Status Report No. 1, Retrofit Pilot Program, Caltrans District 11

March 30, 1998
CTSW-RT-98-098

Prepared by:
Robert Bein, William Frost & Associates
Table of Contents

1.0 Introduction ................................................................. 1
  1.1 Background and Purpose ............................................. 1
  1.2 Report Organization and Content .................................. 1

2.0 BMP Retrofit Pilot Program Siting .................................. 3
  2.1 Background .................................................................. 3
  2.2 Objectives of the Retrofit Pilot Program ......................... 4
  2.3 Siting Process ............................................................ 4
  2.4 Siting Problems and Solutions ..................................... 5
    2.4.1 Wet Basin .............................................................. 5
    2.4.2 Extended Detention Basins ..................................... 6
    2.4.3 Infiltration Basins ................................................ 7
    2.4.4 Infiltration Trenches ............................................. 7
    2.4.5 Biofilters ............................................................. 8
    2.4.6 Media Filters ....................................................... 8

3.0 BMP Pilot Program Siting Costs ..................................... 8

4.0 Conclusions .................................................................. 9
  4.1 Siting .......................................................................... 9

5.0 BMP Retrofit Pilot Program Design ................................ 9
  5.1 Background .................................................................. 9
  5.2 Objectives .................................................................. 10
  5.3 Design Process ........................................................... 10
  5.4 Construction Plans ...................................................... 11
  5.5 Basis of Design .......................................................... 11
  5.6 Consultation with Experts and Regulatory Agencies on Special Issues .... 12
  5.7 Conclusions .................................................................. 12

Appendix

<table>
<thead>
<tr>
<th>Appendix A.1</th>
<th>BMP Pilot Design Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A.2</td>
<td>Geotechnical Reports</td>
</tr>
<tr>
<td>Appendix A.3</td>
<td>Construction Plans</td>
</tr>
<tr>
<td>Appendix A.4</td>
<td>Site Listings</td>
</tr>
</tbody>
</table>
Status Report #1
BMP Retrofit Pilot Program
District 11

1.0 Introduction

1.1 Background and Purpose

Periodic status reports and meetings are specified in the District 11 Scoping Study as a vehicle to update the Plaintiffs on the progress of the BMP Retrofit Pilot Program and receive input as to appropriate changes or modifications to the program. The status meetings have been scheduled on a regular basis to coincide with general project milestones and periods of significant activity. Scheduled dates for the periodic status meetings are given in the Scoping Study.

The Scoping Study also requires the preparation of status reports for each meeting to provide a background for the meeting discussion. The status reports will be prepared two weeks in advance of the status meeting to allow for adequate review time.

The scope of the status reports includes the activities of the program that precede the status meetings. Status reports will include information regarding the Pilot Program siting, design, operation and maintenance program, monitoring reports, program costs and correspondence with special consultants. Each of these topics will be addressed as the information becomes available over the scheduled course of the program. The program Master Schedule is contained in the Scoping Study.

1.2 Report Organization and Content

The BMP Retrofit Pilot Program was formally initiated in the fall of 1997. Since that time, siting of the pilot projects has been substantially completed and significant progress has been made in design of the Pilots. Consequently, this status report contains information relative to siting and design of the BMP Retrofit Pilot Program in District 11.

The report is organized into two primary sections with an Appendix. The first section discusses the siting process, the problems encountered during siting of the Pilots and solutions developed for the identified problems. Cost information is also provided for the siting phase of the program.

The second report section provides information relative to the design phase of the program. Currently, design is only partially complete. A complete discussion of the designs, and design assumptions will be provided in a Basis of Design Report to be...
published per the detailed project design schedule contained in the Appendix. A discussion of design costs will be included in the next status report.

The Appendix is divided into five sections. Appendix A.1 contains a synopsis of information relative to the design of each Retrofit Pilot Project. The data is formatted as 'information sheets' for each pilot site, and contains the basic design information and design references in support of the construction plans.

Appendix A.2 contains the geotechnical report. A geotechnical evaluation was prepared for each site to provide an assessment as to the suitability of the site for the construction of the selected BMP as well as to screen the site for potential construction problems.

Appendix A.3 contains the construction plans for each pilot project. The construction plans are considered 90% complete, requiring Caltrans review and approval.

Appendix A.4 contains spreadsheets describing the pilot projects. The spreadsheets list each pilot project as well as its location and estimated construction cost (preliminary).

