 5
		05-SLO-001-73-74.1 Elephant Trunk Slide	



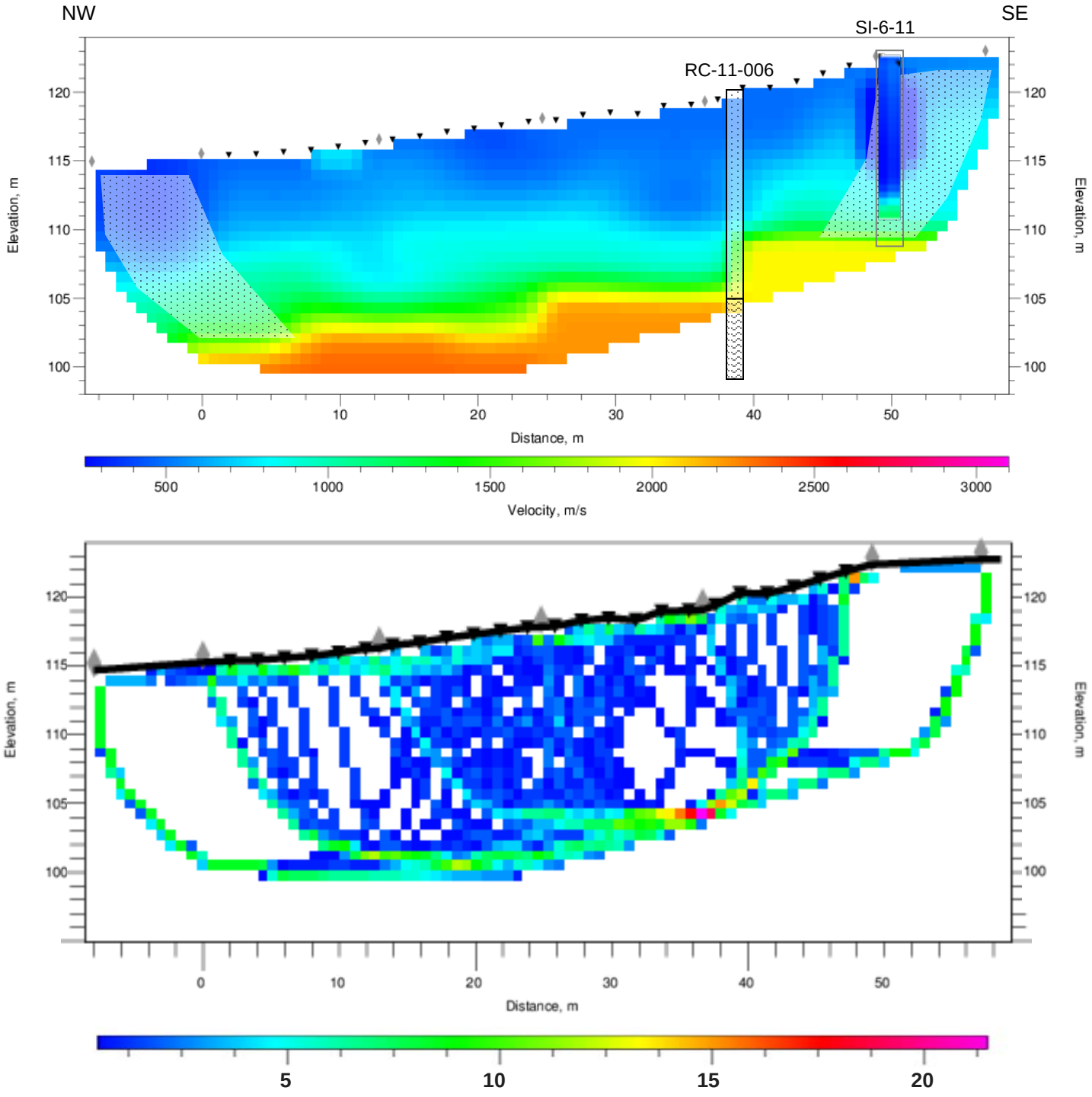
Final velocity model and pseudo ray path model for SI-6-11. Generalized borehole log and ties with RC-11-004 and Line ETS-2 also shown. Shots (gray diamonds) and geophones (black triangles) shown. Model is interpreted as three velocity units. Blue zone interpreted as landslide debris, the green zone is interpreted as older landslide debris, the red zone is interpreted as metamorphic rock. LOTB for SI-6-11 identifies meta-sandstone at elevation106 m (347.76 ft). Below 347.76 ft LOTB describes poorer quality rock to the bottom of the hole. The hit plot model indicates acceptable ray path coverage. Stippling represents one area of suboptimal ray oath coverage.

Caltrans Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov. 30, 2012	SI-6-11 Velocity Plot and Hit Count	Plate 6
		05-SLO-001-73-74.1 Elephant Trunk Slide	



Final velocity model and pseudo ray path model for Seismic Refraction Line ETS-1. Shots (gray diamonds) and geophone locations (black triangles) are shown. Model is interpreted as three main velocity units. Blue unit is landslide debris. Green unit is interpreted as metamorphic cobbles. Red unit is interpreted as slightly weathered metamorphic rock with varying intensity of fracturing.

Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov. 30, 2012	Velocity Plot and Hit Count Seismic Refraction Line ETS-1	Plate 7
		05-SLO-001-73-74.1 Elephant Trunk Slide	



Final velocity model and pseudo ray path model for Line ETS-2. Shots (gray diamonds) and geophone locations (black triangles) are shown.. Model is interpreted as three main velocity units. Blue unit represents landslide debris, green unit is interpreted as additional landslide debris. Red unit is interpreted as slightly weathered metamorphic rock with varying intensity of fracturing. Generalized log for RC-11-006 and tie with Line SI-6-11 shown. ETS-2 elevations were not tied to SI-6-11, resulting in a mis-tie for surface elevation

Division of Engineering Services Office of Geotechnical Support Geophysics and Geology Branch	Project: 0512000009 Date: Nov. 30, 2012	Velocity Plot and Hit Count Seismic Refraction Line ETS-2	Plate 8
		05-SLO-001-73-74.1 Elephant Trunk Slide	

Project Name: Elephant Trunk Retaining Wall
Dist.-Co.-Rte.-PM: 05-SLO-001-PM 73.0/74.1
EA: 05-1A7001; Project ID: 0512000009

GROUNDWATER MONITORING

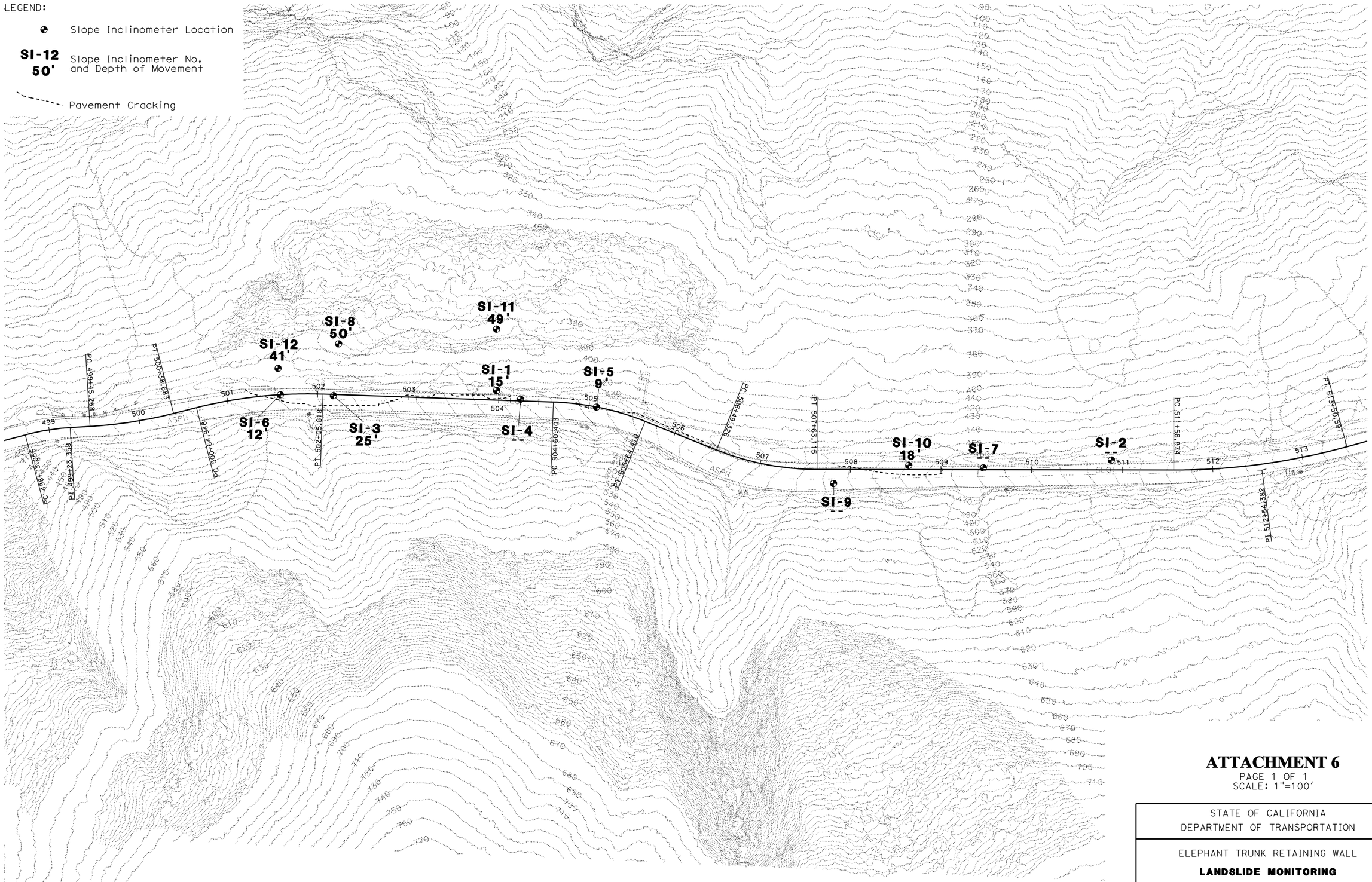
Notes: N/R = Not Read

Date	P1-10 (Elev. 410.7 ft)	P2-10 (Elev.422.20 ft)	P3-10 (Elev.445.21 ft)	P4-10 (Elev.463.01 ft)	P5-10 (Elev.473.52 ft)	SI1-10 (Elev. 423.39 ft)	SI2-10 (Elev. 470.67 ft)	SI3-11 (Elev. 412.79 ft)	SI4-11 (Elev. 425.45 ft)	SI5-11 (Elev. 430.88 ft)	SI6-11 (Elev. 410.17 ft)	SI7-11 (Elev. 462.49 ft)	SI8-11 (Elev. 388.21 ft)	SI9-11 (Elev. 450.82 ft)	SI10-11 (Elev. 456.11 ft)
10/5/2010	70.6	64.5	Dry @ 70.4'	Dry @ 51'	Dry @ 47.6'	N/R	N/R								
12/14/2010	68.4	64.6 (mud)	70.8 (mud)	51.3 (mud)	50.4 (mud)	N/R	N/R								
1/19/2011	71.3	Dry @ 64.6	68.2	46.3	Dry @ 50.4	N/R	N/R								
3/28/2011	35.2	37.0	65.9	36.5	45.5	N/R	N/R								
4/19/2011	Dry @ 36.7	61.8 (mud)	67.7	40.4	50.4 (dry)	N/R	N/R								
4/27/2011	N/R	N/R	N/R	N/R	50.4	N/R	N/R	32.8	26.4						
5/3/2011	N/R	61.3	68.5	48.6	N/R	N/R	N/R	38.1	47.4	52.3					
5/11/2011	N/R	N/R	N/R	N/R	50.2	N/R	N/R	39.2	47.3	54.6	27.2				
5/17/2011	Dry @ 36.5	39.8	68.9	49.4	36.45	N/R	N/R	39.6	47.5	52.7	N/R	66.8	5.8	71.2	
6/16/2011	N/R	57.8	N/R	N/R	N/R	N/R	N/R	46.4	47.8	55.6	39.6	69.5	7.0	72.2	N/R
6/29/2011	N/R	58.9	69.4 (mud)	Dry @ 50.2'	43.7	N/A	N/R	50.7	47.8	55.8	41	70.1	7.1	73.2	77.2
8/18/2011	N/R	62.2	Dry @ 70.7'	Dry @ 50.5'	Dry @ 50.3	N/A	N/R	69	47.7	66	42.9	71.2	7.4	74.5	77.4
12/8/2011	N/R	N/R	Dry @ 70.7'	Dry @ 50.3'	Dry @ 50.2	N/R	N/R	N/R	N/R	N/R	N/R	73	N/R	N/R	75.1
12/21/2011	N/R	Dry @ 62.6	N/R	N/R	N/R	N/R	N/R	65.1	43.9	62.7	50	N/R	N/R	75.45	N/R
3/8/2012	N/R	57.4	Dry @ 70.5'	Dry @ 50.1'	Dry @ 50.25	N/R	N/R	N/R	43.75	N/R	N/R	76	N/R	N/R	70.15
8/21/2012	N/R	Dry @ 66.6	Dry @ 70.7'	Dry @ 50.4'	Dry @ 50.2	N/R	N/R	74.95	43.15	Dry @ 73.5	55	77.1	8.2	N/R	76.3
12/18/2012	Dry @ 36.6	63.3	Dry @ 70.2'	Dry @ 50.4'	40.7	86.2	Mud @ 66.5	N/R	42.8	N/R	N/R	Mud @ 77.3	1/8/1900	N/R	N/R

ATTACHMENT 5

LEGEND:

- Slope Inclinometer Location
- **SI-12 50'** Slope Inclinometer No. and Depth of Movement
- Pavement Cracking



ATTACHMENT 6

PAGE 1 OF 1
SCALE: 1"=100'

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELEPHANT TRUNK RETAINING WALL

LANDSLIDE MONITORING

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	73.0/74.1	1	1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans GEOTECHNICAL DESIGN

SUPERVISING ENGINEER: MIKE FINEGAN

CALCULATED-DESIGNED BY
CHECKED BY

REVISED BY
DATE REVISED

LAST REVISION | DATE PLOTTED = 10 JAN 2017

USERNAME =>s108940

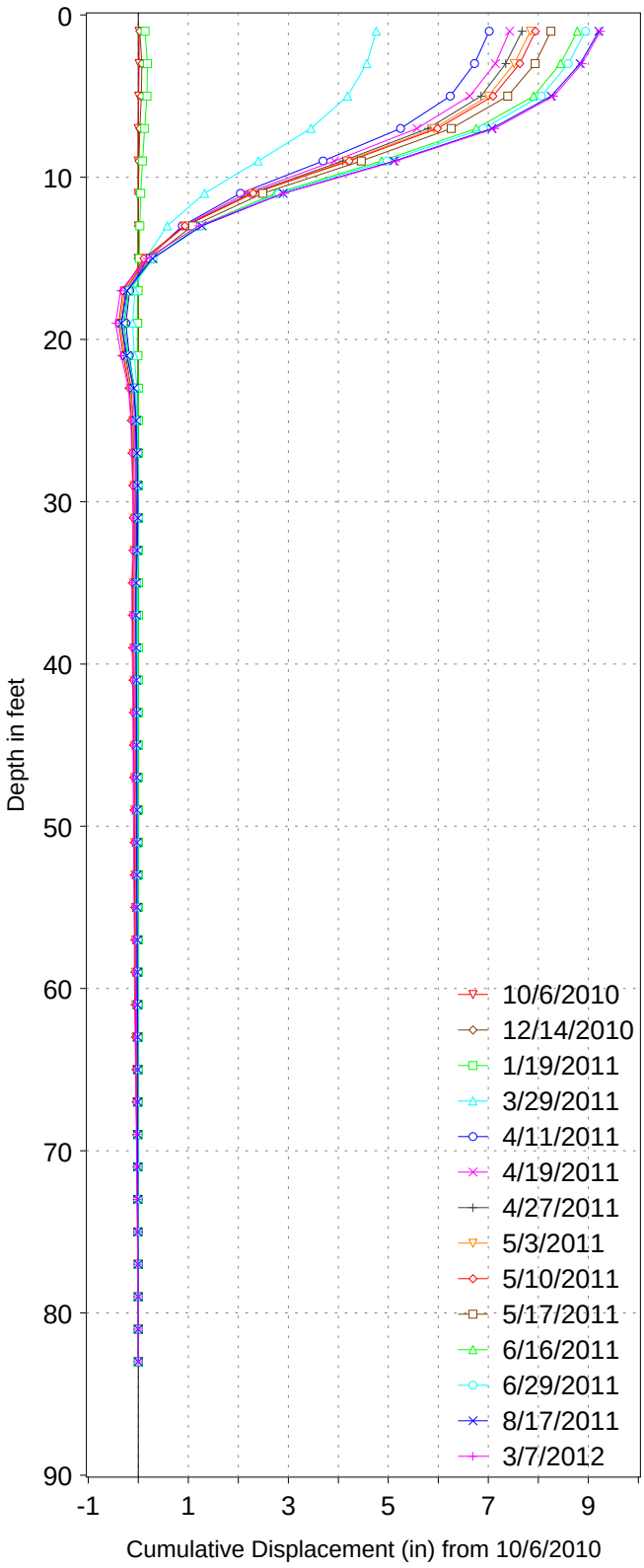
RELATIVE BORDER SCALE 0 1 2 3

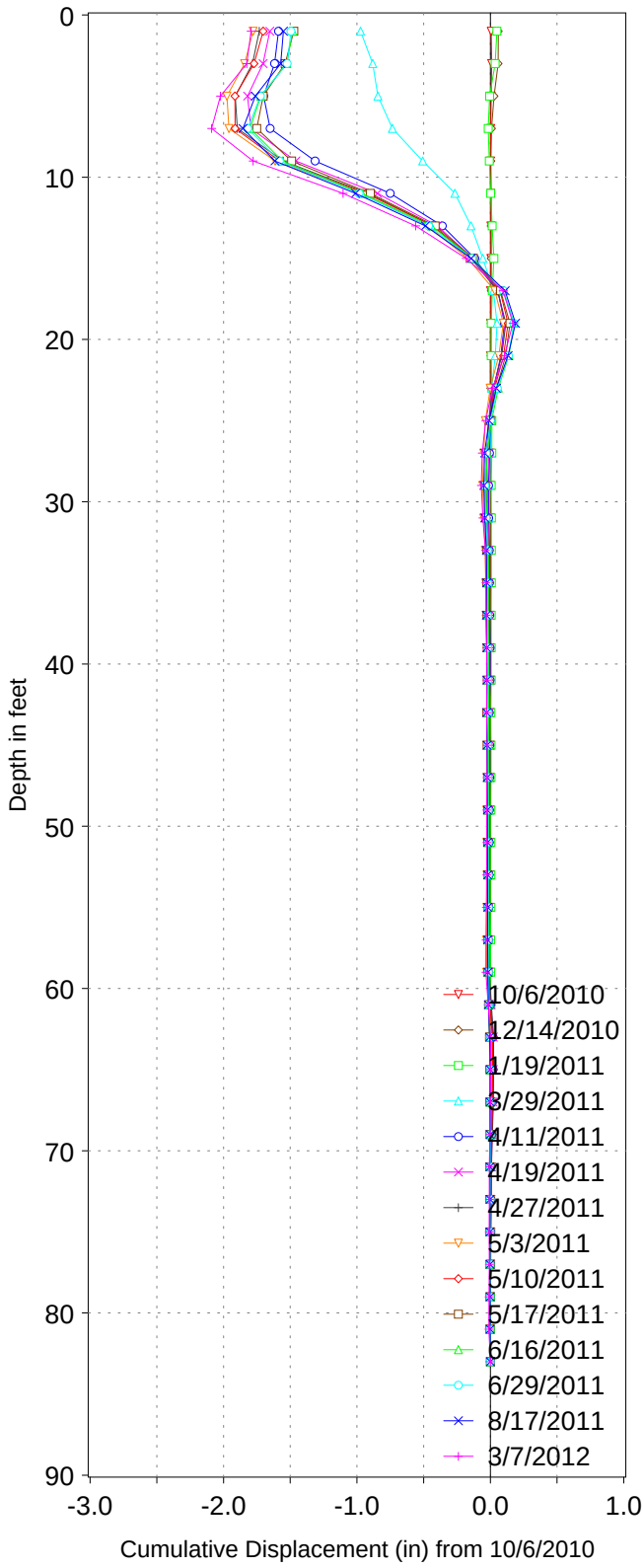
ATTACHMENT 7

Foundation Report
Elephant Trunk Retaining Wall
05-SLO-1-73.0/74.1
EA 05-0A7001, Project ID 0512000009

Slope Inclinometer Plots

(12 Pages)





INCLINOMETER RESULTS, ELEV. 423.39 FT

05-Slo-001-PM 73.7-73.9

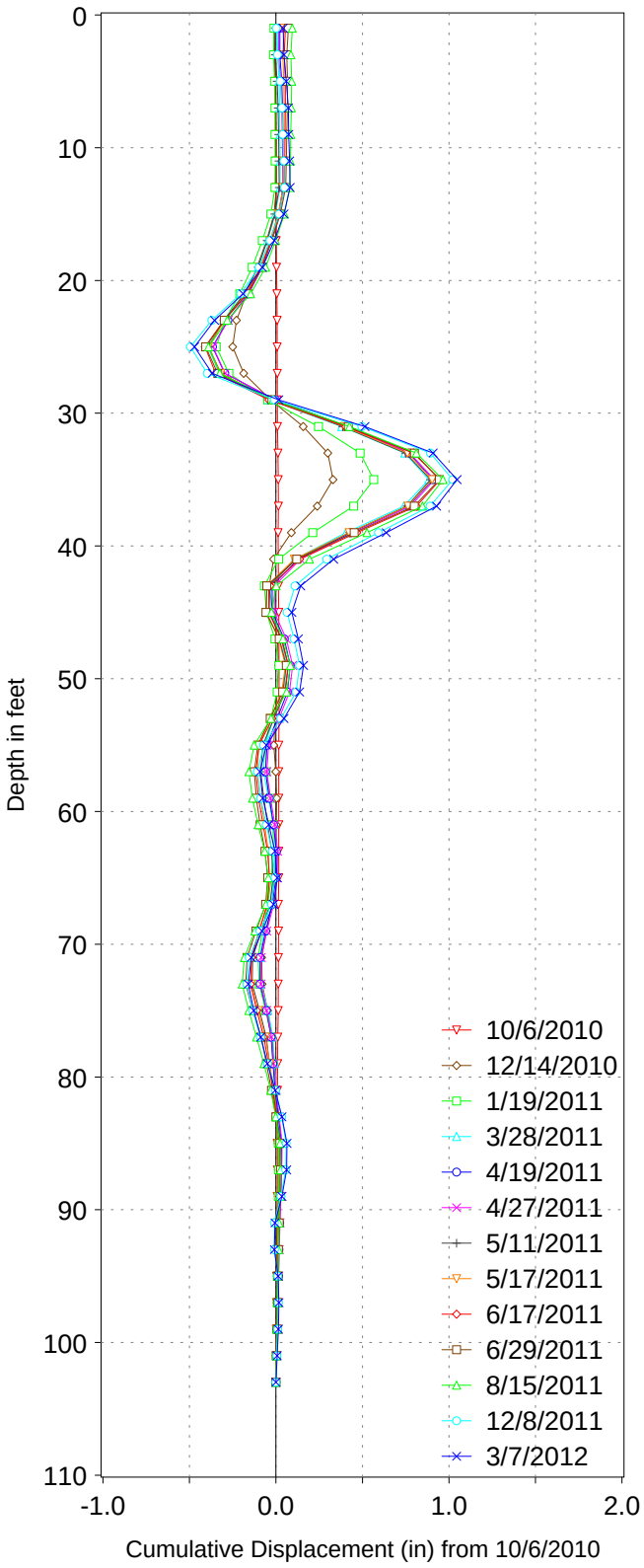
Elephant Trunk Slide

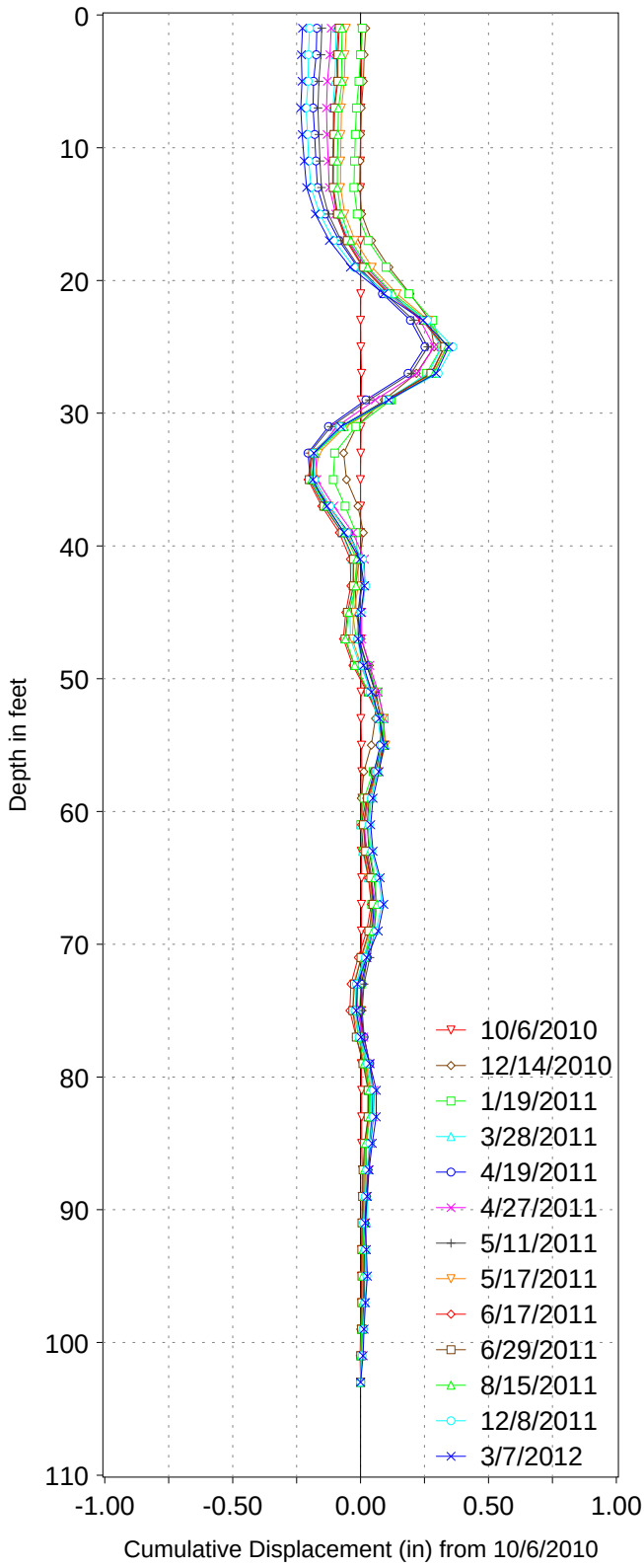
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 83 ft