Appendix A.5 contains project schedules. A detailed project schedule is provided indicating significant project dates through the end of the year. The project Staging Plan is also provided in this Appendix, indicating the decision points and criteria to be used to determine whether pilot projects will proceed according to the master project primary or contingency schedule.
2.0 BMP Retrofit Pilot Program Siting

2.1 Background

As a result of litigation between Caltrans, the US EPA, San Diego Baykeeper and the National Resources Defense Council (NRDC), a Consent Decree was reached outlining, among other requirements, the development of a Best Management Practice (BMP) Retrofit Pilot Program in Caltrans District 11. The Retrofit Pilot Program includes the design, construction and monitoring of 5 BMP pilot projects. The District 11 Consent Decree requires the construction cost of the BMP Retrofit Pilot Program total $2.5 million. The types of devices proposed for siting of pilot projects identified in the Scoping Study include biofiltration strips, biofiltration swales, infiltration basins, infiltration trenches, media filters, extended detention basins, wet basins.

The various retrofit pilot projects have been sited so that retrofit options permit observations pertaining to technical feasibility, costs of retrofitting and benefits. Sites were originally selected based on their being common or typical along Caltran’s right-of-way, including interchanges, park and rides and maintenance facilities. Each site for a retrofit pilot project has been selected to be appropriate to the type of best management practice to be evaluated and without pre-judgment about the outcome of the associated retrofit pilot study.

Sites have been considered along Caltrans freeways and highways, maintenance stations and park and ride lots within District 11. The specific retrofit BMPs, and location are given in the Appendix (A.4).
The siting process was scheduled to occur from October 16, 1997 through January 16, 1998. Siting proceeded with field reconnaissance and visits in October 1997 and November 1997, January 22, 1998 and with the development of individual siting reports in December of 1997 for review by the Plaintiff. The siting process culminated in February 1998 with the publication of the Composite Siting Study (dated February 26, 1998).

Twelve sites have been selected for the 5 projects required by the Consent Decree. Some of the sites contain multiple BMPs (such as the Carlsbad Maintenance Station with an infiltration trench and a biofilter) and some of the BMPs were not sited that were originally contemplated (an oil/water separator). Difficulty was encountered in siting the infiltration BMP devices. Two infiltration basins and one infiltration trench that were originally planned were not sited due to lack of locations with suitable infiltration. The oil/water separator pilot was not sited due to lack of sites with sufficiently high concentrations of free oil and grease in the runoff. Detention basins were substituted for the unsited infiltration basin and trench pilots. A complete listing of the BMP Pilot sites is contained in the Appendix (A.4).

2.2 Objectives of the Retrofit Pilot Program

The pilot projects have been sited to support the overall objectives of the Retrofit Pilot Program which are to:

1. Determine the feasibility of design, construction and maintenance of the selected BMPs;
2. Evaluate the performance of the selected BMPs in removing constituents of concern in highway stormwater runoff; and
3. Evaluate the frequency and magnitude of operational problems associated with maintenance of the structures, including the projected design life of the structure (extrapolated from the operational period) and maintenance and safety concerns specific to transportation facilities and determine solutions to such problems that may be encountered.

The objective of the siting process was to select sites that were suitable for each of the selected types of BMPs, and through this process note the issues and constraints with the siting of each type of device.

2.3 Siting Process

Specific siting criteria for each BMP is described in detail in the report entitled, BMP Retrofit Pilot Program, Composite Siting Study, District 11, dated February 26, 1998.
The site selection process involved a multi-disciplinary approach to evaluating potential sites for suitability for the pilot projects. After preliminary reconnaissance, siting was focused initially on the more difficult pilot projects to locate. The first pilot projects to be sited were the oil/water separator projects which required monitoring of oil and grease in stormwater runoff before a final decision on whether or not to construct and operate such pilot projects could be made. Monitoring of the selected location was completed from October 1997 through January 1998. Siting of Oil/Water separator location was followed by Infiltration BMPs and Media Filters. The infiltration BMPs were difficult to site since they must meet space, safety, distance to existing structures and maintenance access requirements as well as soil infiltration criteria. Media filters require an existing storm drain system. Lastly, Detention Basins, Wet Basins and Biofilters were sited. Detention basins and wet basins have most of the criteria associated with infiltration basins relative to space and maintenance access requirements. Biofilters have fewer space and access criteria providing relatively greater opportunities for siting.

By following a tiered approach siting the most difficult BMPs (those with the most stringent criteria) first followed by those that are progressively easier to site, the selected sites received the type of BMP most suited to each location.

Individual siting reports were published for each type of BMP as siting was completed. Seven individual siting reports were published. These individual siting reports were subsequently published as a Composite Siting Study (Op. Cit.) which included the associated background information relative to siting criteria and preliminary and detailed geotechnical investigations. The siting process had a nominal duration of 3 months.

2.4 Siting Problems and Solutions

Several problems were encountered in siting the various BMPs. A methodical criteria-based approach was used for each type of device. The site selection criteria was used to screen sites for suitability. Siting problems, and the solutions to the problems are discussed for each type of BMP in the following paragraphs.

2.4.1 Wet Basin

The primary problem in siting the wet basin was finding a location with a suitable base flow to sustain a permanent basin pool. A site could not be located that had sufficient right-of-way available as well as a perennial base flow in the storm drain system. This problem was overcome by locating the basin where a shallow ground water table could be intersected. Normally wet basins operate using base flow from the tributary watershed, thereby requiring a substantial watershed area. This method of operation also ensures a constant exchange of water within the basin, eliminating stagnate conditions. It will be an integral part of the selected basin site to evaluate whether a wet basin sustained
with ground water can operate as a viable BMP. Operation and maintenance of the basin will require periodic draining of the pond to ensure adequate circulation of water.

In general siting of this BMP would be inappropriate where a perennial water source is not present. The monitoring portion of this program will define the maintenance issues surrounding the vegetation, and if application of the wet basin concept is valid for a groundwater supplied system.

2.4.2 Extended Detention Basins

Extended detention basins were identified in the Stipulation as appropriately located along Caltrans freeways and highways. Siting problems encountered with this BMP focused on 1) available right-of-way, 2) tributary area and 3) maintenance access. Field review of potential extended detention basin sites in District 11 showed existing right-of-way is available for the construction of the pilot detention basins. However, the number of viable sites were limited primarily by the total available area and the area tributary to the site. Extended detention basins typically require about 1 to 2 percent of the tributary area (FHWA, 1996), however this ‘rule of thumb’ appears to significantly underestimate the space requirements in practical application where space requirements were as high as 50%.

Two issues were responsible for the apparent increase in space requirements as compared to published data. First, many of the sites were located in areas with extremely low relief. The difference in elevation between the basin inlet and outlet was generally very small. This required a relatively shallow detention depth in the basin to avoid a backwater condition on the site storm drain. Secondly, Caltrans requires a 30’ clear recovery zone from the edge of traveled way to the basin. The clear recovery zone is a standard design practice when locating horizontal obstructions adjacent to the right-of-way.

Area tributary to the basin site was also a primary limiting criteria. Available right-of-way must also be located in a watershed low point to collect site runoff. Much of the available right-of-way is in locations where site storm drain nor highway runoff is tributary. Maintenance access is also an important criteria. Safe maintenance access from the freeway/highway must be available.

The general siting of this BMP must account for a clear recovery zone when located adjacent to the highway, and must be located in an area where highway runoff is tributary. Since, Caltrans generally does not maintain surplus right-of-way along the mainline portions of roadways, application of this BMP appears to be most suitable in interchanges.
2.4.3 Infiltration Basins

Infiltration basins were identified in the Stipulation as appropriately located along Caltrans freeways and highways. Siting problems encountered with this BMP focused on 1) available right-of-way, 2) tributary area 3) maintenance access and 4) soil infiltration capacity. Field review of potential infiltration basin sites in District 11 showed existing right-of-way is available for the construction of the pilot infiltration basin. However, the number of viable sites were limited primarily by the infiltration capacity of soils. Much of the soil in District 11 has varying levels of clay content which are not suitable for an infiltration BMP. Further, a high ground water table was encountered in many areas where soil infiltration rates were apparently suitable. Requirements relative to safety setback, right-of-way, and tributary area previously discussed for extended detention basins also apply here. Further, application of this BMP was also excluded where the basin was located within 100 feet of a bridge column or abutment due to structural considerations.

Solutions to the problems noted above, other than incorporating them as siting constraints, were not determined. The lack of suitable soil conditions and the presence of a high ground water table appears to be the primary constraint associated with siting this BMP. Soils that do not possess adequate drainage result in basin drain times that exceed an acceptable time limit (a maximum of 72 hours).