Ao DIRECTION: 250* (magnetic North)

Location (WGS-84) : 35* 47.41N 121* 20.36W





Caltrans

INCLINOMETER RESULTS, ELEV. 470.67 FT

05-Slo-001-PM 73.7-73.9

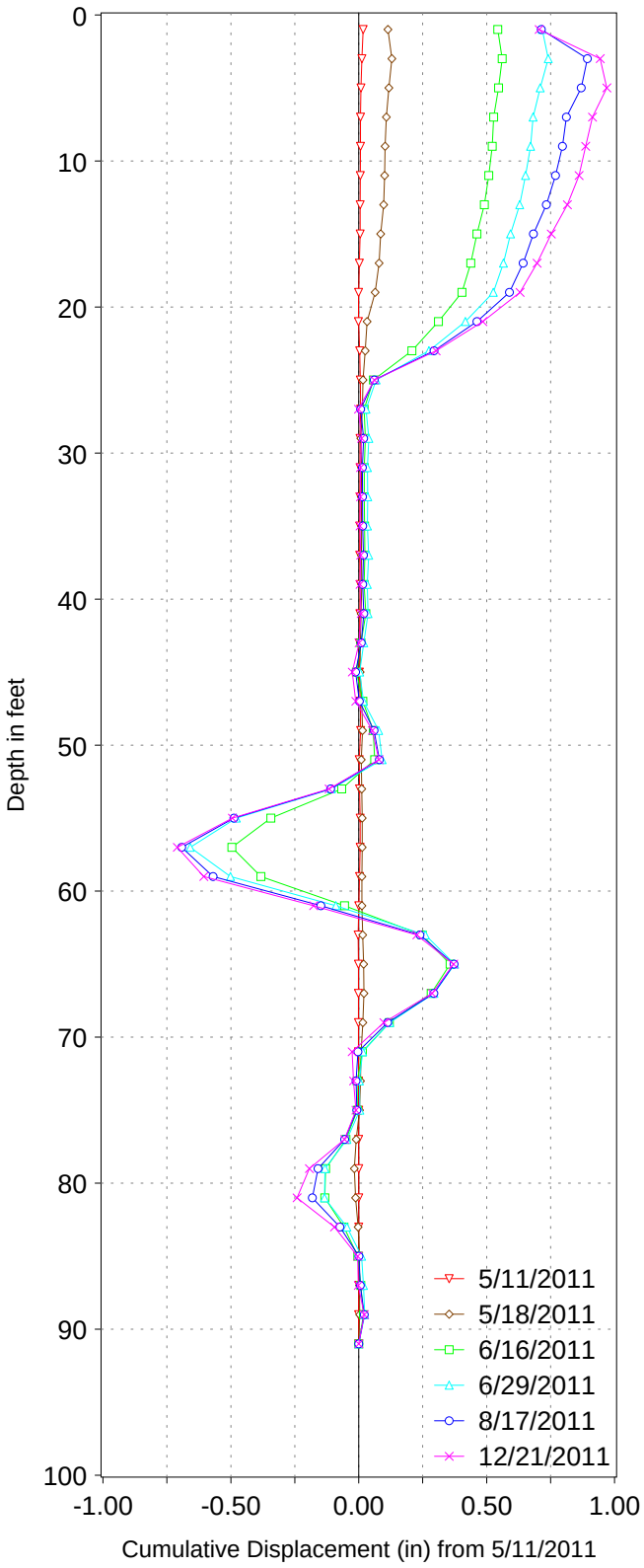
Elephant Trunk Slide

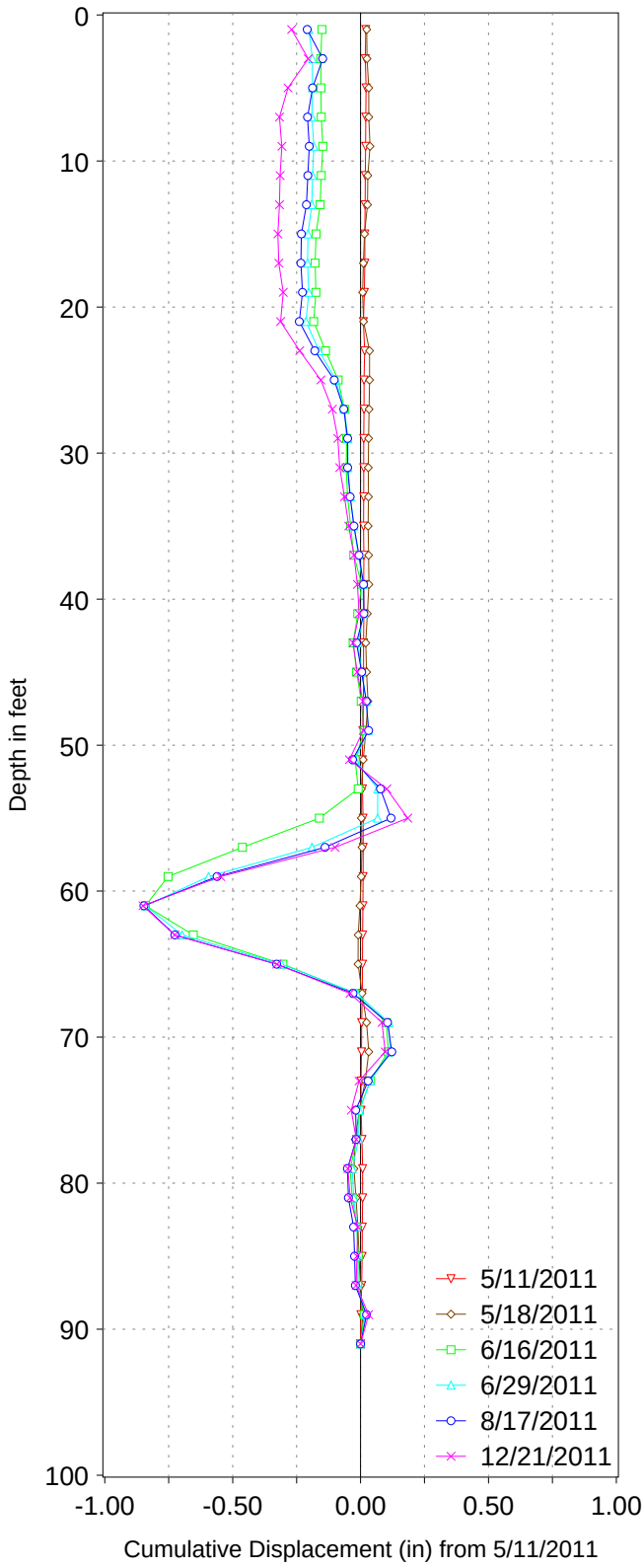
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 103 ft

Ao DIRECTION: 250* (magnetic North)

Location (WGS-84) : 35* 47.51N 121*20.41W

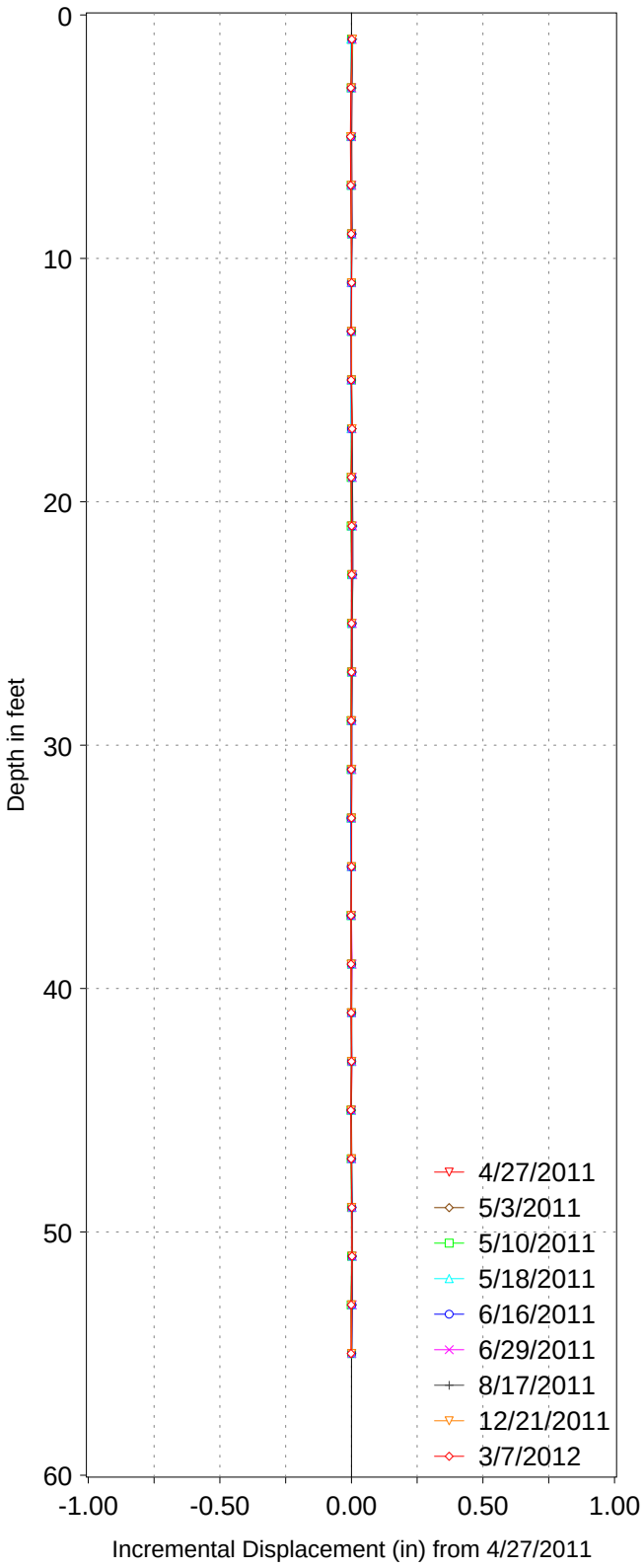


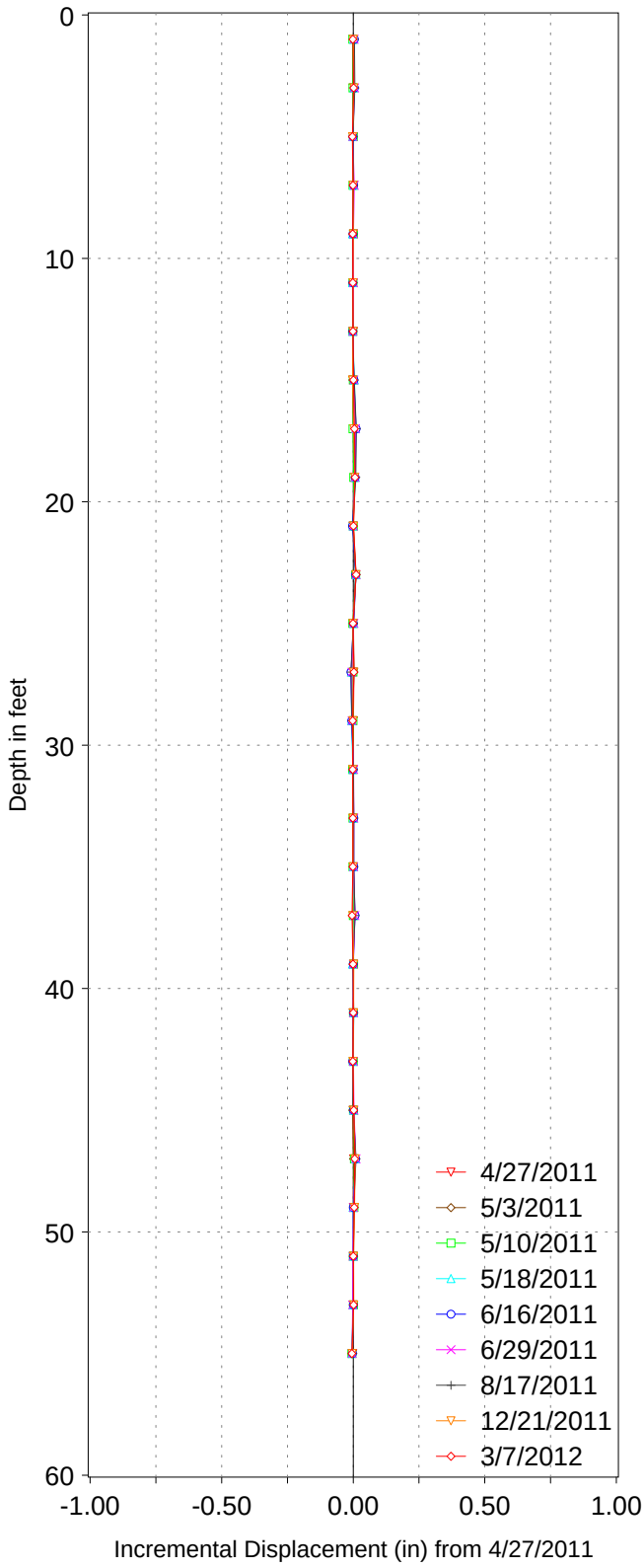


INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9
Elephant Trunk Slide
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 91 ft
Ao DIRECTION: 233* (magnetic North)
Location (WGS-84) :N 35* 78.964, W 121*33.901





INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9

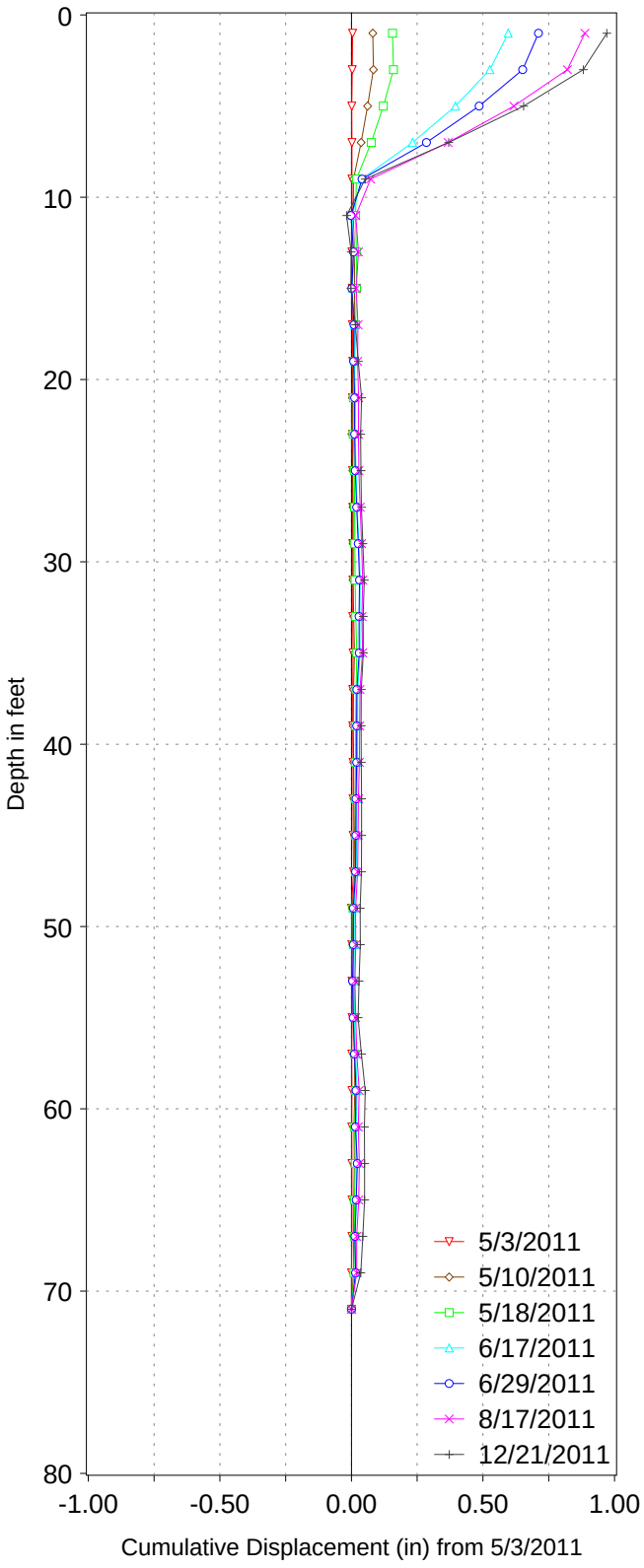
Elephant Trunk Slide

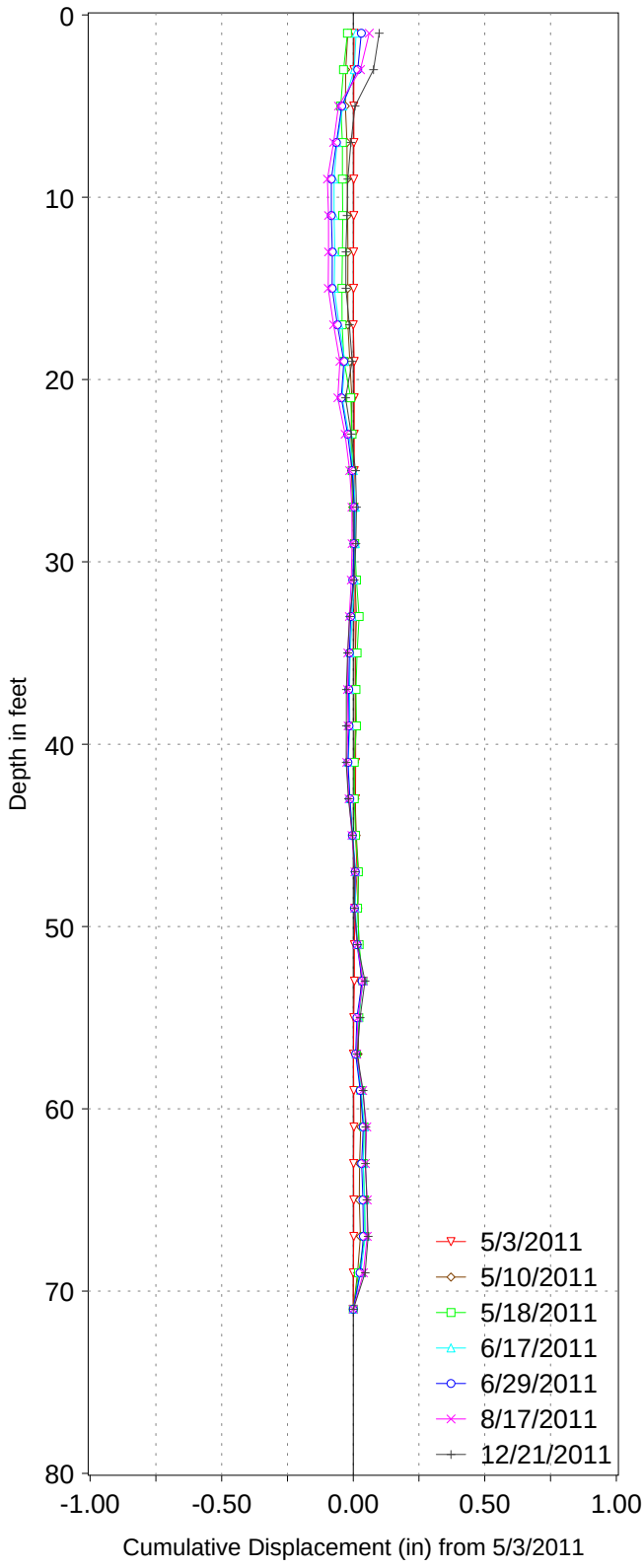
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 57 ft

Ao DIRECTION: 211* (magnetic North)

Location (WGS-84) : N 35*79.012, W 121*33.939





INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9

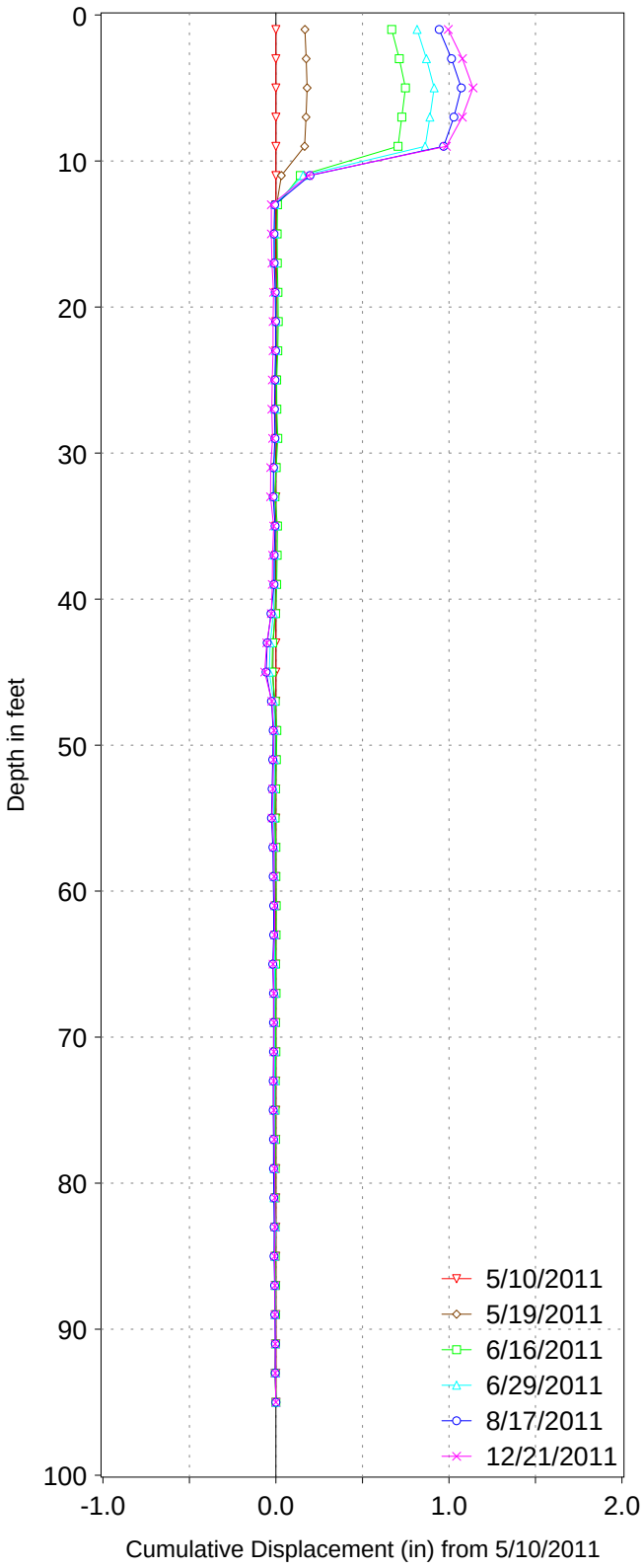
Elephant Trunk Slide

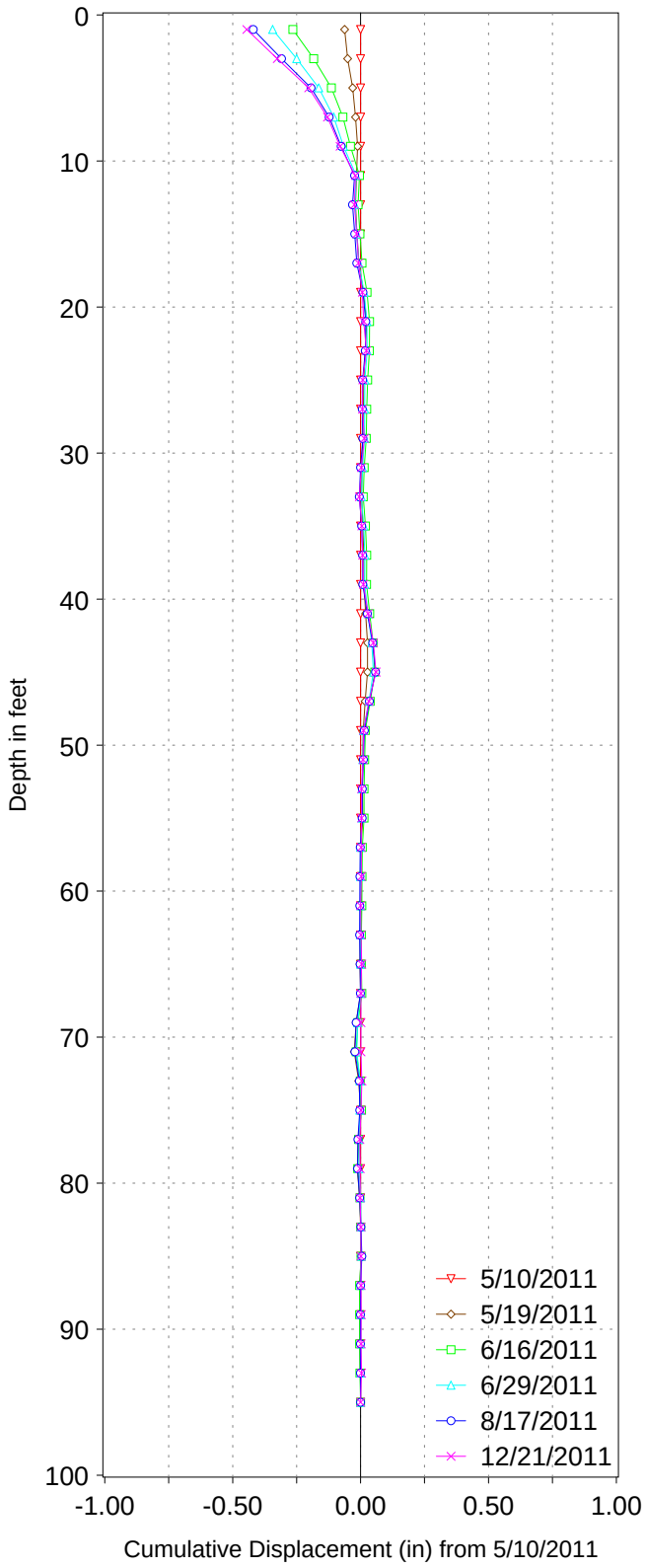
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 71 ft

Ao DIRECTION: 238* (magnetic North)

Location (WGS-84) : N 35*79.041, W 121*33.942





INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9

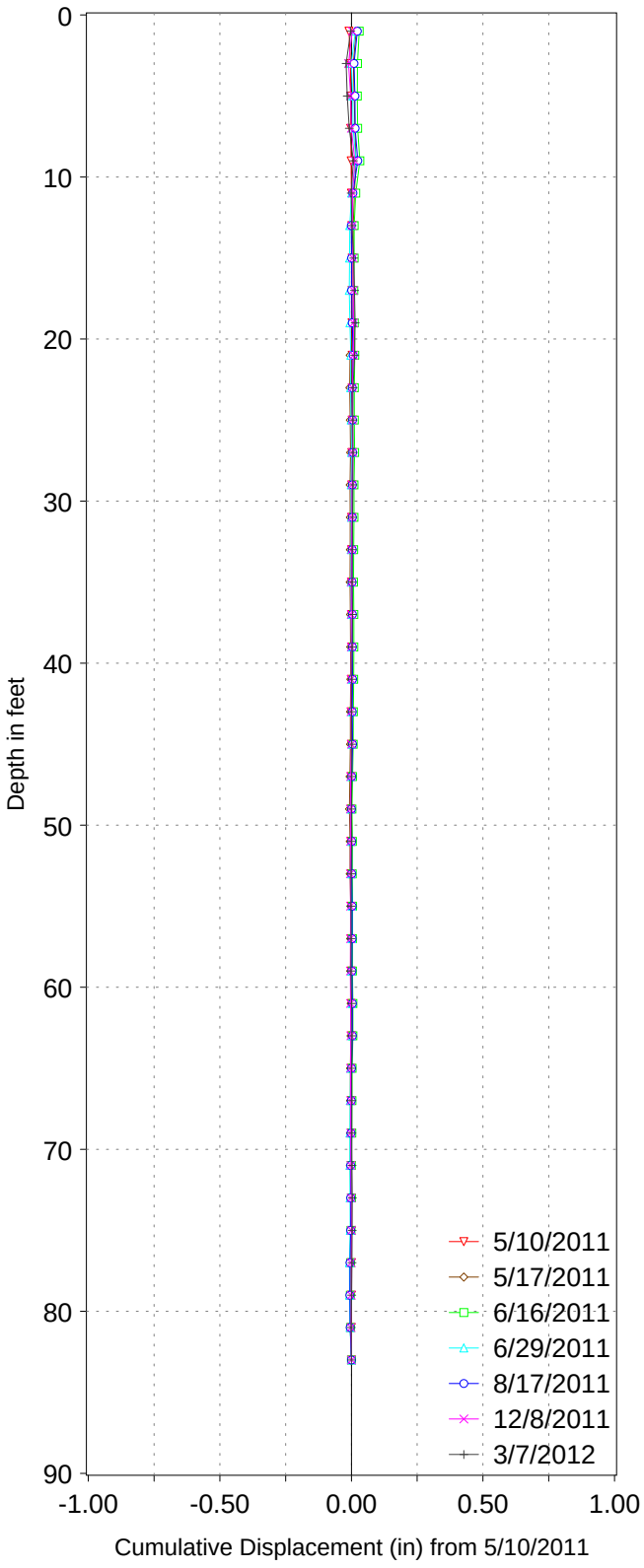
Elephant Trunk Slide

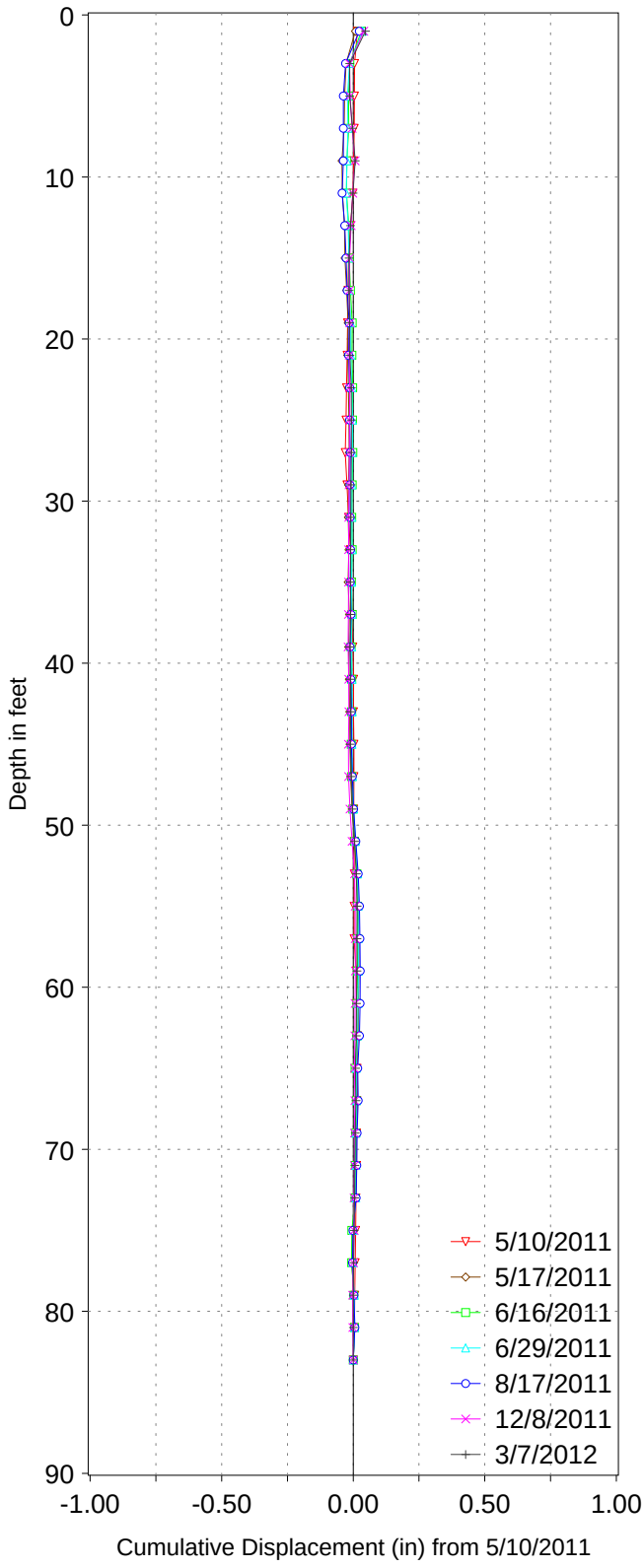
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 95 ft

Ao DIRECTION: 229* (magnetic North)

Location (WGS-84) :N 35*78.946, W 121*33.894





INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9

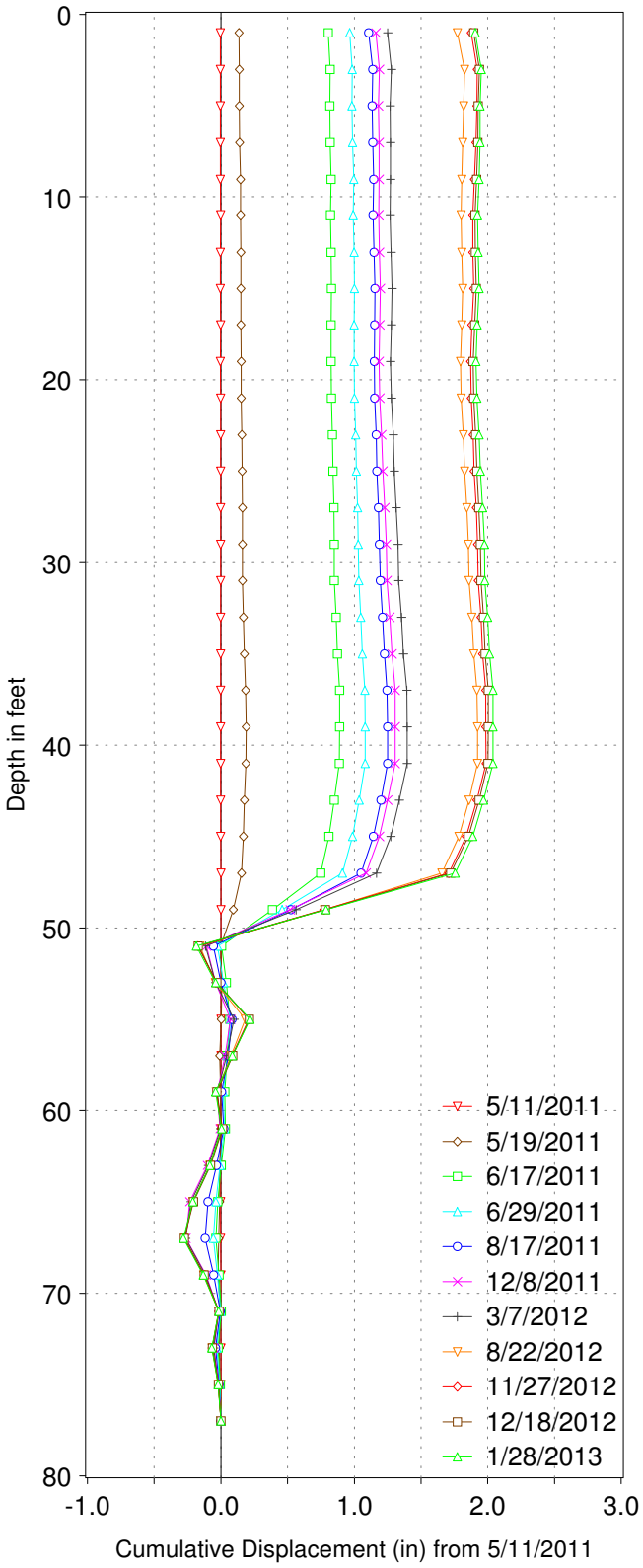
Elephant Trunk Slide

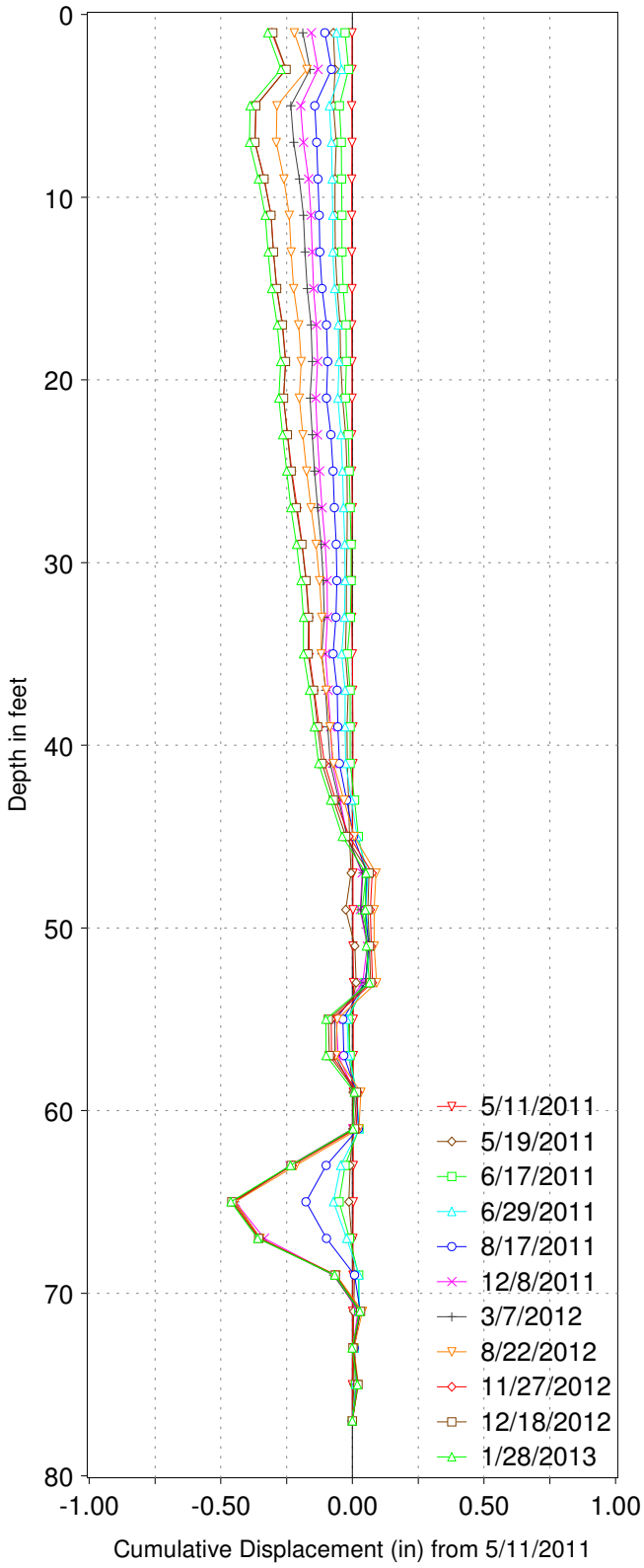
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 83 ft

Ao DIRECTION: 225* (magnetic North)

Location (WGS-84) : N35.79149* W 121.33988*



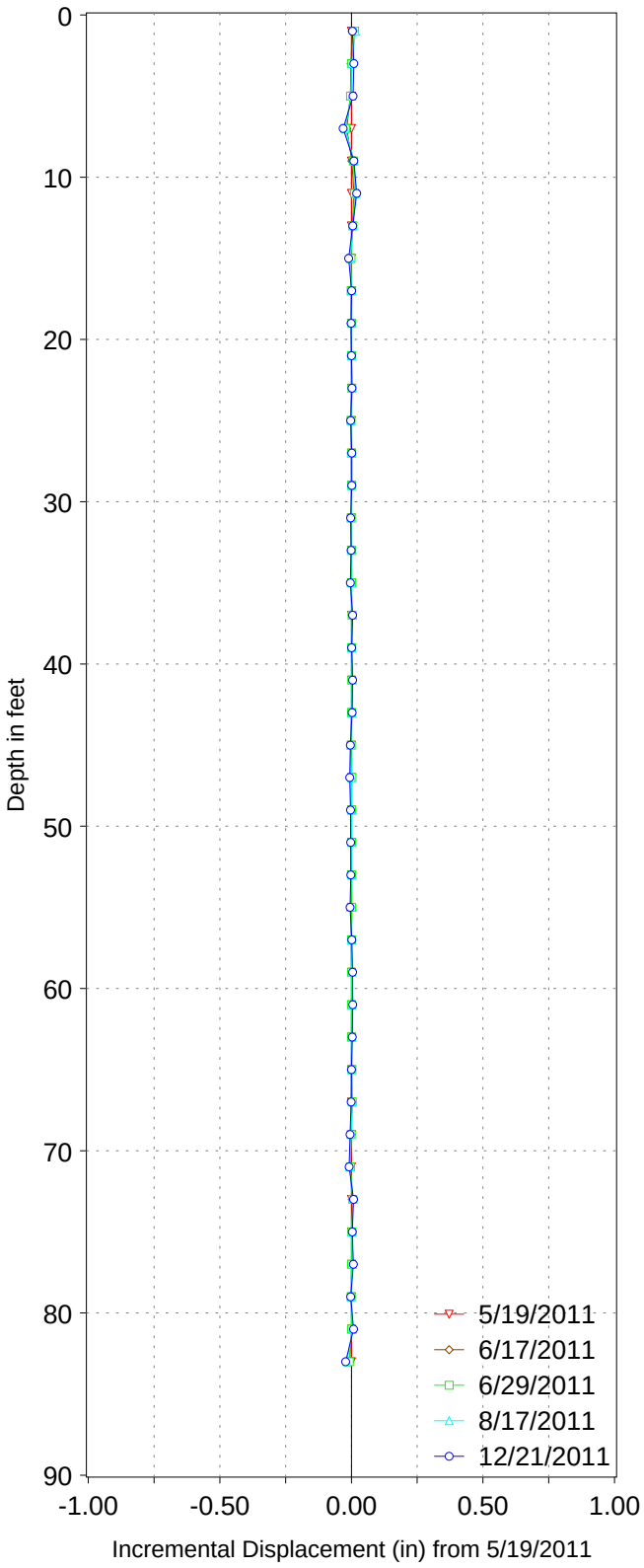


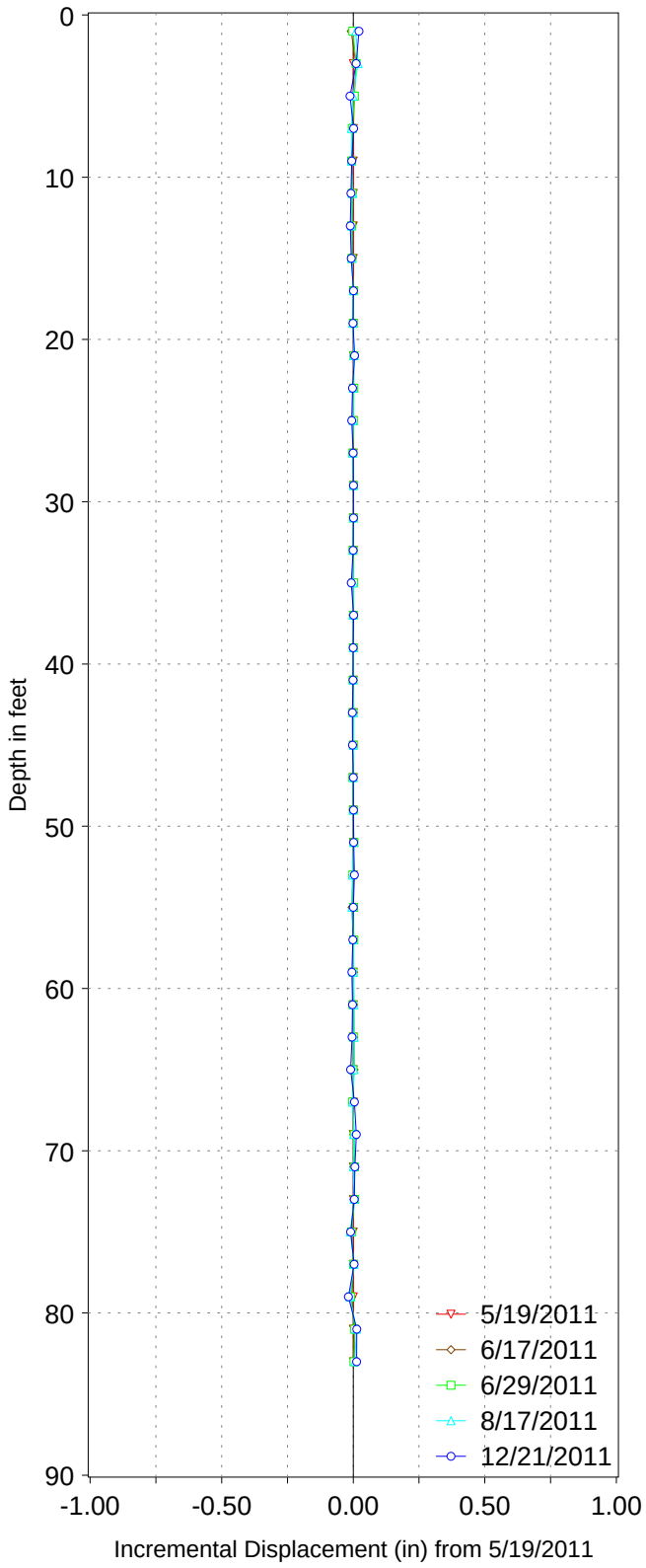
Caltrans

INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9
Elephant Trunk Slide
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 77 ft
Ao DIRECTION: 223* (magnetic North)
Location (WGS-84) : N 35.78962* W 121.33923*