2.4.4 Infiltration Trenches

Infiltration trenches were identified in the Stipulation as appropriately located in Caltrans Maintenance Yards. The primary siting constraints associated with infiltration trenches were the required 100 foot structural setback and suitable soil infiltration rate. Many Caltrans maintenance facilities are located beneath existing highway bridges. Locating an infiltration device within 100 feet of a bridge column or abutment was a significant constraint that limited the applicability of this BMP. Applicability was further limited by the generally low incidence of soils with a suitable infiltration rate, as discussed for infiltration basins. Infiltration trenches are effective in collecting surface flow and do not require a site storm drain; this characteristic made them more suitable for application at maintenance stations.

There were no solutions identified to the problems described for siting infiltration trenches other than establishing the problems as identified siting constraints. Site infiltration testing would be a mandatory step due to the heterogeneous nature of the soils throughout each District and within each site.
2.4.5 Biofilters

Biofilters were identified in the Stipulation as appropriately sited at either Caltrans Maintenance Stations or along freeways and highways. The primary siting constraint for biofilters was right-of-way availability. Generally biofilters were found to be not suitable in urban areas where the edge of shoulder was often contained by a sound wall or some other adjacent structure. Biofilters are also generally not suitable in fill situations where a fill slope occurs at or near the edge of shoulder. Questions relative to the requirement for irrigation and the availability of irrigation were also an issue with this BMP.

Solutions were determined for irrigation and maintenance concerns as a part of the siting process. Vegetation that does not require irrigation was specified as well as vegetation that does not require mowing. Mowing adds a significant maintenance expense and if the clippings are left in place, would tend to increase organic nitrogen load to the receiving waters.

2.4.6 Media Filters

Media filters were identified in the Stipulation as appropriately placed at Caltrans Maintenance Stations and Park and Ride lots. The use of media filters requires a site storm drain, a constraint similar to that identified for catch basin inserts. Media filters may be constructed either above or below grade. Many of the maintenance stations and park and ride lots did not have surplus area to construct an above ground filter. This constrain was overcome by constructing a below grade (Delaware) type media filter. Media filters also require about 3 feet of head to operate. Where sufficient head was not available to operate the filter, the site was considered infeasible. Two possible solutions were identified for this constraint. The site storm drain in some cases could be rebuilt to provide additional head at the selected location. The second solution specified a pump at the filter outlet to lift the discharge to the required outlet elevation.

3.0 BMP Pilot Program Siting Costs

Siting for the Pilot Program was carried out via site reconnaissance of Caltrans facilities, and through a refinement process wherein siting criteria was applied successively for sites suitable for given types of BMPs. Consequently, it is not practical to develop siting costs for individual sites but rather a generalized cost developed through a pro rata basis can be estimated.

Infiltration BMPs require substantially more investigation and siting resources as compared to the other types of BMPs. Site screening for infiltration basins and trenches first must apply criteria relative to space, maintenance and drainage. Next the site must be investigated for a suitable infiltration rate. It is apparent that a site boring must be taken followed by an in-drill hole permeability test to determine soil permeability rates.
Laboratory permeability rates were shown to vary by as much as a factor of 100 compared to in-drill hole rates, and soil heterogeneity even within a site is a significant variable.

The average siting cost for non-infiltration BMPs is $4,700 per site. The average siting cost of infiltration BMPs is $25,300 per site. The total cost for siting of all projects required by the Stipulation and as modified herein was $97,600. These costs include Consultant staff time and expenses only.

4.0 Conclusions

4.1 Siting

The siting phase of the Retrofit Pilot Program is complete. A Composite Siting Study has been published. The Study was submitted for approval to Plaintiffs for approval on February 26, 1998.

No further documentation of the siting process is anticipated. The final report for the BMP Retrofit Pilot Program will include this status report describing the siting process, as well as the Composite Siting Study as an Appendix.

5.0 BMP Retrofit Pilot Program Design

5.1 Background

Design of the pilot projects followed the siting phase. The design phase is scheduled to occur from January 16, 1998 through May 30, 1998. Project bidding and construction will be completed using two different pathways, a procurement system and a standard Caltrans bid-build process. Some of the BMP Pilot Projects are proprietary devices or contain proprietary materials. It is difficult for the State to bid projects with proprietary materials since State procedures require alternate materials and suppliers. To avoid this problem, a direct purchase of these materials and the construction services to install them will be made.