INCLINOMTER RESULTS

05-Slo-001-PM 73.7-73.9

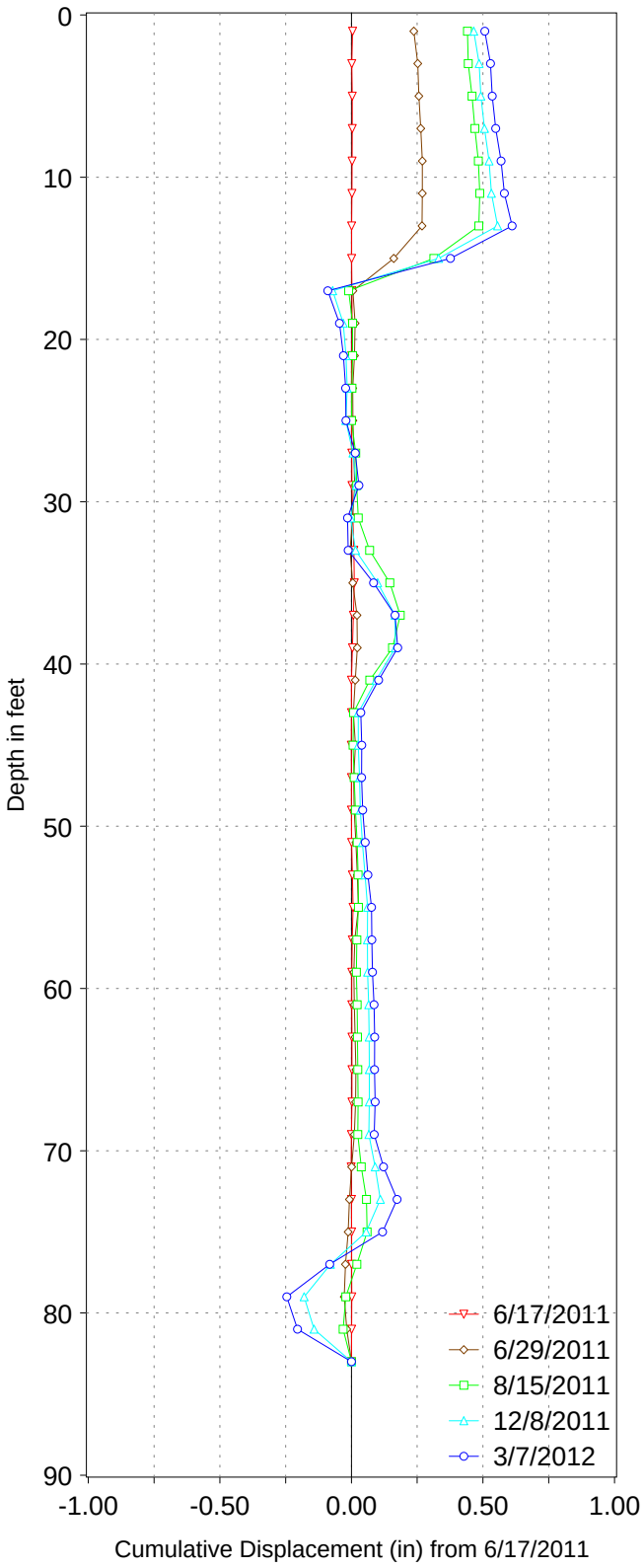
Elephant Trunk Slide

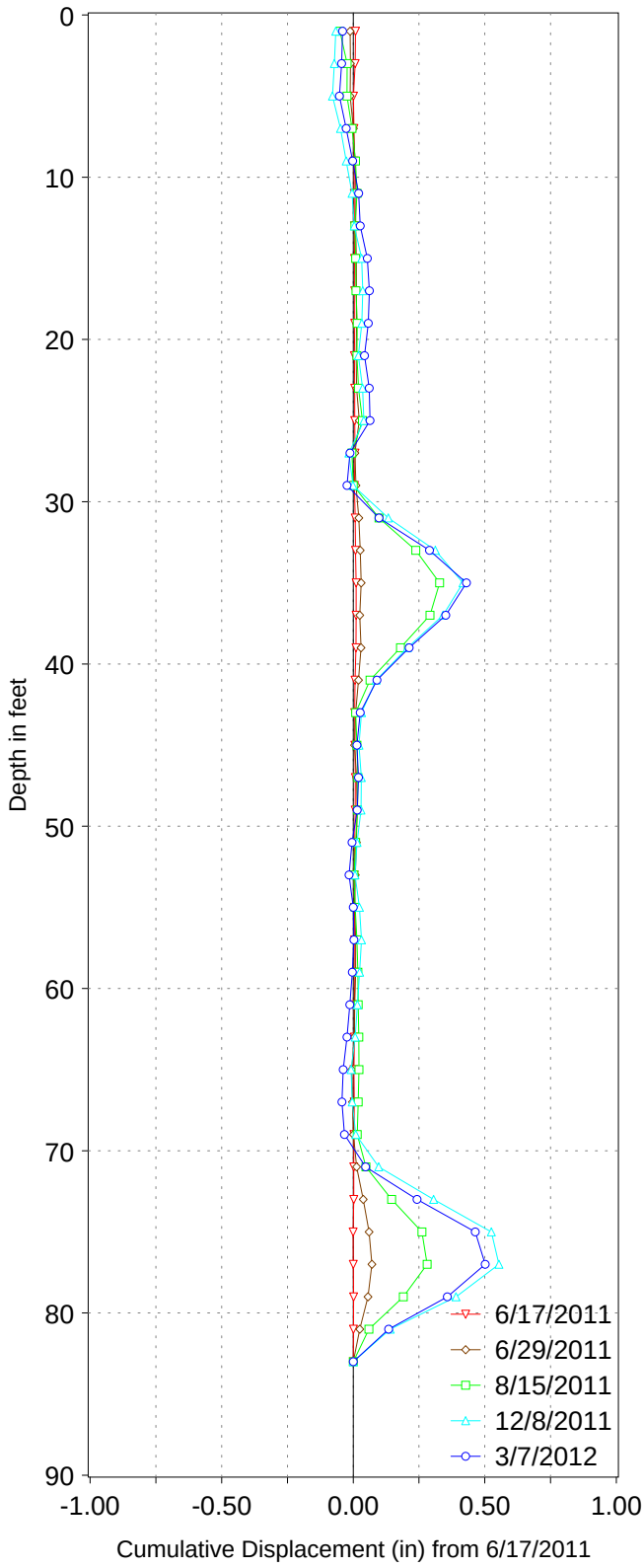
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 85 ft

Ao DIRECTION: * (magnetic North)

Location (WGS-84) :





INCLINOMTER RESULTS

01-Slo-001-PM 73.7-73.9

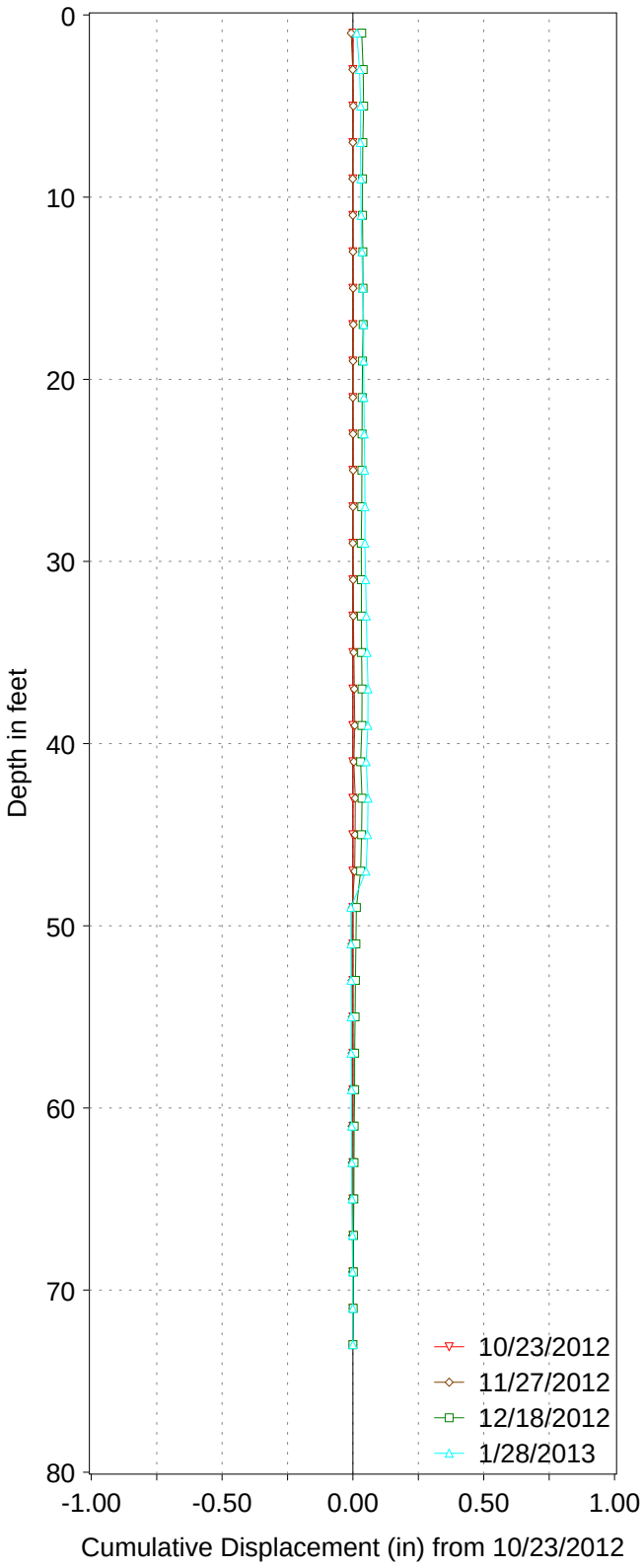
Elephant Trunk Slide

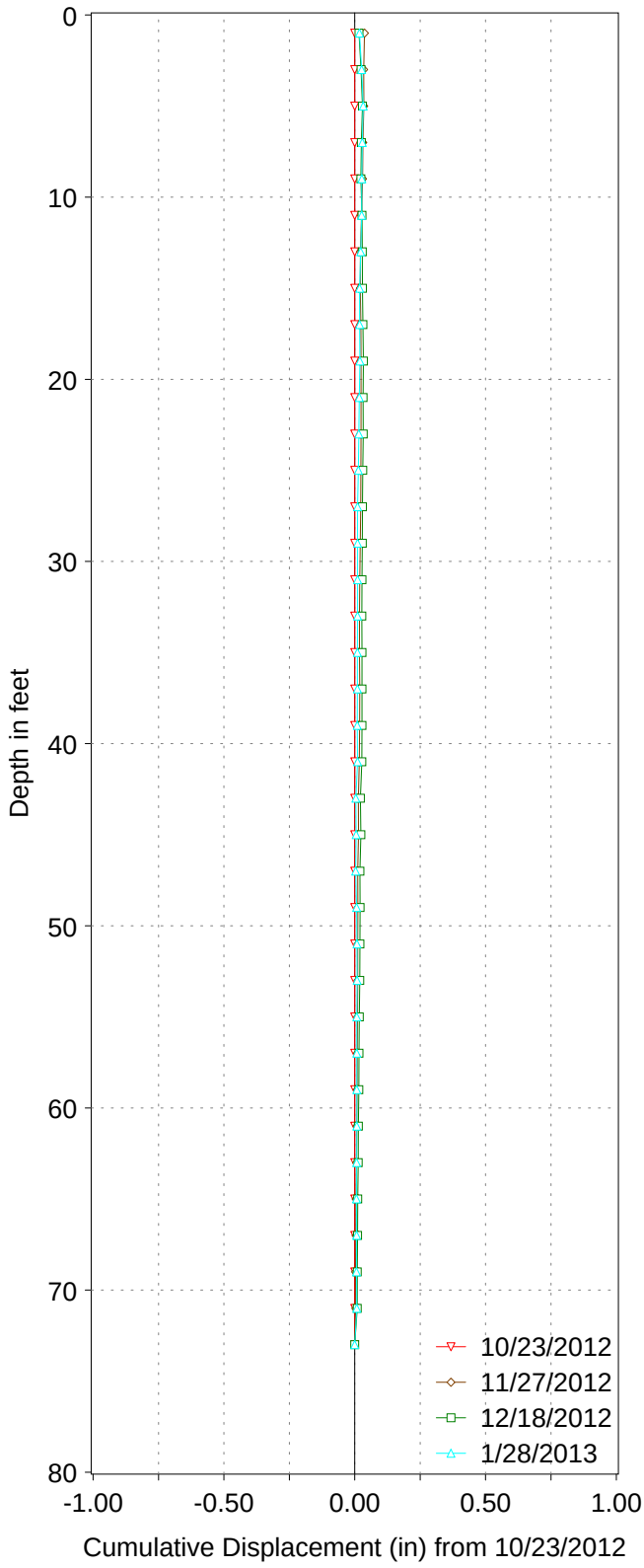
E.A. No: 05-0P350

DEPTH OF INCLINOMETER CASING: 83 ft

Ao DIRECTION: 222* (magnetic North)

Location (WGS-84) : N 35*79.121 & W 121*33.989

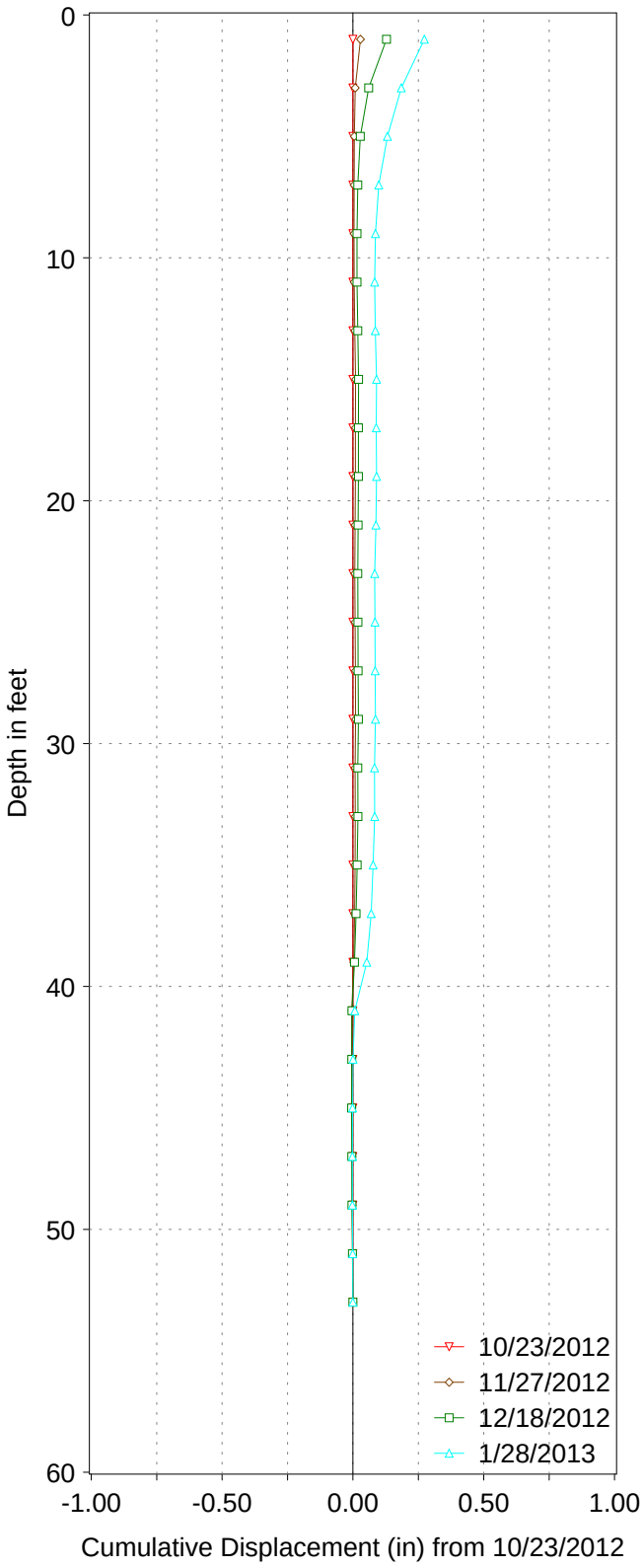


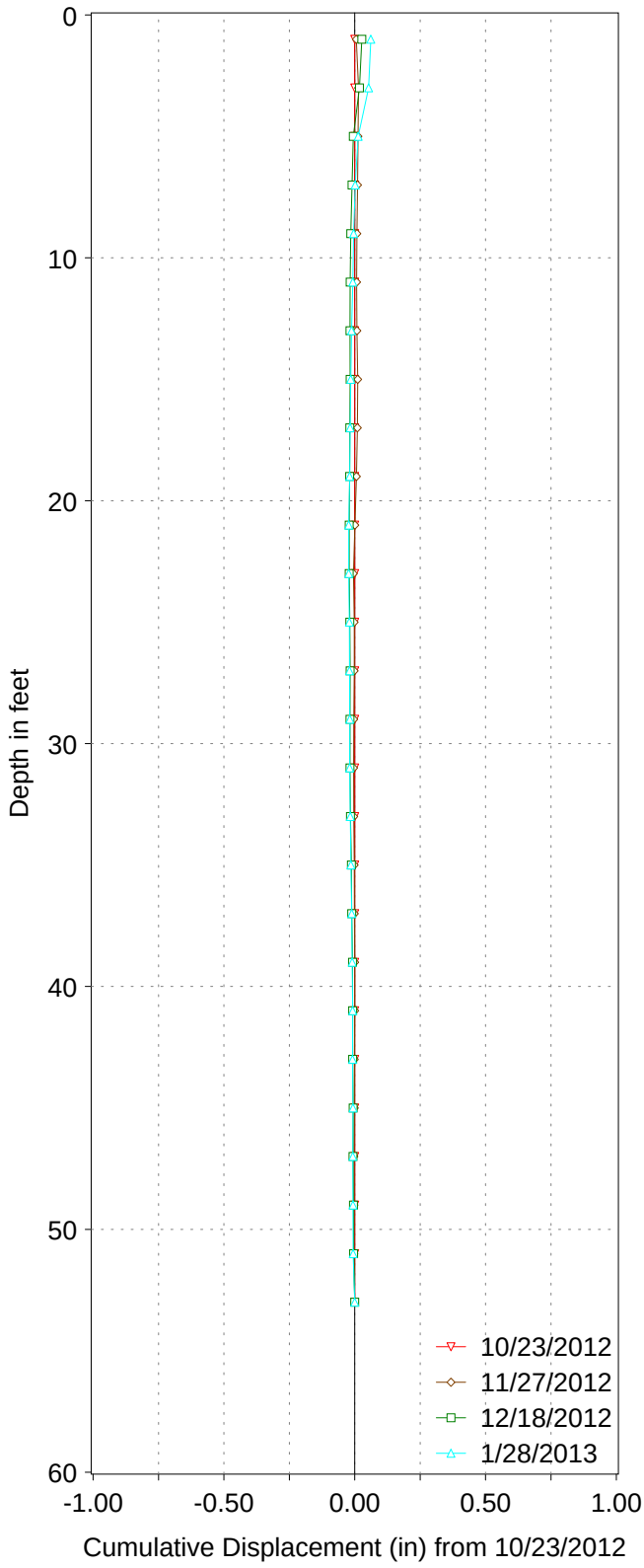


RESULT OF SI MONITORING

05-SLO-001-PM74.3
Site: Elephant Trunk SI-12-11
Project ID: 05-1A700-0-1080

Depth of Casing: 75.3 ft
A0 Direction: 228 deg
Location: N35°47.399',W121°20.372'





T OF SI MONITORING
M74.3
Trunk SI-12-12
.2000009

Depth of Casing: 55.6 ft
A0 Direction: 232 deg
Location: N35°47.371',W121°20.340'

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-001			RC-11-002		RC-11-003		
	Station	502+17			504+24		505+08		
	Line	"CL1"			"CL1"		"CL1"		
	Offset	1' Rt.			2' Lt.		CL		
	Date Sampled	4/20/2011	4/20/2011	4/22/2011	4/23/2011	4/23/2011	4/27/2011	4/27/2011	4/27/2011
	Sample ID	Bulk	19	25	2	3	Bulk	22	23
	Depth Below OG	7'-48'	48.6'-49.3'	79'-80'	10'-10.5'	14'-15'	7'-38'	63'-64'	69.5'-70.5'
	USCS Classification								
PARTICLE SIZE ANALYSIS	63 mm (2½")								
	50 mm (2")								
	37.5 mm (1½")								
	25 mm (1")								
	19 mm (3/4")								
	12.5 mm (1/2")								
	9.5 mm (3/8")								
	4.75 mm (No. 4)								
	2.36 mm (No. 8)								
	1.18 mm (No. 16)								
	600 um (No. 30)								
	300 um (No. 50)								
	150 um (No. 100)								
	75 um (No. 200)								
	5 um								
	1 um								
PI	Liquid Limit								
	Plasticity Index								
EXPANSION INDEX									
CORROSION	Resistivity (ohm-cm)	1315					2156		
	pH	7.42					7.67		
	Chlorides (ppm)	N/A					N/A		
	Sulfates (ppm)	N/A					N/A		
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)		166	164	166	166		165	166
	Moisture (%)								
Optimum	Dry Density (pcf)								
	Moisture (%)								
	Specific Gravity								
DIRECT SHEAR	Friction Angle (°)								
	Cohesion (psf)								
UNCONFINED COMPRESSIVE STRENGTH (psi)			3022	1647	11529	11029		2674	2082
Consol.	Consolidation Index (Cc)								
	Recompression Index (Cr)								
	Initial Void Ratio								

**Test specimen length/diameter ratio not in compliance with test method

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-004							
	Station	501+59							
	Line	"CL1"							
	Offset	CL							
	Date Sampled	5/3/2011	5/3/2011	5/4/2011	5/4/2011	5/4/2011	5/4/2011	5/4/2011	5/4/2011
	Sample ID	Bulk	11	17	23	25	26	27	28
	Depth Below OG	4'-25'	30.3'-30.7'	43.5'-47'	60'-60.9'	67'-67.7'	75'-75.8'	78.3'-78.7'	83'-83.6'
	USCS Classification								
PARTICLE SIZE ANALYSIS	63 mm (2½")								
	50 mm (2")								
	37.5 mm (1½")								
	25 mm (1")								
	19 mm (3/4")								
	12.5 mm (1/2")								
	9.5 mm (3/8")								
	4.75 mm (No. 4)								
	2.36 mm (No. 8)								
	1.18 mm (No. 16)								
	600 um (No. 30)								
	300 um (No. 50)								
	150 um (No. 100)								
	75 um (No. 200)								
	5 um								
	1 um								
PI	Liquid Limit								
	Plasticity Index								
EXPANSION INDEX									
CORROSION	Resistivity (ohm-cm)	1348							
	pH	6.85							
	Chlorides (ppm)	N/A							
	Sulfates (ppm)	N/A							
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)		180		166	164	165	166	164
	Moisture (%)								
DENSITY AND MOISTURE CONTENT Optimum	Dry Density (pcf)								
	Moisture (%)								
	Specific Gravity								
DIRECT SHEAR	Friction Angle (°)								
	Cohesion (psf)								
UNCONFINED COMPRESSIVE STRENGTH (psi)			6763**		13235	10204**	7709	13010	9110**
Consol.	Consolidation Index (Cc)								
	Recompression Index (Cr)								
	Initial Void Ratio								

**Test specimen length/diameter ratio not in compliance with test method

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-005					RC-11-006			
	Station	509+47					502+21			
	Line	"CL1"					"CL1"			
	Offset	2' Lt.					56' Lt.			
	Date Sampled	5/6/2011	5/6/2011	5/6/2011	5/6/2011	5/6/2011	5/7/2011	5/7/2011	5/7/2011	5/7/2011
	Sample ID	Bulk	11	12	15	19	Bulk	21	22	23
	Depth Below OG	1'-20'	30.8'-31.3'	35.2'-36'	47.5'-48.2'	67'-67.6'	0'-50'	51.5'-52'	55'-60'	64.2'-65'
	USCS Classification									
PARTICLE SIZE ANALYSIS	63 mm (2½")									
	50 mm (2")									
	37.5 mm (1½")									
	25 mm (1")									
	19 mm (3/4")									
	12.5 mm (1/2")									
	9.5 mm (3/8")									
	4.75 mm (No. 4)									
	2.36 mm (No. 8)									
	1.18 mm (No. 16)									
	600 um (No. 30)									
	300 um (No. 50)									
	150 um (No. 100)									
	75 um (No. 200)									
	5 um									
	1 um									
PI	Liquid Limit								32	
	Plasticity Index								16	
EXPANSION INDEX										
CORROSION	Resistivity (ohm-cm)	1404					3049			
	pH	7.90					6.76			
	Chlorides (ppm)	N/A					N/A			
	Sulfates (ppm)	N/A					N/A			
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)		164	163	162	164		166		166
	Moisture (%)									
Optimum	Dry Density (pcf)									
	Moisture (%)									
	Specific Gravity									
DIRECT SHEAR	Friction Angle (°)									
	Cohesion (psf)									
UNCONFINED COMPRESSIVE STRENGTH (psi)			7498**	9208	6489**	5385**		7678		2967
Consol.	Consolidation Index (Cc)									
	Recompression Index (Cr)									
	Initial Void Ratio									

**Test specimen length/diameter ratio not in compliance with test method

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-006		RC-11-007						
	Station	502+21		507+81						
	Line	"CL1"		"CL1"						
	Offset	56' Lt.		16' Rt.						
	Date Sampled	5/7/2011	5/8/2011	5/8/2011	5/8/2011	5/8/2011	5/8/2011	5/8/2011	5/8/2011	5/8/2011
	Sample ID	24	26	7	9	10	11	13	14	17
	Depth Below OG	69'-70'	77.5'-78.5'	13.5'-14.4'	19.2'-19.8'	25.9'-26.6'	31.6'-32.2'	38.5'-39.3'	46'-46.8'	54.2'-54.7'
	USCS Classification									
PARTICLE SIZE ANALYSIS	63 mm (2½")									
	50 mm (2")									
	37.5 mm (1½")									
	25 mm (1")									
	19 mm (3/4")									
	12.5 mm (1/2")									
	9.5 mm (3/8")									
	4.75 mm (No. 4)									
	2.36 mm (No. 8)									
	1.18 mm (No. 16)									
	600 um (No. 30)									
	300 um (No. 50)									
	150 um (No. 100)									
	75 um (No. 200)									
	5 um									
	1 um									
PI	Liquid Limit									
	Plasticity Index									
EXPANSION INDEX										
CORROSION	Resistivity (ohm-cm)									
	pH									
	Chlorides (ppm)									
	Sulfates (ppm)									
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)	164	166	165	165	165	166	166	164	166
	Moisture (%)									
Optimum	Dry Density (pcf)									
	Moisture (%)									
	Specific Gravity									
DIRECT SHEAR	Friction Angle (°)									
	Cohesion (psf)									
UNCONFINED COMPRESSIVE STRENGTH (psi)		4768	5180	20576	6966**	21577	13298	17367	10369	9034**
Consol.	Consolidation Index (Cc)									
	Recompression Index (Cr)									
	Initial Void Ratio									

**Test specimen length/diameter ratio not in compliance with test method

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-007			RC-11-008				
	Station	507+81							
	Line	"CL1"			"CL1"				
	Offset	16' Rt.							
	Date Sampled	5/8/2011	5/9/2011	5/9/2011	5/9/2011	5/9/2011	5/9/2011	5/10/2011	5/10/2011
	Sample ID	19	21	27	12	13	14	15	16
	Depth Below OG	63'-63.7'	72.2'-73.2'	90.2'-90.9'	56'-57'	61.5'-62'	67.5'-68'	74'-75'	76.8'-77.3'
	USCS Classification								
PARTICLE SIZE ANALYSIS	63 mm (2½")								
	50 mm (2")								
	37.5 mm (1½")								
	25 mm (1")								
	19 mm (3/4")								
	12.5 mm (1/2")								
	9.5 mm (3/8")								
	4.75 mm (No. 4)								
	2.36 mm (No. 8)								
	1.18 mm (No. 16)								
	600 um (No. 30)								
	300 um (No. 50)								
	150 um (No. 100)								
	75 um (No. 200)								
	5 um								
	1 um								
PI	Liquid Limit								
	Plasticity Index								
EXPANSION INDEX									
CORROSION	Resistivity (ohm-cm)								
	pH								
	Chlorides (ppm)								
	Sulfates (ppm)								
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)	167	166	163	165	164	165	165	169
	Moisture (%)								
Optimum	Dry Density (pcf)								
	Moisture (%)								
	Specific Gravity								
DIRECT SHEAR	Friction Angle (°)								
	Cohesion (psf)								
UNCONFINED COMPRESSIVE STRENGTH (psi)		16337	14279	8448**	4057	6402	11327	12796	11679
Consol.	Consolidation Index (Cc)								
	Recompression Index (Cr)								
	Initial Void Ratio								

**Test specimen length/diameter ratio not in compliance with test method

MATERIALS PROPERTIES SUMMARY
ELEPHANT TRUNK RETAINING WALL
SLO-1-73.0/74.1

DESCRIPTION	Boring No.	RC-11-009		RC-11-010				
	Station			508+63				
	Line	"CL1"		"CL1"				
	Offset			5' Lt.				
	Date Sampled	5/17/2011	5/17/2011	6/15/2011	6/15/2011	6/15/2011	6/16/2011	6/16/2011
	Sample ID	6	7	14	16	18	20	21
	Depth Below OG	28'-29'	33'-34'	46'-47'	55.2'-55.7'	66'-67'	75.5'-76.5'	82'-83'
	USCS Classification							
PARTICLE SIZE ANALYSIS	63 mm (2½")							
	50 mm (2")							
	37.5 mm (1½")							
	25 mm (1")							
	19 mm (3/4")							
	12.5 mm (1/2")							
	9.5 mm (3/8")							
	4.75 mm (No. 4)							
	2.36 mm (No. 8)							
	1.18 mm (No. 16)							
	600 um (No. 30)							
	300 um (No. 50)							
	150 um (No. 100)							
	75 um (No. 200)							
	5 um							
	1 um							
PI	Liquid Limit							
	Plasticity Index							
EXPANSION INDEX								
CORROSION	Resistivity (ohm-cm)							
	pH							
	Chlorides (ppm)							
	Sulfates (ppm)							
DENSITY AND MOISTURE CONTENT In Situ	Dry Density (pcf)	166	166	165	165	164	164	164
	Moisture (%)							
Optimum	Dry Density (pcf)							
	Moisture (%)							
	Specific Gravity							
DIRECT SHEAR	Friction Angle (°)							
	Cohesion (psf)							
UNCONFINED COMPRESSIVE STRENGTH (psi)		15294	16814	6335	7474	10231	3908	11504
Consol.	Consolidation Index (Cc)							
	Recompression Index (Cr)							
	Initial Void Ratio							

**Test specimen length/diameter ratio not in compliance with test method

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	73.7/74		

REGISTERED CIVIL ENGINEER — X — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — M.J. Cullen — No. C40620 — Exp. 03-31-2015 — CIVIL — STATE OF CALIFORNIA

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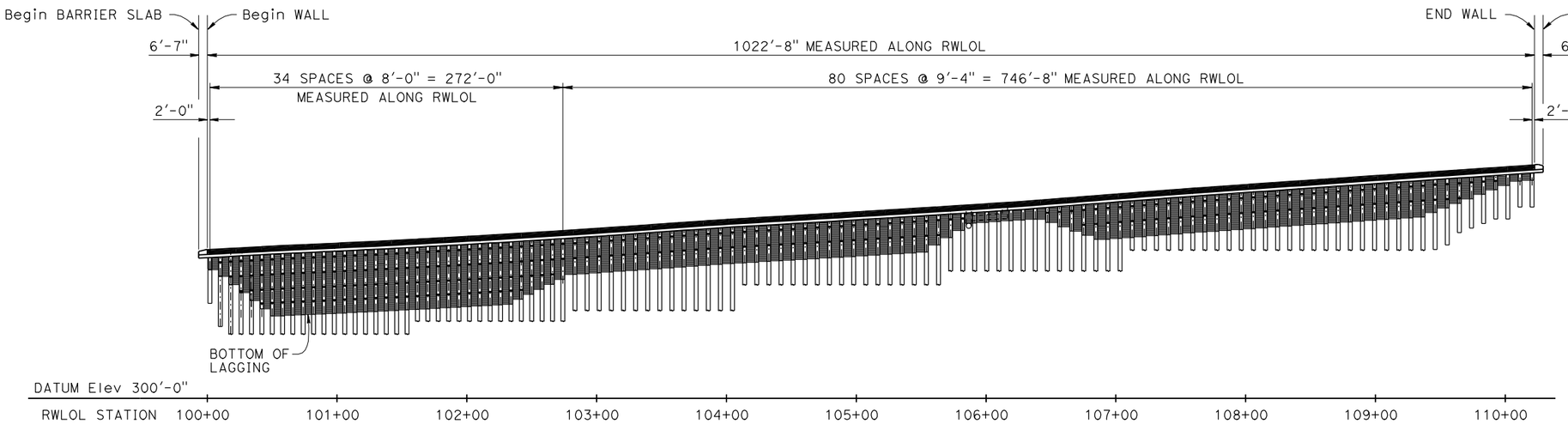
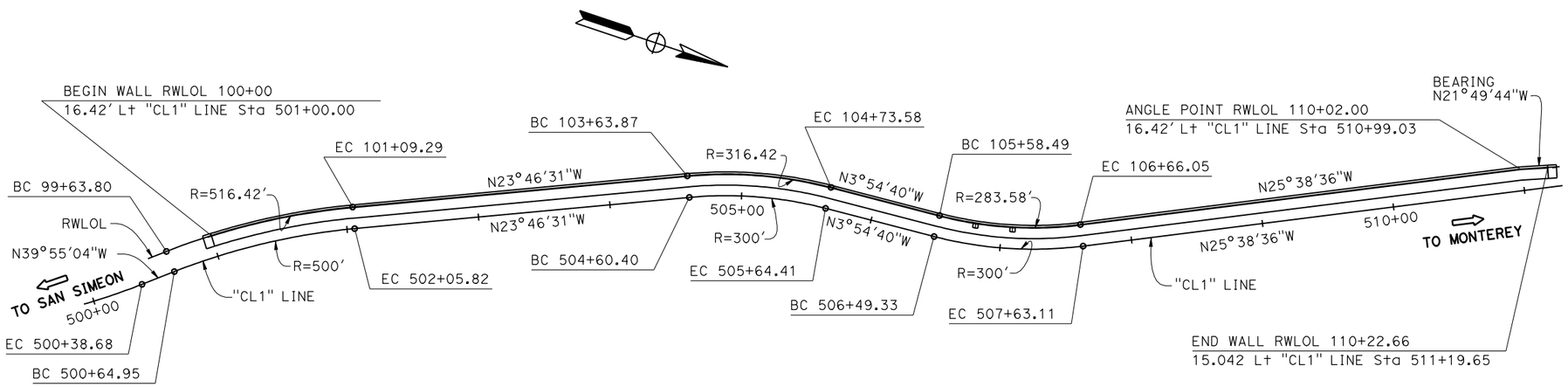


DEVELOPED MIRROR ELEVATION

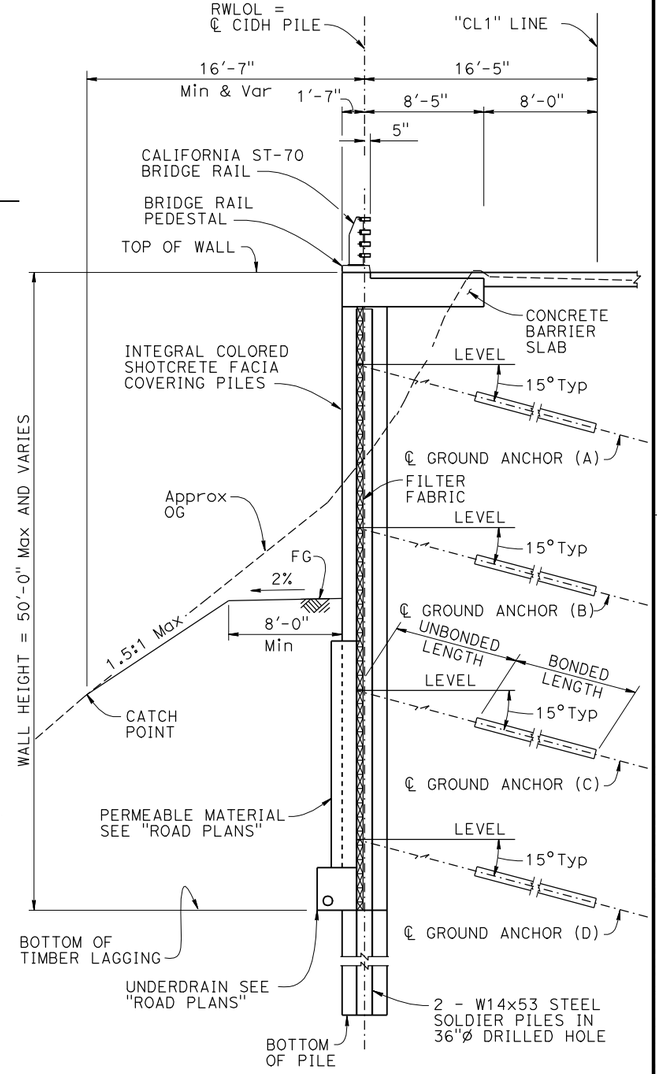
1" = 60'

RWLOL CURVE DATA			
R	Δ	T	L
516.42	16°08'33"	73.23	145.49
316.42	19°51'50"	55.40	109.70
283.58	21°43'56"	53.43	107.56



PLAN

1" = 60'



TYPICAL SECTION

3/16" = 1'-0"

ATTACHMENT 9

DESIGN	BY M. Cullen	CHECKED H. Perez	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: HL93 W/"LOW-BOY"; PERMIT DESIGN VEHICLE			
DETAILS	BY J. Yang	CHECKED H. Perez	LAYOUT	BY M. Cullen	CHECKED H. Perez		
QUANTITIES	BY R. Melko	CHECKED R. Washington	SPECIFICATIONS	BY X	PLANS AND SPECS COMPARED X		

X
DESIGN ENGINEER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 6

BRIDGE NO. 49E0022
POST MILE 73.7/74

ELEPHANT TRUNK RETAINING WALL
GENERAL PLAN

UNIT: 3591
PROJECT NUMBER & PHASE: 0512000009
CONTRACT NO.: 05-1A7001

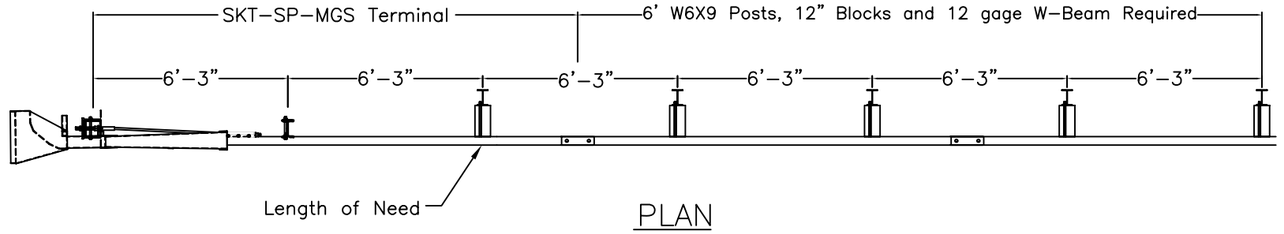
DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
03-12-13	06-05-13			1	29

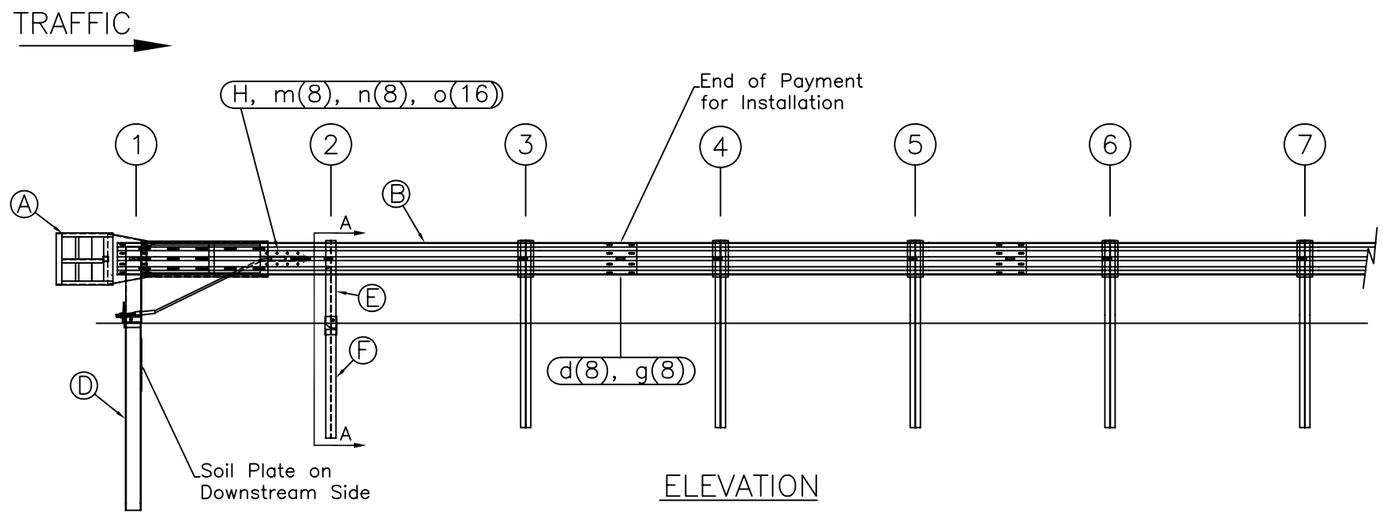
STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.09-01-10)

FILE => aa-gp.dgn

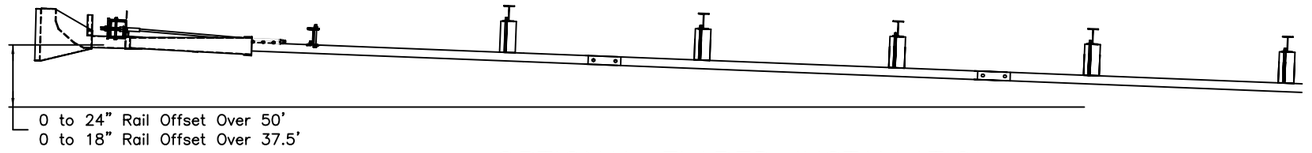
USERNAME => s136468 DATE PLOTTED => 18-JUN-2013 TIME PLOTTED => 10:45



PLAN



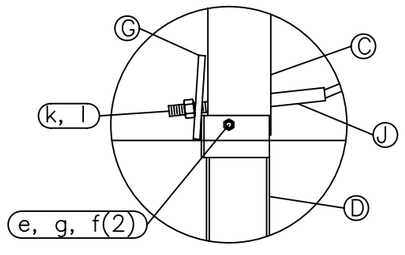
ELEVATION



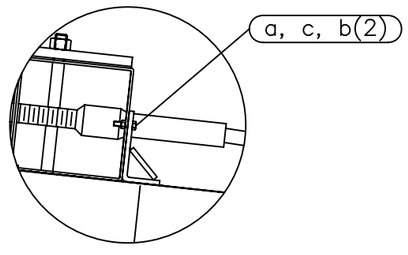
OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate

ITEM	QTY	BILL OF MATERIALS	ITEM NO.
A	1	IMPACT HEAD	S3000
B	1	W–BEAM GUARDRAIL END SECTION, 12 Ga.	MGS–SF1303
C	1	FIRST POST TOP (6X6X$\frac{1}{8}$" Tube)	TPHP1A
D	1	FIRST POST BOTTOM (6' W6X15)	TPHP1B
E	1	SECOND POST ASSEMBLY TOP	UHP2A
F	1	SECOND POST ASSEMBLY BOTTOM	HP3B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
		HARDWARE (ALL DIMENSIONS IN INCHES)	
a	2	5/16 x 1 HEX BOLT GRD 5	B5160104A
b	4	5/16 WASHER	W0516
c	2	5/16 HEX NUT	N0516
d	9	5/8 Dia. x 1 1/4 SPLICE BOLT (POST #2)	B580122
e	1	5/8 Dia. x 9 HEX BOLT GRD 5	B580904A
f	3	5/8 WASHER	W050
g	10	5/8 Dia. H.G.R NUT	N050
h	1	3/4 Dia. x 8 1/2 HEX BOLT GRD A449	B340854A
j	1	3/4 Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	CABLE ANCHOR BOX SHOULDER BOLT	SB58A
n	8	1/2 A325 STRUCTURAL NUT	N055A
o	16	1 1/16 OD x 9/16 ID A325 STR. WASHER	W050A

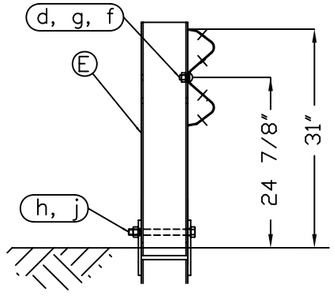
GENERAL NOTES:
1. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
2. The lower sections of the Posts 1&2 shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
3. The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
4. When competent rock is encountered, a 12" Ø post hole, 20 in. deep cored into the rock surface may be used if approved by the engineer for post 1. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first post can be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
5. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.
6. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.



Post #1 Connection Detail



Impact Head Connection Detail



SECTION A–A
Post #2

Road Systems, Inc.
Big Spring, TX
Phone: 432-263-2435
or Phone: 330-346-0721

SKT-SP-MGS Terminal
Midwest Guardrail System
31" Top of Rail

Sheet: 1
Date: 02/24/10
By: JRR
Drawing Name: SKT-SP-S-MGS
Scale: None
Rev: 0

ET-31™ Guardrail End Treatment
NCHRP Report 350 Test Level 3
System Length 53'-1 1/2" (16.19 m)

For specific assembly, maintenance, or repair details refer to the state or specifying agency's standard drawings and/or Trinity standard layout drawings.

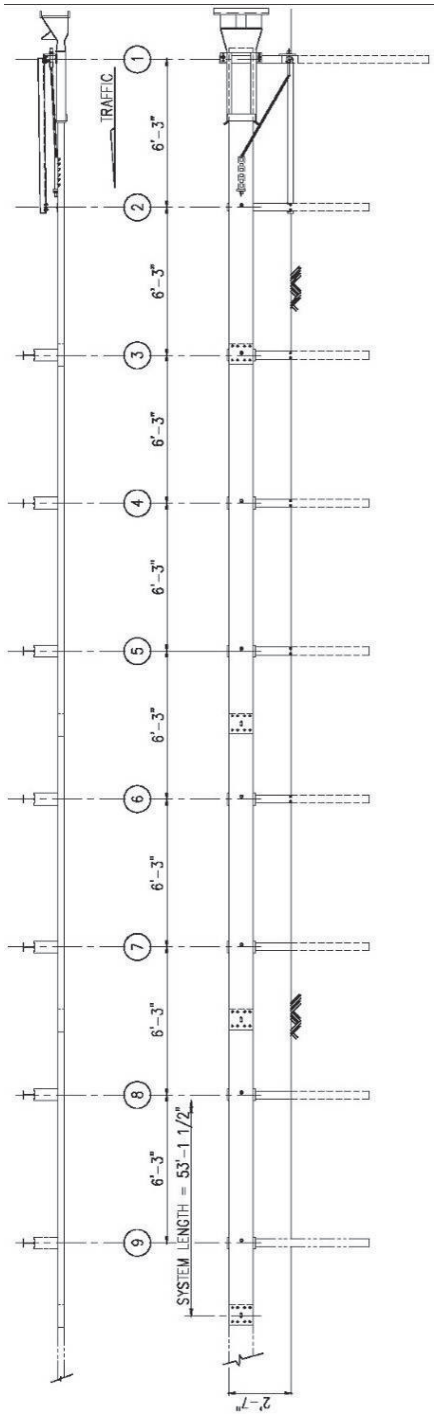
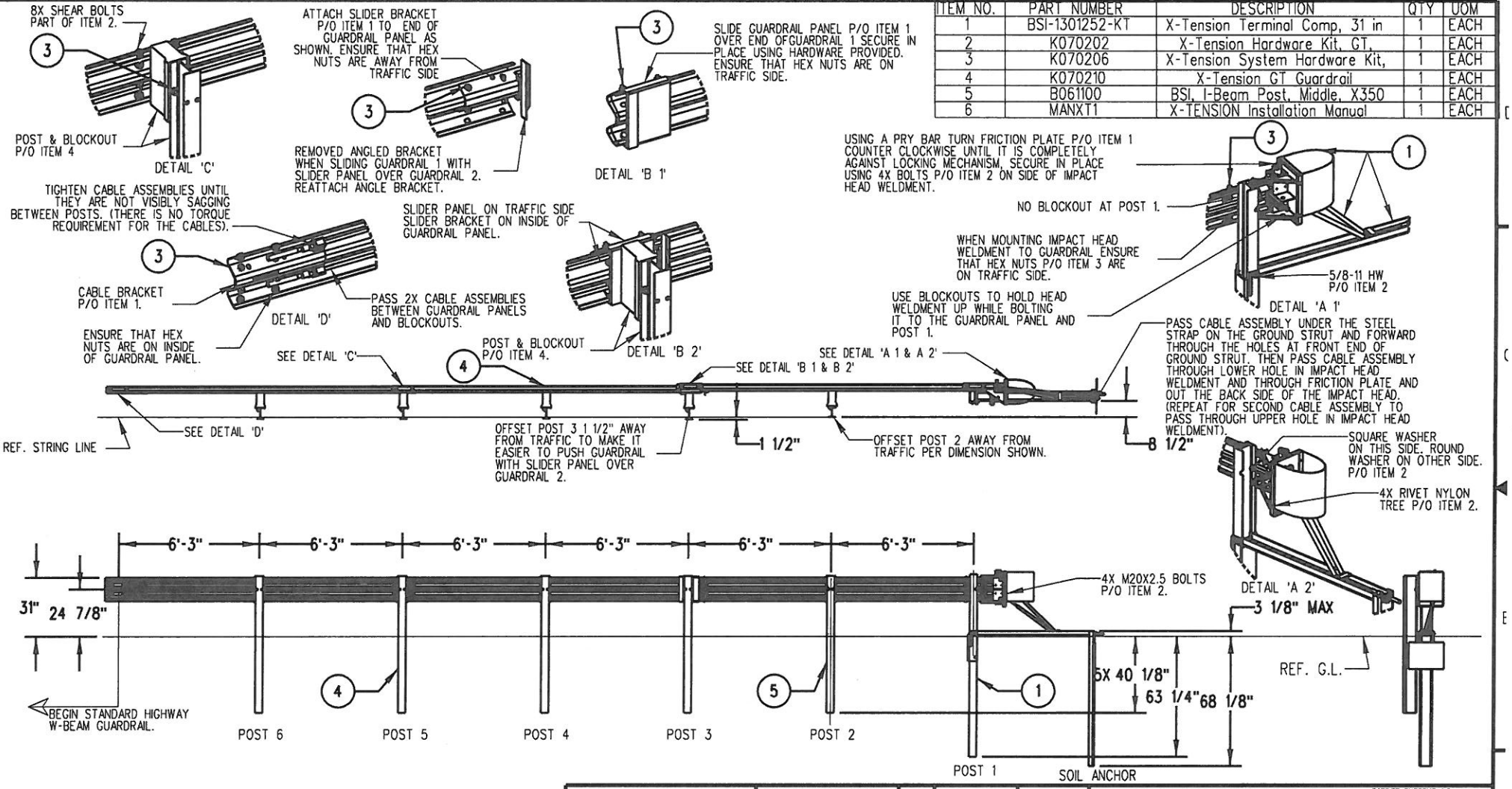


Figure 4 (TL-3)

[This drawing represents one version of the 53'-1 1/2" (16.19 m) system]

ITEM NO.	PART NUMBER	DESCRIPTION	QTY	UOM
1	BSI-1301252-KT	X-Tension Terminal Comp, 31 in	1	EACH
2	K070202	X-Tension Hardware Kit, GT,	1	EACH
3	K070206	X-Tension System Hardware Kit,	1	EACH
4	K070210	X-Tension GT Guardrail	1	EACH
5	B061100	BSI, I-Beam Post, Middle, X350	1	EACH
6	MANXT1	X-TENSION Installation Manual	1	EACH



NOTES: UNLESS OTHERWISE SPECIFIED.

1. SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
2. ONLY TIGHTEN THE CABLE ASSEMBLIES USING THE NUTS AT THE CABLE BRACKET (SEE DETAIL 'D'). DO NOT TIGHTEN THE CABLES AT THE FRONT OF THE GROUND ANCHOR.
3. WHEN DRIVING STEEL POST, ENSURE THAT A DRIVING CAP WITH TIMBER OR PLASTIC INSERT IS USED TO PREVENT DAMAGE TO THE GALVANIZING TO THE TOP OF THE POST.