Plans completed under the Caltrans design-bid-build process will be bid through a public process using Caltrans procedures. Projects build using this model (referred to as ‘PS&E’ for plans, specifications and estimates), require a more formalized plan package. Each of the plan packages, both direct procurement and PS&E will be checked by the local Caltrans District for conformance with State standards and criteria prior to construction.

### 5.2 Objectives

The objectives of the design process are to develop plans, specifications and estimates packages for the Retrofit Pilot Projects using Caltrans design practices and design guidance manuals while maintaining state-of-the-art design practices. State-of-the-art design practices includes using the most recent published guidance on the design of structural BMPs. One of the objectives of the Scoping Study was to define the design references to be used for the Retrofit projects. The literature consulted in the development of the design guidance for the Retrofit projects is contained in the Scoping Study Bibliography. The primary design references used are the *Caltrans Planning and Design Staff Guide*, the FHWA publication, *Evaluation and Management of Highway Runoff Water Quality*, and several design guidance manuals from the City of Austin, Texas, City of Portland, Oregon, King County, Washington, Washington State Department of Transportation and the Denver Urban Drainage and Flood Control District.

### 5.3 Design Process

Design (PS&E and procurement) packages have been completed and submitted for review for all of the projects in District 11. The plan packages for District are provided in the Appendix (A.3) for information. The submittal and review schedule for each of the plan packages is provided in the Appendix (A.5).

The design process completed to date included several phases. The initial phase consisted of obtaining topographic information for each site. Topographic information was compiled using site survey techniques. Topographic information was also obtained using aerial photography where this approach was cost-justified. Site topography was collected in digital format and used as base design information. All design is being completed in CADD using a Microstation Intergraph System.

Following compilation of the topographic base information to CADD format, hydrology studies were completed to compute both water quality and design storm discharges for the subject storm drain systems. Development of the PS & E package includes the following elements:

- Standard plans list
• Construction staking and survey information
• Contour grading and drainage plan
• Drainage profiles, details and quantities
• Traffic handling plan
• Miscellaneous quantities
• Drainage cross sections

Specifications and an Engineer’s Estimate are also a part of the PS&E package. The Engineer’s Estimate is completed based on Caltrans Cost Data and the quantities estimated from the construction drawings. Specialty items not in the Caltrans Cost data base are priced using manufacturer’s information and construction cost data from other projects.

5.4 Construction Plans

The construction plans completed to date are included in the Appendix (A.3) for information. The plans have defined approval process that must be maintained to ensure that the subsequent bid and construction schedules are met. The review dates are given in the Appendix (A.5).

The plans will be revised as appropriate to reflect review comments received from Caltrans and the Plaintiff. Once the plans have been approved by the District, they will be signed by the Engineer and forwarded to Caltrans Headquarters for finalization of the bid package and the bid listing process for formal solicitation of construction bids. Once plans have been bid, changes to the plans must be made through an addendum process which can be cumbersome. Once a final bidder is selected, further changes if necessary must be made through a change order process. Plans may not be changed without the approval of the Engineer of Record.

5.5 Basis of Design

Basis of Design Reports will be completed for each Pilot project following approval of the plans. This will be a documentation process whereby the design guidance, assumptions and exceptions to standard criteria or design will be noted. Outlines of these basis of design reports have been prepared and are provided in the Appendix (A.1). The design basis outlines provide most of the information that will be used to develop the Basis of Design Reports. Changes may be required to this information as the Pilot projects move through and complete the design phase. These changes, as appropriate, will be made when the information is incorporated into the Basis of Design Reports. The Basis of Design Reports will be submitted to the Plaintiffs in a staged fashion during the
month of June. The formal submittal dates are identified on the project calendar given in the Appendix (A.5).

5.6 Consultation with Experts and Regulatory Agencies on Special Issues

Vector and mosquito control have emerged as significant issues relative to the design and operation of the Pilot Projects. An expert in the field of mosquito and vector control (Dr. Bill Walton) has been retained to advise Caltrans on control and abatement issues. Dr. Walton has provided input relative to design of the pilots to minimize mosquito problems and abatement requirements. Some of Dr. Walton’s suggestions for the design phase of the project include:

- Limit growth of aquatic plants and standing water. Concrete lining may be used for detention basins.
- Maintain the width of ponds to a maximum of 100' to allow for the application of abatement practices such as bacteria and insect growth regulators (IGRs).

A meeting has been scheduled (April 1, 1998) with the regional vector control districts to discuss issues relative to control and abatement. The Plaintiffs are invited to attend this meeting to participate in the discussion.