APPROVALS

DRAWN BY:	NMV
DRAWN DATE:	2/08/13
APPR'D BY:	JMT
APPR'D DATE:	2/08/13

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACTIONS ±1/16 DECIMAL .XX ± .03 .XXX ± .010 ANGLES ±1/2°
INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5-1994
THIRD ANGLE PROJECTION
DO NOT SCALE DRAWING

REV	ECN#	DATE
B	2067	05/02/13
A	2022	2/08/13

LINDSAY TRANSPORTATION SOLUTIONS™

BARRIER SYSTEMS INC.
3333 Vaca Valley Parkway Ste 800
Vacaville, CA 95688
Tel: 888-800-3691
www.barriersystemsinc.com

TITLE
X-TENSION GUARDRAIL TERMINAL SYSTEM
STEEL POST WITH COMPOSITE BLOCKOUT
31" RAIL HEIGHT

SIZE	DWG NO.	REV.
B	XTGTSS5	B

SCALE 1:50 SHEET 1 OF 1

ADIEM™

Advanced Dynamic Impact Extension Module

The Advanced Dynamic Impact Extension Module (ADIEM™) is a cost effective energy-absorbing system that utilizes lightweight, crushable concrete modules. Enhanced coatings and optional covers provide additional protection from the elements.

Features

- No site-specific foundation pad needed.
  Can be placed on existing surfaces such as concrete, asphalt or compacted soil/base material.
- Composed of three component groups; reinforced concrete base, engineered lightweight concrete modules, and anchor brackets.
- Re-directive capability.
  (Beginning Length of Need at 15' (4.6 m) from nose.)
- NCHRP Report 350 Test Level 3 compliant.

Installation and Repair Advantages

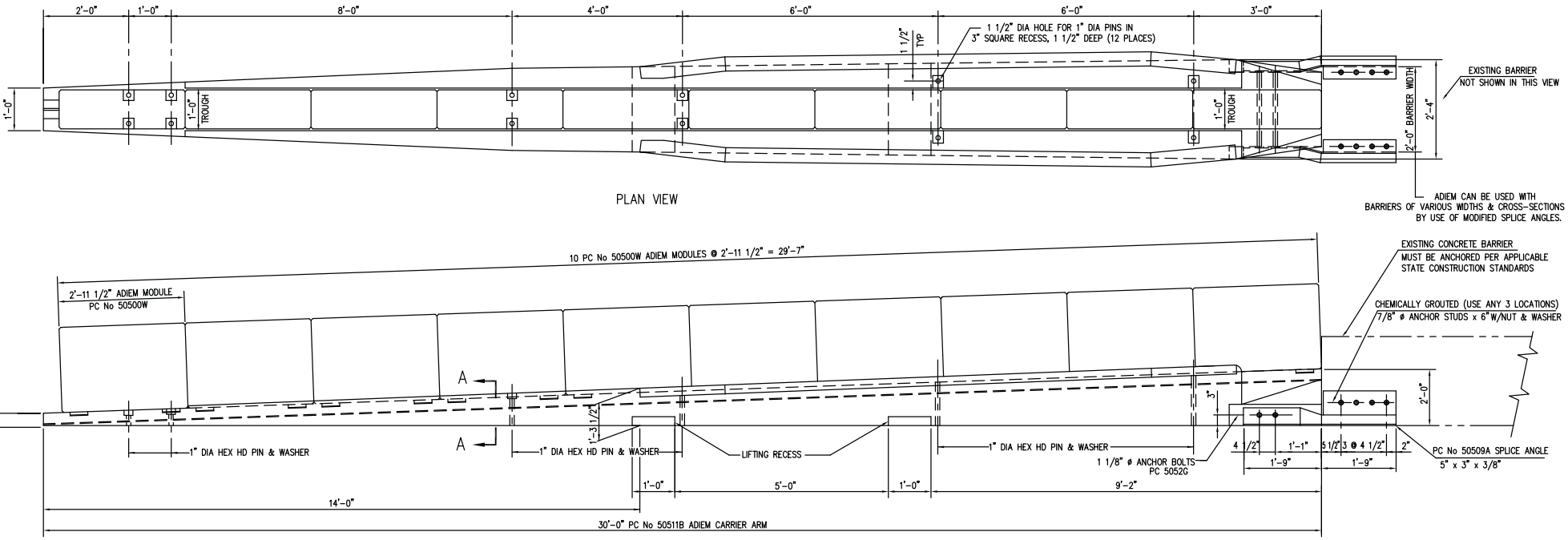
- Pinned anchorage allows unit to be moved and relocated quickly.
- All ten lightweight modules are common in design and composition, requiring no sequence priority when attaching or replacing damaged modules.
- Impact damage to the product is typically confined to the modules making repair a simple process.
- Contains no torque-sensitive bolts.
- No concrete to pour.

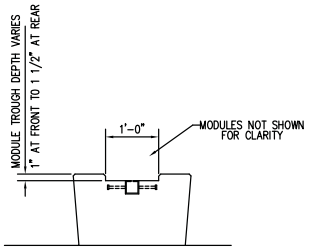
Specifications

- System Length: 30'- 0" (9.2 m) Base
- System Width: 32" (313 mm) at Widest Point
- System Height: 28" (712 mm) at Nose, 48" (1.2 m) at Hazard
- Base Weight: 11,500 lbs. (5216 kg)

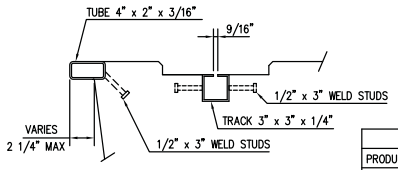
1-800-527-6050
www.highwayguardrail.com

1-888-323-6374
www.energyabsorption.com

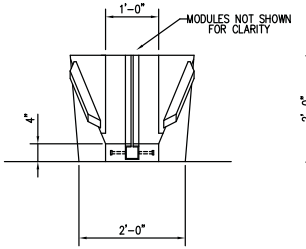




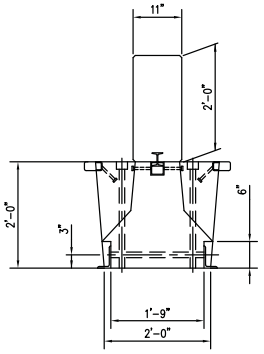
SECTION A-A



TRACK & BUMPER DETAIL



FRONT ELEVATION VIEW



REAR ELEVATION VIEW

BILL OF MATERIAL

PRODUCT CODE	QTY	DESCRIPTION	REMARKS
50500W	10	MODULES x 2'-11 1/2"	
50511B	1	BASE x 30'-0"	
50508A	1	SPLICE ANGLE x 3'-6" RT	
50509A	1	SPLICE ANGLE x 3'-6" LT	
6549W	1	GARNA-THANE COATING (1 GAL)	
5052G	2	1 1/8" ø x 25" HEX HD BOLT	
4963G	4	1 1/8" WASHER	
3976G	2	1 1/8" HEX NUT	
4616G	6	7/8"ø STUD x 6" (FULL THD)	
3725G	6	7/8" WASHER	
3735G	6	7/8" HEX NUT	
☆ 5206B	1	ADHESIVE HY150 CARTRIDGE	
3900G	12	1" WASHER	

	SCH			ANCHOR PIN SCHEDULE PER SURFACE (SEE NOTES 1-5)		
				PCC	ACP	BASE
5665G	SEE SCH	1" ø HEX HD PIN x 48"	SEE NOTES 1-5			4
5642G		1" ø HEX HD PIN x 42"			4	
5650G		1" ø HEX HD PIN x 36"		4		4
5641G		1" ø HEX HD PIN x 30"			4	4
5646G		1" ø HEX HD PIN x 24"		4	4	
5643G		1" ø HEX HD PIN x 18"		4		

ADIEM INSTALLATION INSTRUCTIONS

1. The ADIEM base is to be placed on a smooth surface (the same horizontal plane as the concrete barrier) and parallel to the mainline or ramp traveled lane(s).
2. Install anchor rods for ADIEM base by driving in soil or soft asphalt or driving in pre-drilled holes for hard asphalt or concrete (no epoxy required). The base should not be moved after the holes are drilled. The holes should be drilled using, at a minimum, a 35# hammer and minimum 36 inch long drill bit. (A 50# hammer is recommended.)
3. Attach connection brackets to base with two (2) 1 1/8" X 25" hex head bolts provided. Then field drill holes in the existing barrier and attach connection brackets to it with chemically grouted hardware provided.
4. Oil the ADIEM base track. Slide the modules onto the base. Be careful not to damage edges of the modules while sliding onto the base.
5. If the modules are scuffed or nicked, apply GARNA-THANE coating to the affected area.
6. Recommended tools and equipment:
   - 35/50# air hammer/drill
   - 1 3/8" ø x 36" rock drill
   - 1 1/4" ø x 12" rock drill
   - Sledge hammer
   - Oil
   - Wrenches

OPTIONAL ANCHOR ITEMS	
PRODUCT CODE	DESCRIPTION
5205B	ADHESIVE DISPENSER
5207B	MIXER HIT HY150 (NOZZLE)
5208B	FILLER HIT HY150 (FILLER TUBE)
5209B	BIT TE-C+ 11/16-18 (11/16" ø BIT)

☆ EACH CARTRIDGE INCLUDES 1 EACH : MIXER HY 150 CARTDIDGE(NOZZLE)
: FILLER HIT HY 150 (FILLER TUBE)

NOTES:
1) ANCHOR PINS ARE 1" DIA HEX HD, POINTED, GALV RODS (A307)
2) PORTLAND CEMENT CONCRETE (PCC)
3) ASPHALTIC CONCRETE (ACP)
4) BASE AND/OR COMPACTED SOIL (BASE)
5) ADIEM INSTALLATION NOT RECOMMENDED ON LOOSE SOIL.

ALTERNATE ADIEM INSTALLATION INSTRUCTIONS

1. At a holding site, the modules are slid into the ADIEM base after oiling the base track. Be careful not to damage the edges of the modules while sliding them onto the base.
2. If the modules are scuffed or nicked, apply GARNA-THANE coating to the affected area.
3. The unit is then delivered to the job site. The unit is to be placed on a smooth surface (the same horizontal slope as the concrete barrier) and parallel to the mailine or ramp traveled lane (s).
4. The front module should be removed so the remaining modules can be shifted for easy access for drilling the anchor rod holes.
5. Install anchor rods for ADIEM base by driving in soil or soft asphalt or driving in predrilled holes for hard asphalt or concrete (no epoxy required). The base should not be moved after the holes are drilled. The holes should be drilled using, at a minimum, a 35# hammer and a minimum 36 inch long drilling bit. (A 50# hammer is recommended.)
6. Attach connection brackets to base with two (2) 1 1/8" X 25" hex head bolts provided. Then field drill holes in the existing barrier and attach connection brackets to it with chemically grouted hardware provided.

REV.	CHK'D	BY	DATE	REMARKS
6	B.T.	L.H.	12/10/03	REPLACED GROUT WITH HILTI, UPDATED DWG
5		L.H.	03/12/03	DELETED NOTE #7, REVISED NOTE #3
4	D.D.	L.H.	12/17/99	REVISED COATING, CHANGED TITLE BLOCK
3		BT	3-14-97	DELETED PC 5484, ADDED PC 5052, CHG QTY PC 3976
2		BT	2-14-97	GENERAL UPDATES

ADIEM 30'

ERECTION DETAILS

DRAWN	B.TAKACH
CHECKED	D.D.
APPROVED	
DATE	3/19/96
ENG. FILE #	SS349-01E
SHT.No.	E1 OF 1
DRAWING NO.	SS 349
REV.	6

TRINITY INDUSTRIES, INC.
HIGHWAY SAFETY PRODUCTS
2525 STEMMONS FREEWAY, DALLAS, TX 75207

QuadGuard® CZ System

PORTABLE NON-GATING REDIRECTIVE CRASH CUSHION FOR WORK ZONES

OVERVIEW

The innovative QuadGuard CZ System has been improved with the addition of modular plate bases to reduce anchorage and speed installation. The QuadGuard CZ System meets all of today's strict crash cushion performance criteria. The QuadGuard CZ System provides the same lifesaving efficiency and features of the permanent QuadGuard System, in a compact, portable system that is easier than ever to install.

During head-on impacts, the QuadGuard Systems telescope rearward and crush the cartridges to absorb the energy of impact. When impacted from the side at angles up to 20°, the QuadGuard Systems safely redirect the errant vehicle back toward its original travel path without allowing gating.

FEATURES AND BENEFITS

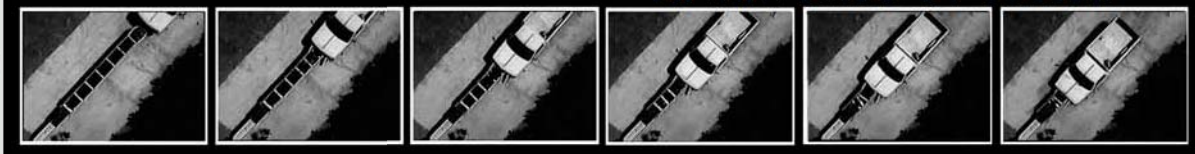
- NCHRP 350 TL-3 performance requires only 30 anchors
- Compact, modular design can accommodate speeds from 70 km/h (45 mph) to 115 km/h (71 mph)
- 80% reusability after most design impacts
- Lifting points allow easy repositioning as a complete unit
- Easy to access anchor holes allow for fast installation
- Available in 610, 762 & 910 mm (24, 30 & 36 in.) widths to protect a wide array of hazards

Modular plate base reduces anchorage and speeds installation

Built-in lifting points allow the system to be moved as a complete unit

ENERGY ABSORPTION SYSTEMS, INC.

SAVING LIVES BY DESIGN



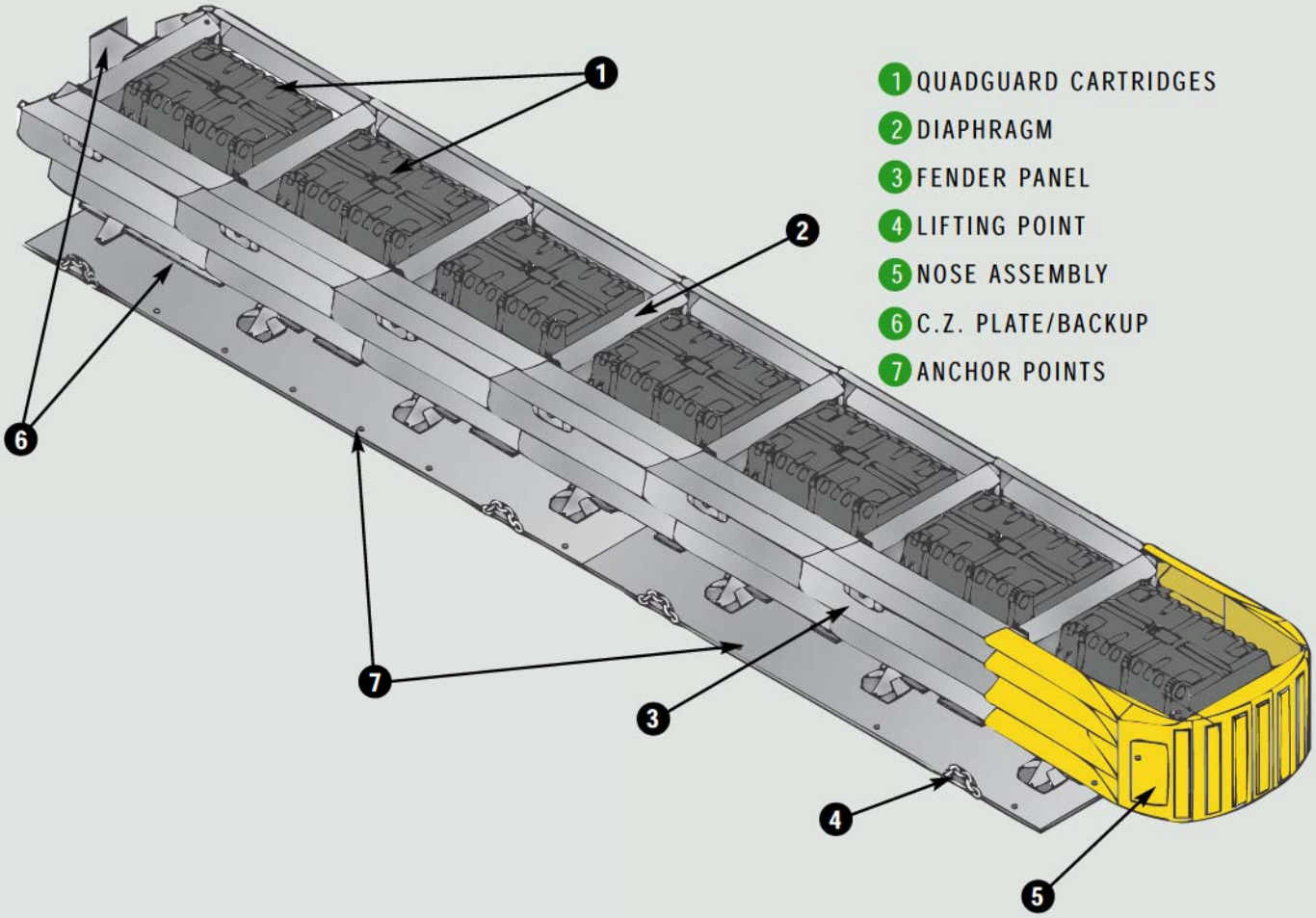
WWW.ENERGYABSORPTION.COM

QUICK & EASY INSTALLATION & REMOVAL

- Only 30 anchor bolts needed for TL-3 six bay unit
- Easy access to anchor holes
- Entire system can be moved as a single unit using lifting points

SPECIFICATIONS

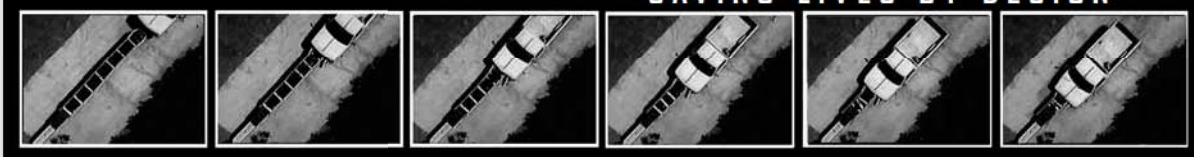
Minimum Width at Backup	610.0 mm	(2')
Maximum Width at Backup	915 mm	(3')
Weight (typical 6-bay unit)	1594.0 kg	(3512 lb.)
Length (typical 6-bay unit)	6.4 m	(21')



1. QUADGUARD CARTRIDGES
2. DIAPHRAGM
3. FENDER PANEL
4. LIFTING POINT
5. NOSE ASSEMBLY
6. C.Z. PLATE/BACKUP
7. ANCHOR POINTS

Quixote Transportation Safety

SAVING LIVES BY DESIGN



WWW.QUIXTRANS.COM

ENERGY ABSORPTION SYSTEMS, INC.

35 East Wacker Drive • Chicago, IL 60601
Tel: (312) 467-6750 • Fax: (312) 467-9625
www.energyabsorption.com

Distributed By:

General specifications for the QuadGuard System are subject to change without notice to reflect improvements and upgrades. Additional information is available in the Product Manual for this system. Contact Energy Absorption Systems for details.

ABSORB 350® | NON-REDIRECTIVE CRASH CUSHION - SACRIFICIAL

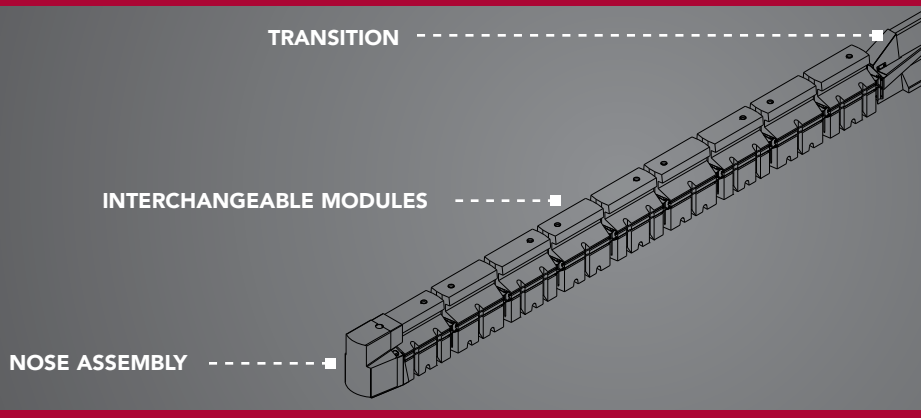
- ANCHORLESS INSTALLATION - NO FOUNDATION REQUIRED
- COST EFFECTIVE PROTECTION FROM CONCRETE BARRIER ENDS
- WORLDWIDE PROVEN PERFORMANCE
- NCHRP 350 ACCEPTED

BARRIER SYSTEMS®
BY LINDSAY

ABSORB 350® | NON-REDIRECTIVE CRASH CUSHION - SACRIFICIAL

PHYSICAL SPECIFICATIONS

Classification	NR-S	
TL-3 Length	32′	9.7 m
Width	24″	610 mm
Height	32″	813 mm
Module Weight Empty	110 lb.	50 kg
Test Level	NCHRP 350	TL 1/2/3



NARROW ANCHORLESS WATER FILLED CRASH CUSHION

No ground anchoring, the largest selection of transitions and modular technology allow the ABSORB 350 System to be used in multiple speed conditions. The ABSORB 350 System is ideal for contractors due to the ease of maintenance after an impact and quick deployment. At 24″ (610 mm) wide, it is ideally suited for narrow areas where road and workspace is limited. The ABSORB 350 System is easy to restore after an impact because the System uses uniform modular components. The use of standardized modular components also helps to reduce inventory costs.

FREQUENTLY ASKED QUESTIONS

Can the nose be angled off the barrier to better face traffic?
Yes, as long as all of the ABSORB 350 modules remain pinned and connected. For larger angles, it is recommended that the last barrier section be moved to face traffic.

Can the ABSORB 350 System be moved while filled with water?
Yes, the System is rigid enough to be repositioned filled with water by sliding the optional wheel / jack assembly under each element.

What transitions are available?
Dozens of transition options are available, including attachments to; Standard NJ / J / K / F, Wide / X-Wide NJ, I-Lock, Smooth Face, JJ Hook, QMB, ArmorGuard®, Orion®, BarrierGuard® and ZoneGuard®.

Can the ABSORB 350 System be used during cold weather?
Since ABSORB 350 modules have no internal steel parts, the use of any approved anti icing chemical is acceptable.

FEATURES

- Rapid deployment and retrieval
- No ground anchoring required
- Low initial price
- Narrow footprint
- Can be deployed on almost any road surface
- Meets NCHRP 350 TL-1, TL-2, TL-3 test criteria
- Easily transitioned to multiple widths and shapes of barriers
- Nose and transition are reusable after most design impacts
- Approved for use in permanent and work zone locations

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Lindsay Transportation Solutions Sales and Services, Inc.
180 River Road • Rio Vista, CA 94571 • +1 707.374.6800 U.S. Toll Free: 888.800.3691 • www.barrriersystemsinc.com
General details for the ABSORB 350 System are subject to change without notice to reflect improvements and upgrades.
Additional information is available from Lindsay Transportation Solutions Sales and Services, Inc.
PT # ABS04-03252013

ACZ-350™

PORTABLE
TL-2 & TL-3
END
TREATMENT

OVERVIEW

The ACZ-350 System combines ease of use and NCHRP 350, gating, non-redirective TL-2 and TL-3 crash cushion performance for work zone protection. This partially reuseable crash cushion can be easily transported, and installed with No Roadway Anchors.

SUPERIOR IMPACT PERFORMANCE

The unique design of the ACZ-350 systems protects errant drivers from impacting concrete barrier ends, and also contains the errant vehicle from vaulting into the workzone.

FEATURES AND BENEFITS

- No Vaulting
- Safely contains errant vehicle
- Accommodates impacts up to 2,000 kg, (4,500 lbs) traveling at speeds up to 100 km/h (62 mph)
- Simple and Fast Installation
- Protects Permanent or Temporary, Steel or Concrete Barrier
- Ideal for Work Zones
- No Foundation or Anchoring

EASY CLEAN-UP
NARROW PROFILE
MINIMUM INTRUSION
LOW COST/ AFFORDABLE
QUICK/EASY TO MOVE

NON-REDIRECTIVE, GATING CRASH CUSHION SYSTEM

All Crash Cushions defined as Non-redirective and Gating require a clear zone. Clear Zones are areas behind the crash cushion that NO workers, machinery, obstructions or other debris could interfere with an errant vehicle. This area should also remain relatively flat. If there are any questions or concerns, please contact your local Energy Absorption Systems, Inc. representative.