5.7 Conclusions

The design process is about 70% complete. Procurement projects are staged to be finalized about 1 month behind PS&E packages. Significant further information will be obtained as the design packages move through the plan check process.
Appendix
Appendix A.1
BMP Pilot Project Design Information
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 1, Site 1

Project Location: Caltrans District 11. Basin bounded by the SR 78 on the north, the I-15 on the east and the I-15 north connector to the SR78 east, on the south-west. Basin site is located at the toe of slope, within Caltrans right of way.

Project Type: Extended Detention Basin (EDB)

Design References:
- Caltrans Storm Water Quality Handbook, Planning and Design Staff Guide
- Caltrans BMP Retrofit Pilot Program, Composite Siting Study, District 11
- Scoping Study, Retrofit Pilot Program, Caltrans District 11

General Description: The pilot is an in-line, concrete lined, extended detention basin with a tributary area that includes mainline freeway, a collector and some adjacent slope areas for a total tributary area of 11.0 acres. Inflow to the basin occurs at a single point, the total water quality design volume is 1.24 acre-feet. Flow is discharged through an orifice cut into the wall of the riser outlet. A debris screen (¼” openings) protects the orifice from clogging as well as providing a 300mm wide, 180° clear zone flow path. The rim of the riser has been set at the 1-year, 24-hour storage elevation. Less frequent storms will discharge through the top of the riser. An additional riser was designed for the 25-year storm recurrence interval to pass higher flows. The surrounding watershed area has been stabilized to reduce erosion potential using a hydoseed mix as indicated in the project specifications.

Maintenance access is provided at the perimeter of the basin. Storm water samples will be taken using automated equipment at both the basin inflow and outflow points. The discharge within the basin outlets onto a grouted riprap pad, which reduces the outlet velocity and spreads the flow. The basin geometry is a L:W ratio of 10:1.

Design Data

Water Quality Discharge: 9.0 cfs

Tributary Area: 11 acres

Design Rainfall or Volume: The 1-year, 24-hour rainfall. 1.24 Acre-ft.

Design Average Detention Time or Residence Time: Average detention time for the extended detention basin is 24 hours, the maximum drawdown time is 72 hours.
Design Discussion

The basin was designed as an inline facility to capture the tributary watershed for water quality monitoring purposes. In addition, the basin will accommodate less frequent storm events. A canal gate at the basin invert is provided to drain the basin should clogging of the orifice occur. A 30-foot clear zone setback was maintained adjacent to the basin. An AC pullout was provided to access the maintenance road located at the perimeter of the basin.

Basin side slopes are 1:4, however, the basin is concrete lined.
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 1, Site 2

Project Location: Caltrans District 11. Area created by the northbound cloverleaf offramp from I-5 at Manchester Avenue. Area is north of Manchester Avenue and east of the I-5.

Project Type: Extended Detention Basin (EDB)

Design References:
- Caltrans Storm Water Quality Handbook, Planning and Design Staff Guide
- Caltrans BMP Retrofit Pilot Program, Composite Siting Study, District 11
- Scoping Study, Retrofit Pilot Program, Caltrans District 11

General Description: The pilot is an in-line, concrete lined, extended detention basin with a tributary area that includes mainline freeway, an off ramp and some adjacent slope areas for a total tributary area of 7 acres. Inflow to the basin occurs at a single point, the total water quality design volume is 0.26 acre-feet. Flow is discharged through an orifice cut into the wall of the riser outlet. A debris screen (¼” openings) protects the orifice from clogging as well as providing a 300mm wide, 180° clear zone flow path. The rim of the riser has been set at the 1-year, 24-hour storage elevation. Less frequent storms will discharge through the top of the riser. A spillway designed for the 25-year storm recurrence interval has been incorporated to pass higher flows. The surrounding watershed area has been stabilized to reduce erosion potential using a hydroseed mix as indicated in the project specifications.

Maintenance access is provided at the perimeter of the basin. Storm water samples will be taken using automated equipment at both the basin inflow and outflow points. The discharge within the basin outlets onto a grouted riprap pad, which reduces the outlet velocity and spreads the flow. Storm frequencies less than 25-years discharge to an existing storm drain. The spillway discharges through a riprap pad into an existing sump. The basin side slopes are concrete lined and the perimeter slope areas are stabilized with the seed mix shown in the specifications. The basin geometry is a L:W ratio of 2.9:1.

Design Data

Water Quality Discharge: 5.2 cfs

Tributary Area: 7 acres

Design Rainfall or Volume: The 1-year, 24-hour rainfall. 0.24 Acre-ft.
**Design Average Detention Time or Residence Time:** Average detention time for the extended detention basin is 24 hours, the maximum drawdown time is 72 hours.

**Design Discussion**

The basin was designed as an online facility to capture the tributary watershed for water quality monitoring purposes. In addition, the basin will accommodate less frequent storm events. The inflow and outflow elevations restricted the location and orientation of the extended detention basin. The inflow system diverges from the ground surface and the outflow confluences with an existing storm drain system. A canal gate at the basin invert is provided to drain the basin should clogging of the orifice occur. A 30-foot clear zone setback was maintained adjacent to the basin. A driveway was provided to access the maintenance road located at the perimeter of the basin.

Basin side slopes are 1:4, however, the basin was concrete lined due to the high ground water elevation at this site.
BMP Retrofit Pilot Program
Pilot Project Design Information

General – Project 1, Site 3

Project Location: Located adjacent to Interstate 5 approximately 300 meters near the Palomar Airport Drive off-ramp

Project Type: Bio-filter Swale BMP

Design Reference: Caltrans' Planning and Design Staff Guide, Scoping Study, Siting Study

General Description: The proposed BMP consists of a bio-filter swale that runs adjacent to the southbound lanes of the Interstate 5 freeway. The tributary area, which totals approximately 1.0 acre, is comprised of the southbound side of the Interstate 5 freeway mainline. Design inflow to the BMP swale is conveyed through the proposed concrete V-ditch. The computed design storm flow for the 1-year storm event is approximately 1.0 cfs. The bio-filter swale is a trapezoidal-shaped channel with 2:1 side slopes. The channel will be lined with grass using hydrotech mix as indicated in the Specifications. Storm water samples will be taken using automated equipment at both the BMP inflow and outflow points.

Access to the BMP site will be through the proposed pullout located adjacent to Interstate 5.

Design Data

Water Quality Flow: 1.0 cfs

Tributary Area: 2.32 acres

Design Rainfall/Volume: 1-year/24-hour rainfall value

Residence Time: 4.1 minutes

Design Discussion

Since the proposed BMP site is located adjacent to Interstate 5, design of the bio-filter swale was designed in such a manner that it will not pose any significant hazard to the driving public. The BMP swale and the concrete V-ditch were designed with a maximum depth of 97.5mm (4") and side slopes of 10:1.

Due to the existing physical restrictions of the site, the following design exceptions were implemented:

- Channel Shape - The narrow shoulder necessitated the use of the V-shaped channel instead of the recommended trapezoidal-shaped channel.

- Residence Time - Due to limited grade differential between the headwork and the outlet elevations (which restricted the length of the bio-filter swale), the target residence time of 5 minutes was not achieved.
BMP Retrofit Pilot Program
Pilot Project Design Information

General – Project 2, Sites 1 and 2

Project Location: Located in the Carlsbad Maintenance Station on Paseo Del Norte, near Interstate 5

Project Type: Infiltration Trench and Bio-filter Strip BMP

Design Reference: Caltrans’ Planning and Design Staff Guide Handbook, Scoping Study, Siting Study

General Description: The proposed BMP consists of a dual system comprising an infiltration trench and a bio-filter strip. The tributary areas for the infiltration trench and the bio-filter strip are 1.72 acres and 0.66 acres, respectively. The design storm runoff of approximately 1.60 for the infiltration trench is conveyed by the proposed concrete swale and routed through the BMP trench. The infiltration trench BMP is sized to contain the total design storm volume of 83.3 m³.

The storm runoff tributary to the bio-filter strip sheet flows directly onto the BMP strip and flows through the proposed grass lined swale. The computed storm flow tributary to the bio-filter strip is approximately 0.60 cfs.

A concrete-lined swale is proposed to provide outlet for the tributary storm flows in excess of the 1-year storm event.

Storm water monitoring and sampling will be performed using automated equipment at the inflow point of the infiltration trench BMP and the outlet point of the bio-filter swale. A monitoring well is proposed near the lower terminus of the infiltration trench for water quality sampling.

Access to the BMP site is through the maintenance station.