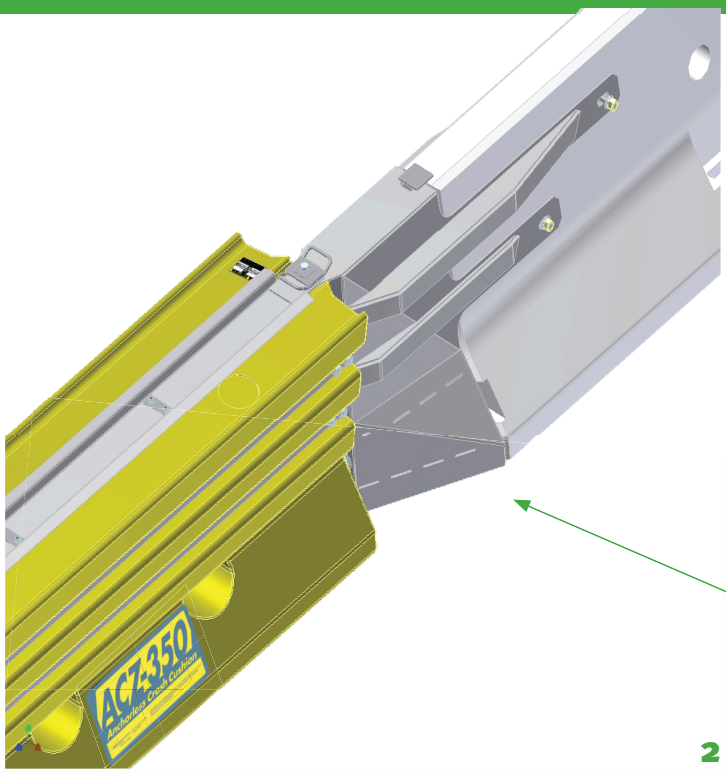



ENERGY ABSORPTION SYSTEMS, INC.

SAVING LIVES BY DESIGN®

www.energyabsorption.com

ACZ-350™

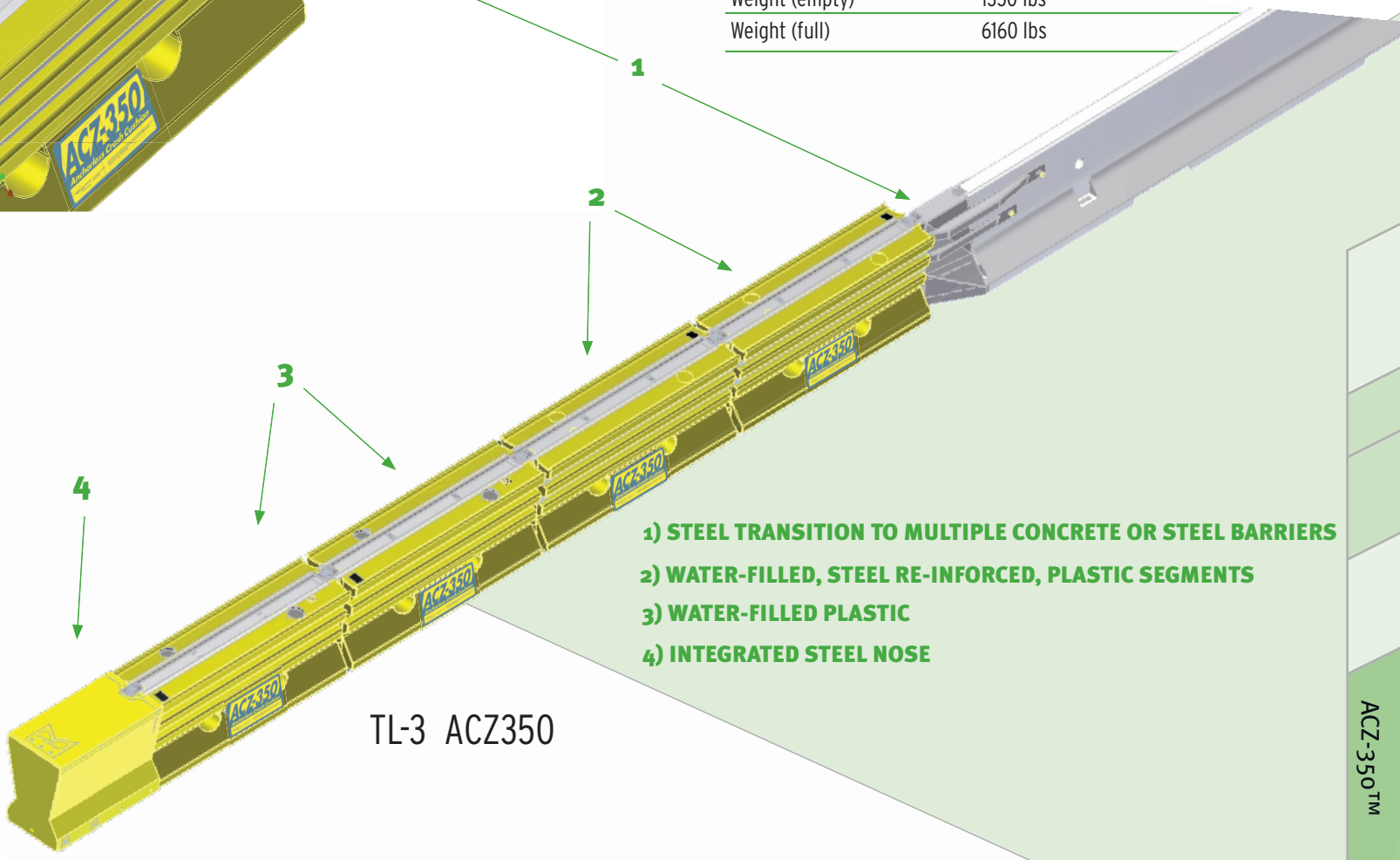


EASY DEPLOYMENT AND REMOVAL

The ACZ-350 System can be easily unloaded and positioned without cranes or heavy equipment. Deployment involves three simple steps:

1. Unload
2. Position and pin barrier sections.
3. Fill Segments with water

SPECIFICATIONS	TL-3
Length	31'-7" (9.6 m)
Width	1'-10" (.6m)
Height	2' 9" (.8m)
Weight (empty)	1350 lbs
Weight (full)	6160 lbs



TL-3 ACZ350

1) STEEL TRANSITION TO MULTIPLE CONCRETE OR STEEL BARRIERS

2) WATER-FILLED, STEEL RE-INFORCED, PLASTIC SEGMENTS

3) WATER-FILLED PLASTIC

4) INTEGRATED STEEL NOSE

ACZ-350™

DISTRIBUTED BY:

Quixote Transportation Safety

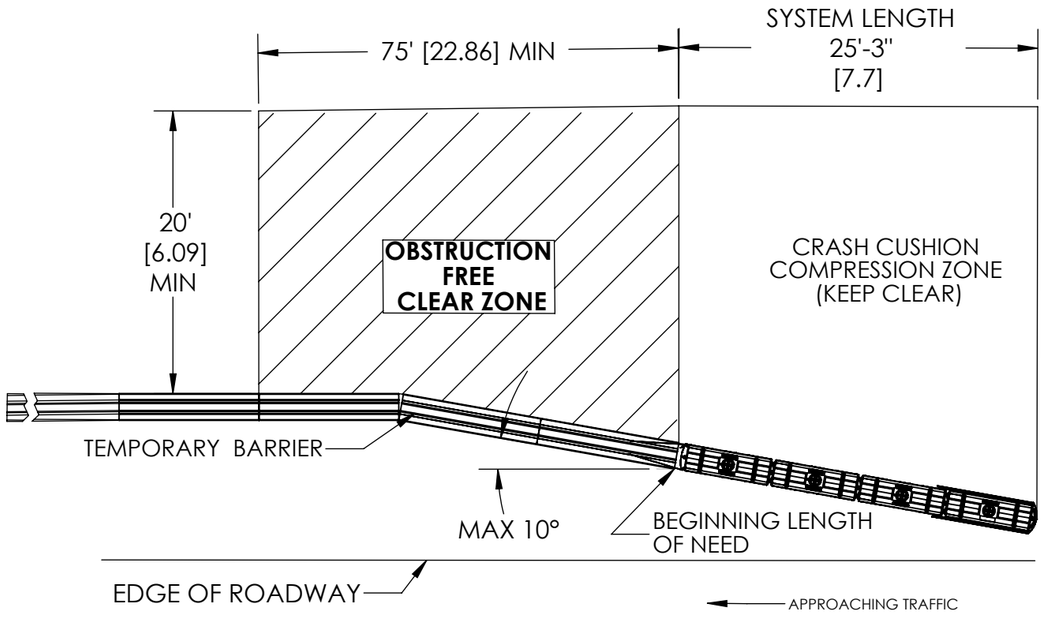
35 East Wacker Drive • Chicago, IL 60601
Tel: (312) 467-6750 • Fax: (312) 467-9625
www.energyabsorption.com

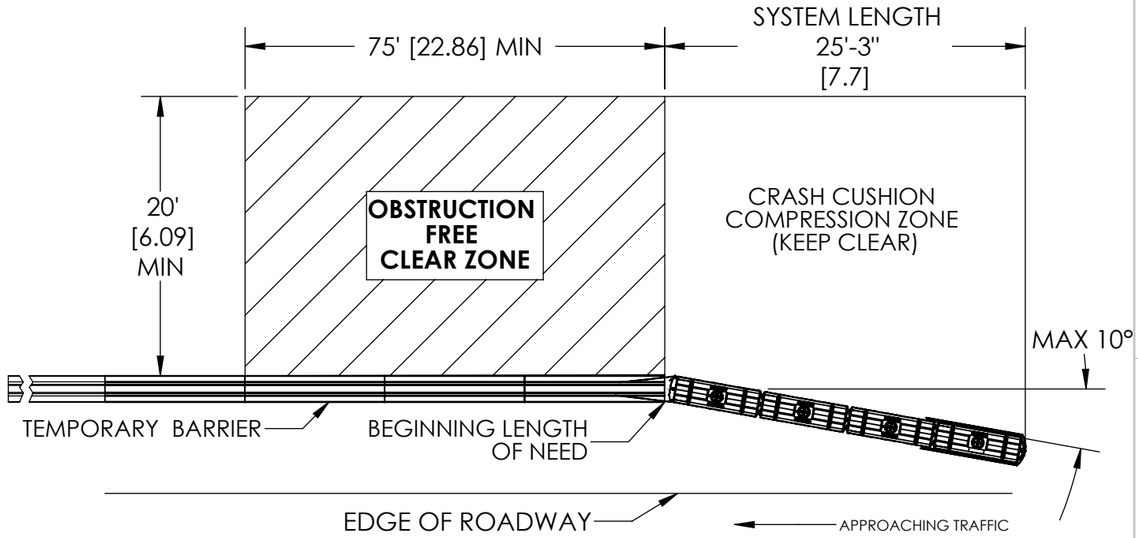
ENERGY ABSORPTION SYSTEMS, INC.

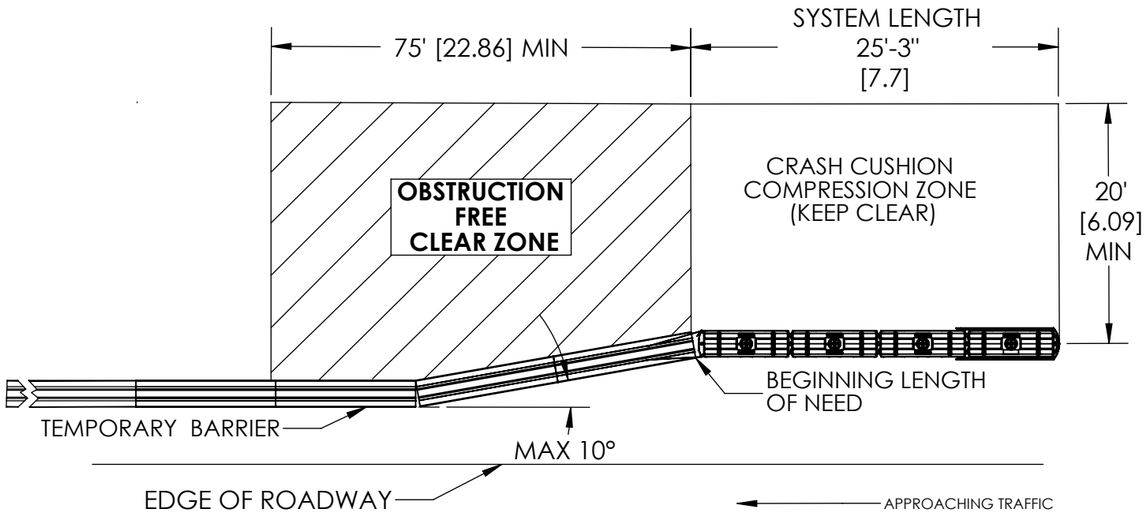
www.quixtrans.com

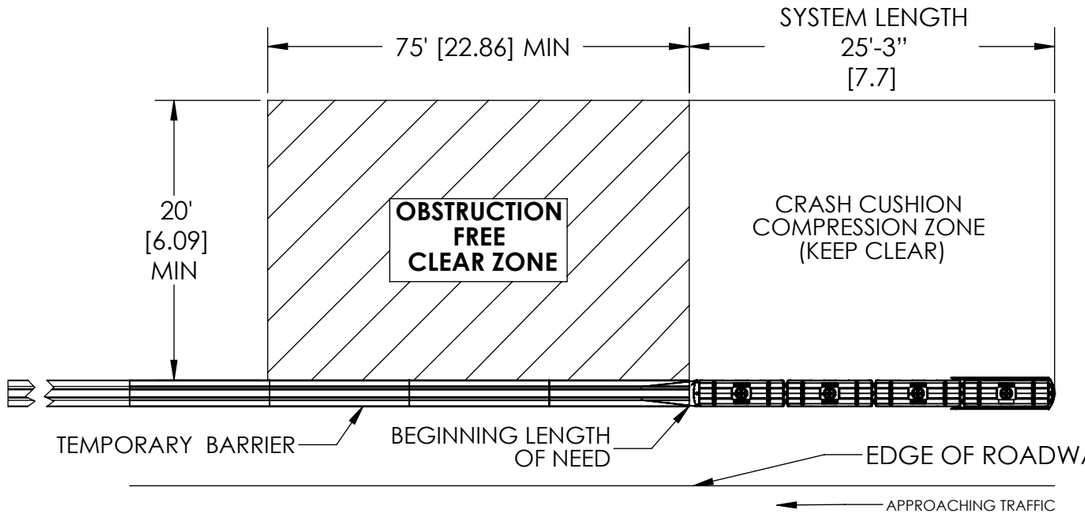
SLED EURO TERMINAL MANUFACTURED BY TRAFFIX DEVICES, INC., 160 AVENIDA LA PATA, SAN CLEMENTE, CA 92673 (PHONE: 949-361-5663) AND DISTRIBUTED BY A&A SAFETY. (PHONE: 513-943-6100)

DRAWING NUMBER	DRAWING NAME	MOST RECENT REVISION DATE
300-148	SLED END TREATMENT ANCHORED/UNANCHORED CONFIGURATIONS	6/9/2011
300-147	SLED END TREATMENT SYSTEM	6/10/2011
300-146	SLED END TREATMENT TL3	6/10/2011
45044-Y	SLED END TREATMENT MODULE	6/10/2011
45044-T	SLED END TREATMENT TRANSITION ASSEMBLY (PAGE 1 OF 6 ONLY)	6/2/2010
SPEED CONFIGURATION	TL-2 & TL-3 SPEED CONFIGURATION	--









NOTES:

1. MINIMUM LENGTHS OF TEMPORARY CONCRETE BARRIER ARE BASED ON UN-ANCHORED LENGTHS
2. SLED END TREATMENT SYSTEM DOES NOT REQUIRE ATTACHMENT TO A FOUNDATION. THE SYSTEM CAN BE LOCATED ON FIRM SOIL, ASPHALT, OR CONCRETE SURFACES.
3. SLED SYSTEM ANGLED TOWARD TRAFFIC AT ANGLE APPROPRIATE PER STATE AND LOCAL SPECIFICATION FOR GATING CRASH CUSHION.
4. RUN OF BARRIER SHALL MEET THE LENGTH OF NEED CALCULATION
5. SLED SYSTEM TO BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS AND SPECIFICATION
6. AN APPROPRIATE OBSTRUCTION FREE CLEAR ZONE MUST BE ADJACENT TO THE SLED SYSTEM. THE OBSTRUCTION FREE CLEAR ZONE REPRESENTS THE IMPACT TEST RECOVERY AREA OF APPROXIMATELY 75 FT LONG BY 20 FT WIDE.
7. IN ADDITION TO THE RECOMMENDED OBSTRUCTION FREE CLEAR ZONE, AN AREA DIRECTLY ADJACENT TO THE CRASH CUSHION (CRASH CUSHION COMPRESSION ZONE) MUST BE KEPT CLEAR

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN FEET[m].

TrafFix Devices Inc.
160 Avenida La Pata
San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
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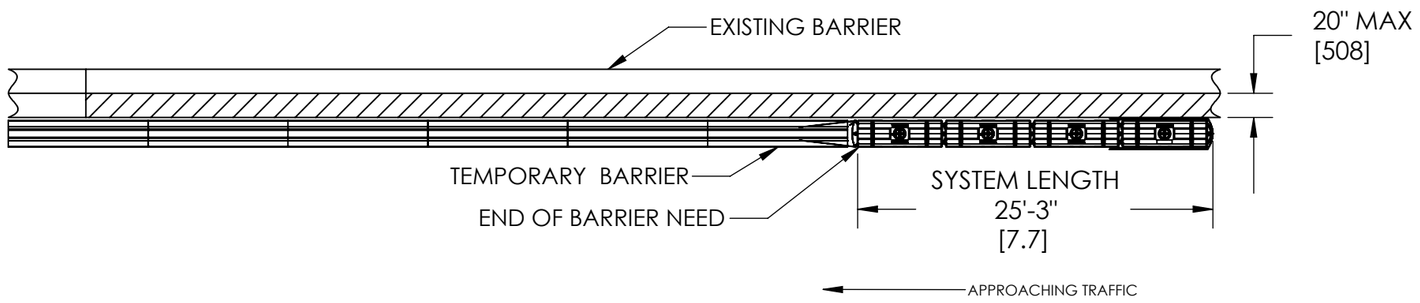
TITLE:
SLED END TREATMENT ANCHORED/UNANCHORED CONFIGURATIONS

DRAWN BY:	DATE:
Mary Dralle	06-09-11
CHECKED BY: FA	DATE: 06-09-11
APPROVED BY: FA	DATE: 06-09-11

SIZE	DWG. NO.	REV
B	300-148	C



ROADSIDE INSTALLATION ON APPROACH OF ELEVATED BRIDGES OR ROADWAYS

PLACEMENT OF THE SLED SYSTEM ON ELEVATED BRIDGE DECKS OR ROADWAYS ADJACENT TO EXISTING RAIL OR BARRIER SHALL BE OFFSET AT LEAST 20 INCHES [0.5 METER] FROM THE EXISTING RAIL OR BARRIER.

HATCHED AREA TO BE KEPT CLEAR OF ANY OBJECTS

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN FEET[m].

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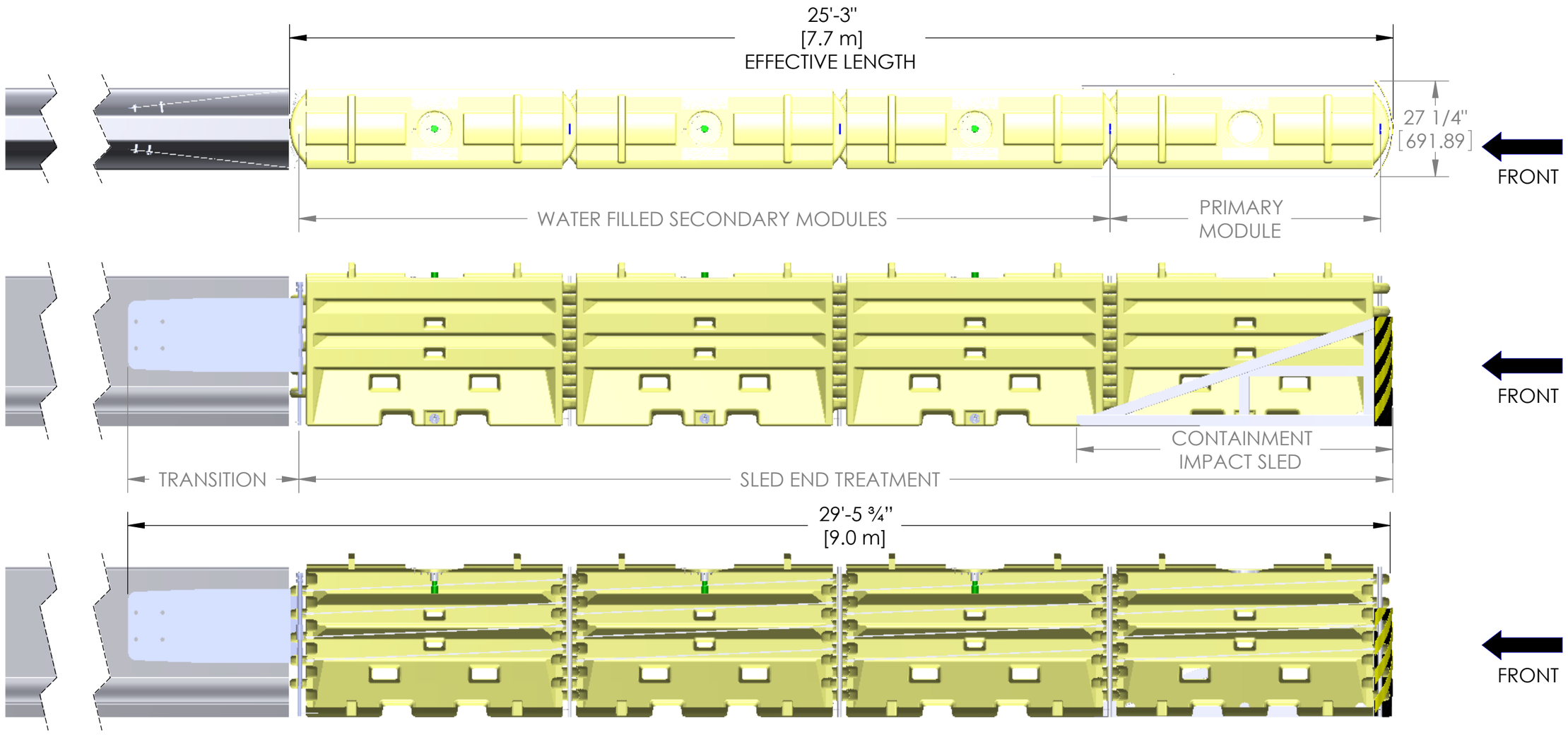
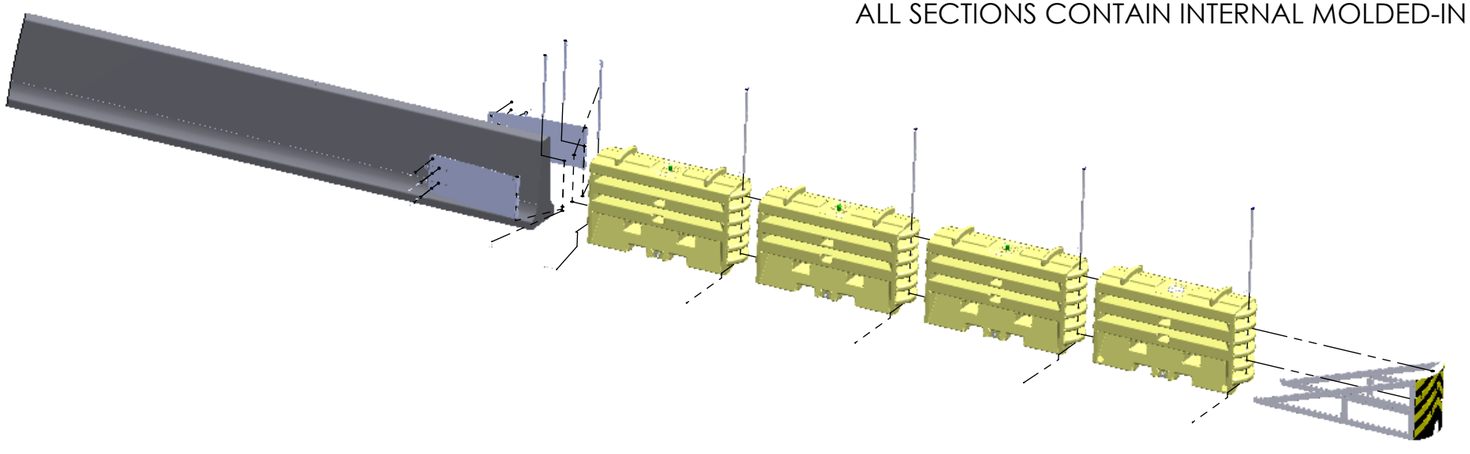
TITLE: SLED END TREATMENT ANCHORED/UNANCHORED CONFIGURATIONS

DRAWN BY: Mary Dralle	DATE: 06-09-11	SIZE B	DWG. NO. 300-148
CHECKED BY: FA	DATE: 06-09-11		REV C
APPROVED BY: FA	DATE: 06-09-11		SHEET 2 OF 2



CUT AWAY SLED END TREATMENT
ALL SECTIONS CONTAIN INTERNAL MOLDED-IN CABLES.



UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES[mm].
TOLERANCES:
FRACTIONAL: X/X ± 1" [25.4mm]
DECIMAL: .000 ± .0625
DEGREES: ± 0.5°

DRAWN BY: Mary Dralle	DATE: 06-10-11
CHECKED BY: FA	DATE: 06-10-11
APPROVED BY: FA	DATE: 06-10-11

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160 Avenida La Pata
San Clemente, CA 92673
(949) 361-5663
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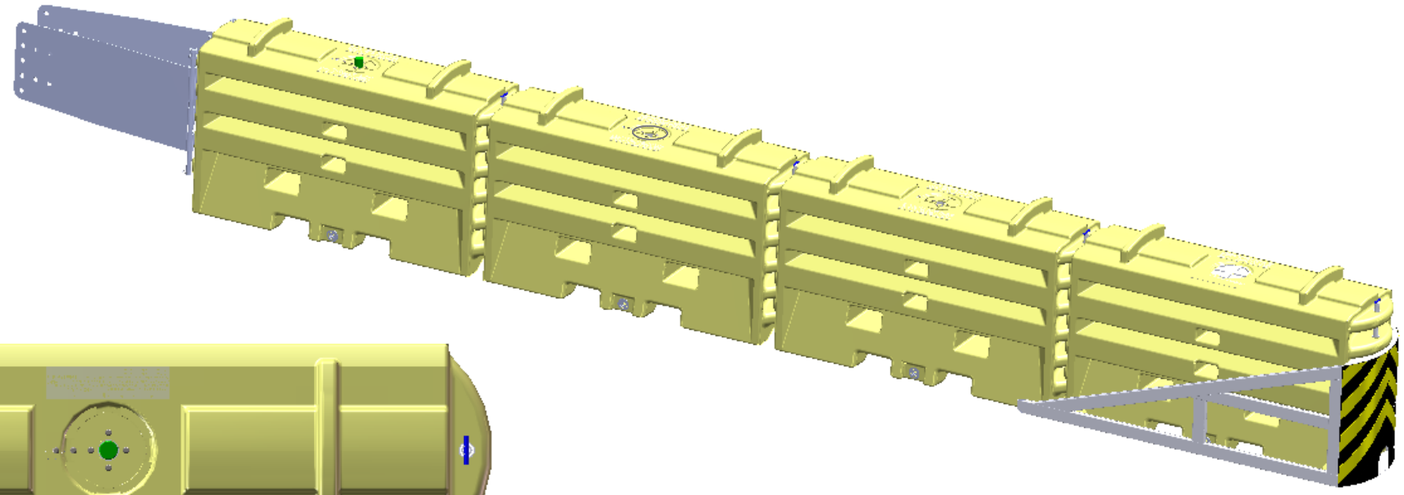
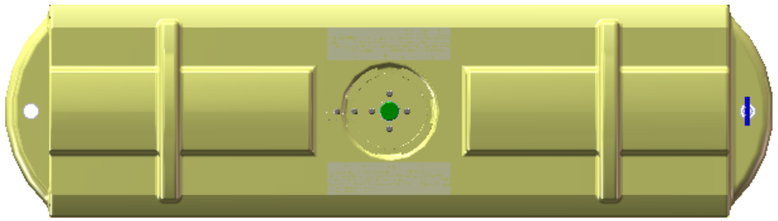
www.traffixdevices.com

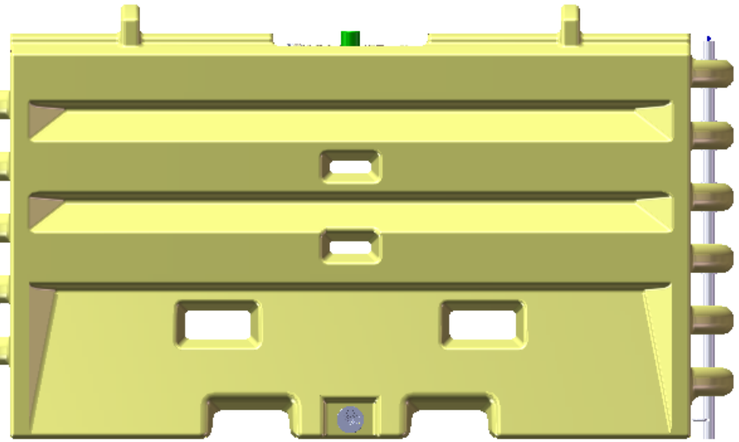
TITLE:
SLED END TREATMENT SYSTEM

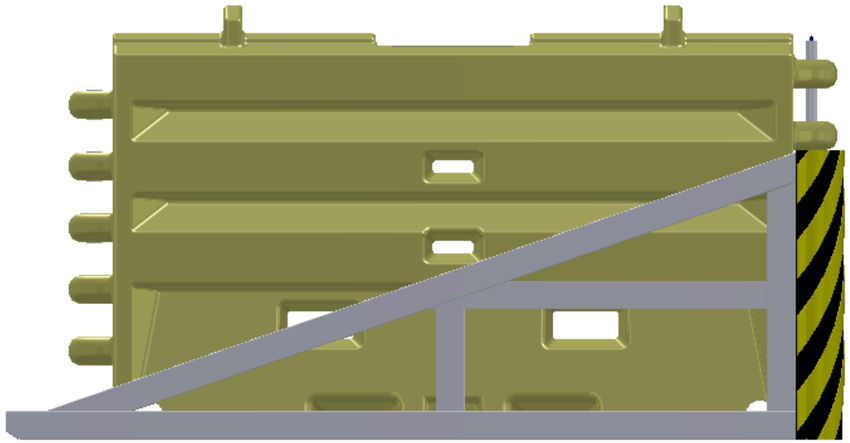
SIZE	DWG. NO.	REV
B	300-147	A

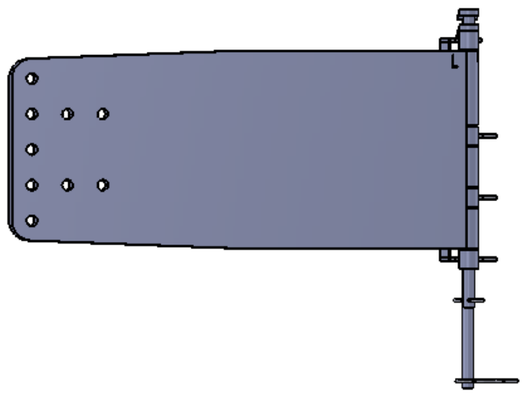
SHEET 1 OF 1











45044-T

45044-Y

45044-CIS

PN	DESCRIPTION	QTY
45044-Y-CIS	Containment Impact Sled	1
45044-Y	43" SLED End Treatment Module	3
45044-T	SLED End Treatment Transition	1

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES[mm].
TOLERANCES:
FRACTIONAL: X/X ± 1/16" [1.6mm]
DECIMAL: .000 ± .0625
DEGREES: ± 0.5°

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FAX (949) 361-9205
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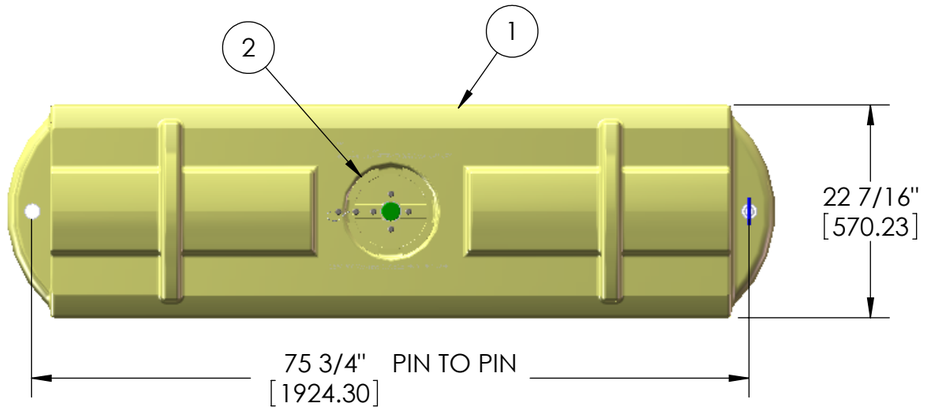
TITLE:

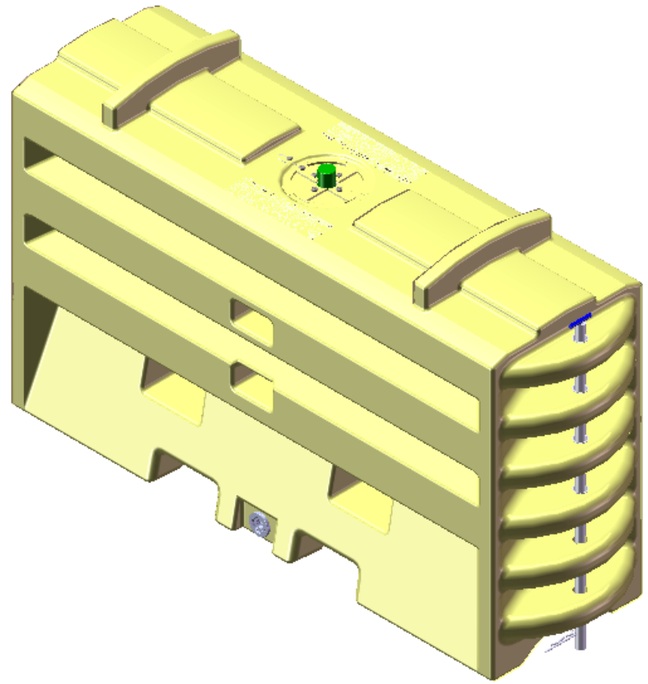
SLED End Treatment TL3

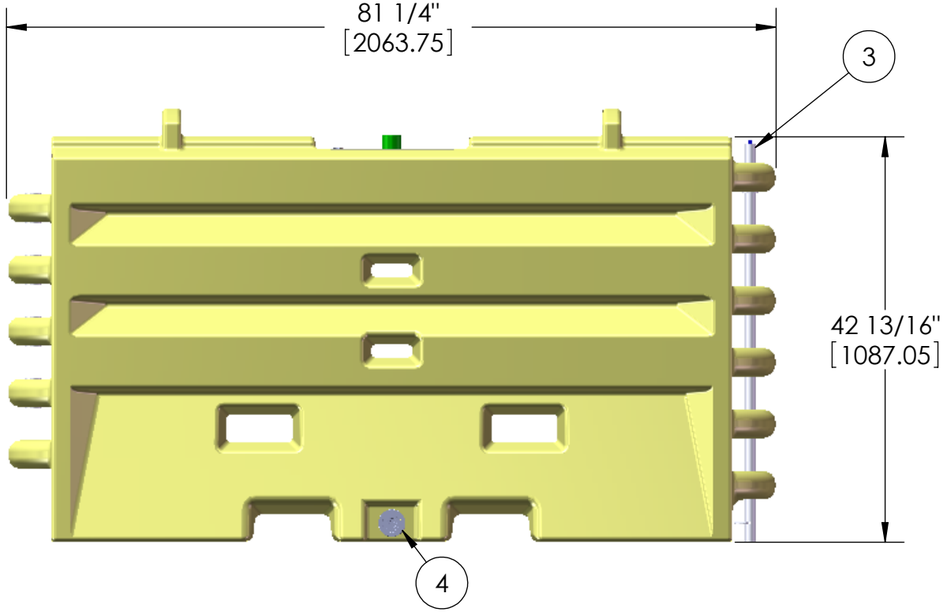
DRAWN BY: Mary Dralle	DATE: 06-10-11	
CHECKED BY: GM	DATE: 06-10-11	
APPROVED BY: GM	DATE: 06-10-11	

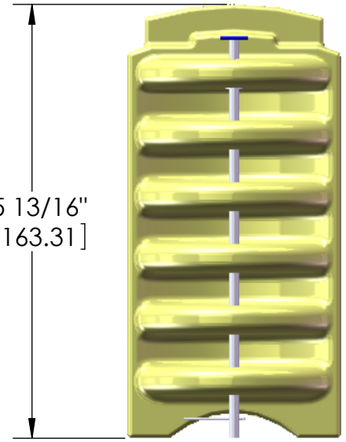
SIZE B | DWG. NO. 300-146 | REV A

SHEET 1 OF 1









SLED END TREATMENT
UNITS: INCHES [mm]
COLOR: YELLOW
EMPTY WEIGHT: APPROX. 160 LBS. [73 kg]
FILLED WEIGHT: APPROX. 2000 LBS [907 kg].
FILL MATERIAL: WATER

ITEM	DESCRIPTION	PN	QTY
1	43" SLED End Treatment	45044-YEL	1
2	Water Level Indicator Fill Cap	18009-Y-I	1
3	Sentry Water Cable Barrier T-Pin w/Keeper Pin	45043-CP	1
4	Water Wall Drain Plug	45033-RC-B	1

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TOLERANCES:
FRACTIONAL: X/X ± 1/16" [1.6mm]
DECIMAL: .000 ± .0625
DEGREES: ± 0.5°

DRAWN BY: Mary Dralle	DATE: 06-10-11	
CHECKED BY: FA	DATE: 06-10-11	
APPROVED BY: FA	DATE: 06-10-11	

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160 Avenida La Pata
San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
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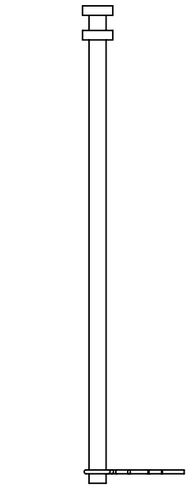
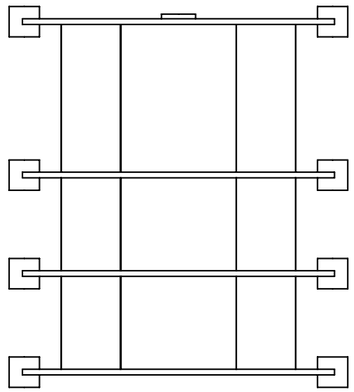
TITLE:
SLED END TREATMENT MODULE

SIZE	DWG. NO.	REV
B	45044-Y	A

SHEET 1 OF 1

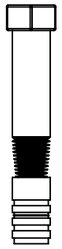


45145
SLED TRANSITION
SHORT DROP PIN



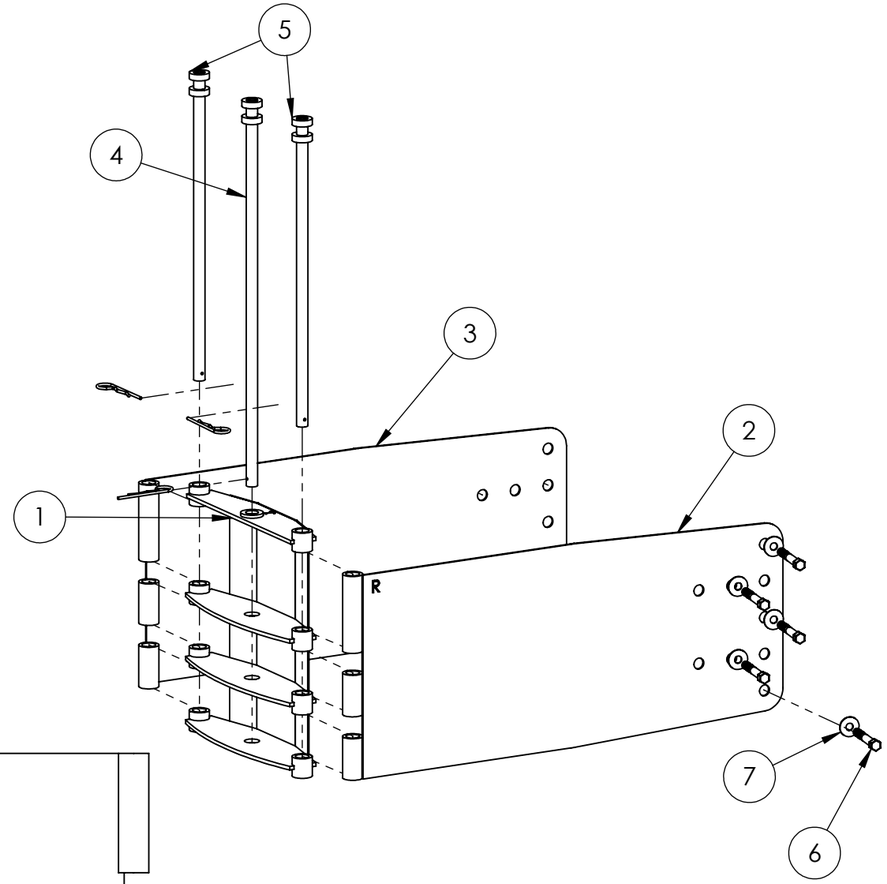
45130
SLED TRANSITION FRAME

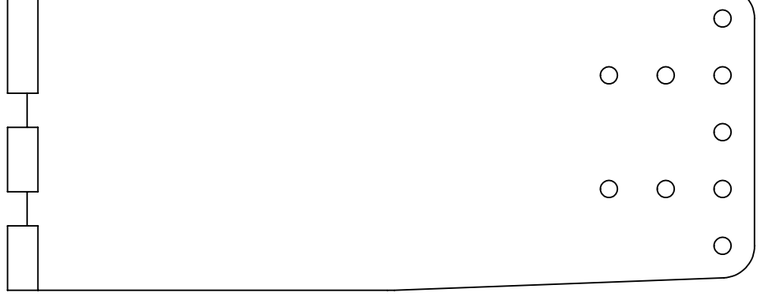
45140
SLED TRANSITION
LONGDROP PIN



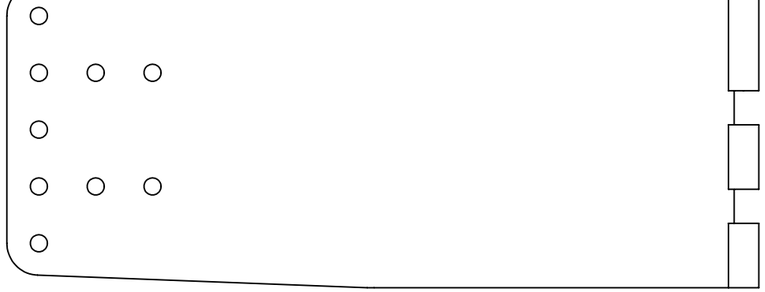
45047
BOLT,
TAPER ANCHOR,
3/4" X 4-1/8"

12060
WASHER, FLAT,
3/4"IDX2"OD





45150L
SLED TRANSITION PANEL, LEFT



45150R
SLED TRANSITION PANEL, RIGHT

ITEM NO.	DESCRIPTION	PN	QTY
1	SLED TRANSITION FRAME ASSY	45130	1
2	RIGHT SLED TRANSITION PANEL ASSY	45150R	1
3	LEFT SLED TRANSITION PANEL ASSY	45150L	1
4	SLED TRANSITION LONG DROP PIN	45140	1
5	SLED TRANSITION SHORT DROP PIN	45145	2
6	BOLT, TAPER ANCHOR, 3/4" X 4/1/8"	45047	9
7	WASHER, FLAT, 3/4"ID X 2"OD	12060	9

2. FINISH: HOT DIP GALVANIZE
1. MATERIAL: A36 AND A513 STEEL
NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
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TOLERANCES:
FRACTIONAL: X/X ± 1/16" [1.6mm]
DECIMAL: .000 ± .0625
DEGREES: ± 0.5°

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San Clemente, CA 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

TITLE: SLED END TREATMENT TRANSITION ASSY

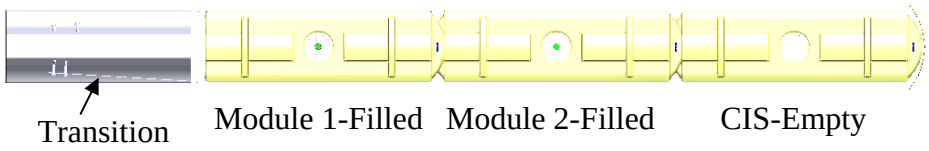
DRAWN BY: Mary Dralle	DATE: 06-02-10	
CHECKED BY: FA	DATE: 06-02-10	
APPROVED BY: FA	DATE: 06-02-10	

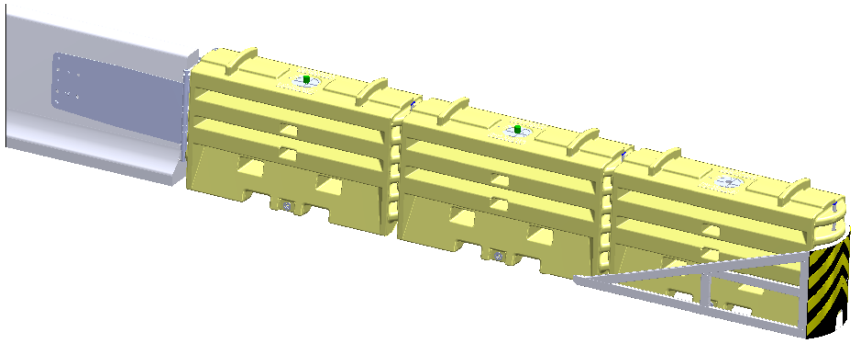
SIZE B | DWG. NO. 45044-T | REV B

SHEET 1 OF 6

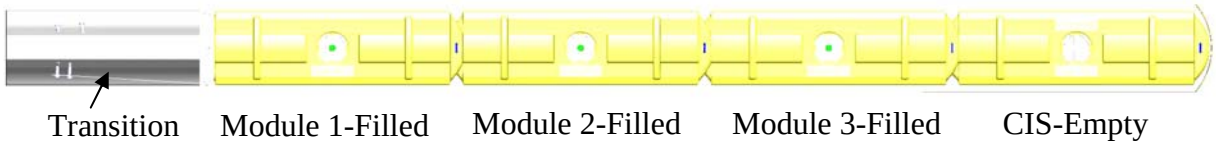
Speed Configuration

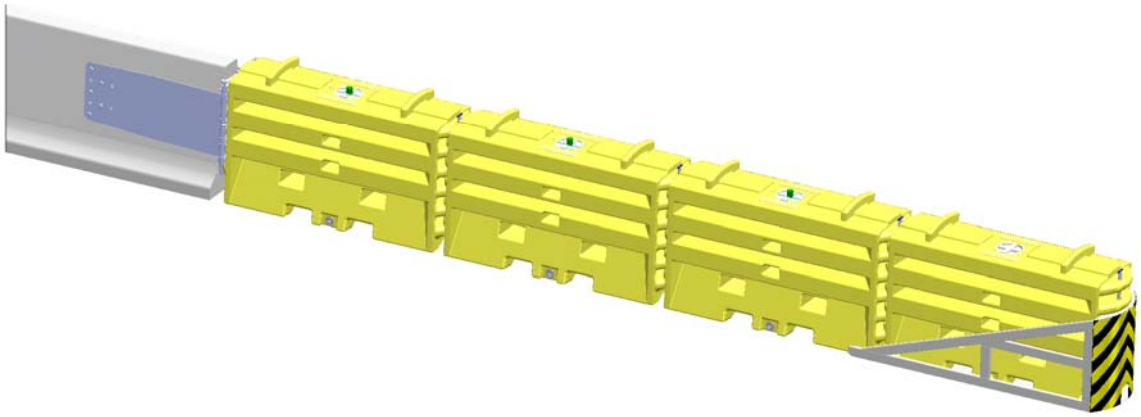
TL-2 Configuration





TL-3 Configuration





* CIS is ALWAYS empty.

NOTE:
1. USE 15'-7½" LENGTH RAIL.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

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.

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

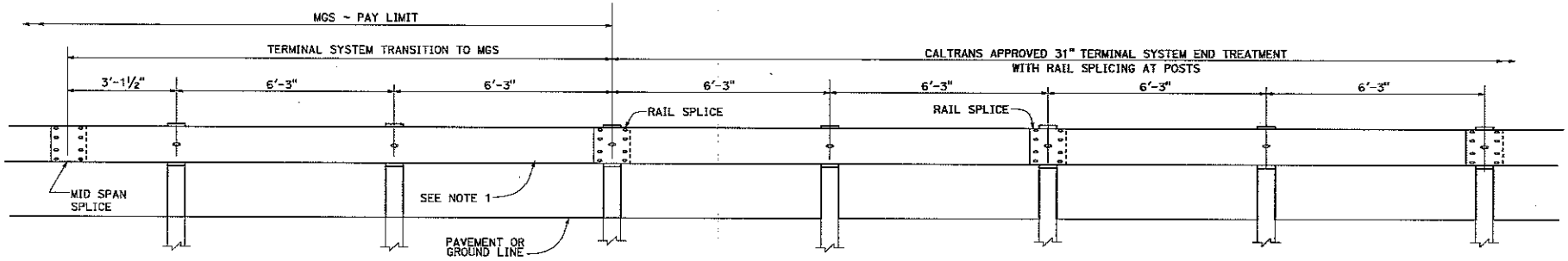
REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans



TRANSITION DETAIL FOR 31" TERMINAL SYSTEM END TREATMENT WITH RAIL SPLICING AT POSTS TO MIDWEST GUARDRAIL SYSTEM

LAST REVISED | DATE PLOTTED => 28-FEB-2014
00-00-00 | TIME PLOTTED => 12:55

BORDER LAST REVISED 7/2/2010 | USERNAME => s114640 | DGN FILE => mgs transition details.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0000 | PROJECT NUMBER & PHASE 00000000001