Design Data

Water Quality Discharges/Volumes: 83.3 m³ for the Infiltration Trench BMP
1.60 cfs for the Infiltration Trench BMP
0.60 cfs for the Bio-filter Strip BMP

Tributary Area: 1.72 acres for the Infiltration Trench BMP
0.66 acres for the Bio-filter Strip BMP

Design Rainfall/Volume: Riverside Region per the Planning and Design Staff Guide Handbook based on 100% impervious area

Residence Time: Drains in 72 hours max.

Design Discussion: The site chosen for this BMP is currently used for parking which necessitated the design for a new parking area located northwest of this BMP site.
A portion of the access area just north of the BMP site is proposed to be reconstructed in order to provide a uniform grade necessary to induce sheet flow condition for storm flows tributary to the bio-filter strip.
BMP Retrofit Pilot Program
Pilot Project Design Information

General – Project 2, Site 3

Project Location: Located on the south side of SR78 adjacent to the Melrose Drive off ramp

Project Type: Bio-filter Swale BMP

Design Reference: Caltrans' Planning and Design Staff Guide, Scoping Study, Siting Study

General Description: The proposed BMP consists of a bio-filter swale that runs adjacent to the eastbound side of the SR 78 freeway. The tributary area, which totals 2.30 acres, is comprised of the eastbound side of the SR78 freeway mainline. BMP design flows will be intercepted via two overside drains located on each side of the existing inlet. The computed design storm flow based upon the 1-year storm event is approximately 4.0 cfs. The bio-filter swale BMP is a trapezoidal-shaped channel with 2:1 side slopes. The channel will be lined with grass using hydrosed mix as indicated in the Specifications. The design storm flows will be sampled and monitored using automated equipment.

Access to the BMP site is provided at Hacienda Drive.

Design Data

Water Quality Flow: 4.0 cfs

Tributary Area: 2.30 acres

Design Rainfall/Volume: 1-year/24-hour rainfall value

Residence Time: 4.2 minutes

Design Discussion

The existing right-of-way and elevation change between the inflow and outflow points controlled the design of the bio-filter swale BMP. The swale was sized to prevent the undercutting of the freeway shoulder and to minimize flow velocities.

Due to the above mentioned restrictions, the following design exceptions were implemented:

- Width - In order to reduce the flow velocity, a channel width of 6 meters was used, which exceeds the maximum recommended width of 4.8 meters.

- Residence Time - Due to channel length restriction, the resulting hydraulic residence time is 4.2 minutes, which is lower than the target value of 5 minutes.
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 3, Site 1

Project Location: Caltrans District 11, San Diego, California. Area located just off of the SR-56 eastbound/I-5 southbound connector. Site may be accessed via Carmel Valley Road, just off the I-5 freeway.

Project Type: Extended Detention Basin (EDB)

Design References:
- Caltrans Storm Water Quality Handbook, Planning and Design Staff Guide
- Caltrans BMP Retrofit Pilot Program, Composite Siting Study, District 11
- Scoping Study, Retrofit Pilot Program, Caltrans District 11

General Description: The pilot is an in-line, earthen, extended detention basin with a tributary area that includes mainline freeway, a collector ramp and some adjacent slope areas for a total tributary area of 4.3 acres. Inflow to the basin occurs at a single point, the total water quality design volume is 0.22 acre-feet. Flow is discharged through an orifice cut into the wall of the riser outlet. A debris screen (1/4" openings) protects the orifice from clogging as well as providing a 300mm wide, 180° clear zone flow path. The rim of the riser has been set at the 1-year, 24-hour storage elevation. Less frequent storms will discharge through the top of the riser. A spillway designed for the 25-year storm recurrence interval has been incorporated to pass higher flows. The surrounding watershed area has been stabilized to reduce erosion potential using a hydrosedum mix as indicated in the project specifications.

Maintenance access is provided at the perimeter of the basin. Storm water samples will be taken using automated equipment at both the basin inflow and outflow points. The discharge within the basin outlets onto a riprap pad, which reduces the outlet velocity thereby protecting the invert of the basin as well as dispersing the flow. Storm frequencies less than 25-years discharge to an existing riprap pad, located within an easement, at a sump adjacent to Sorrento Valley Road. The basin side slopes are stabilized with the seed mix shown in the specifications. The basin flowpath geometry is a L:W ratio of approximately 6:1.

Design Data

Water Quality Discharge: 4.6 cfs

Tributary Area: 4.3 acres

Design Rainfall or Volume: The 1-year, 24-hour rainfall. 0.22 Acre-ft.
Design Average Detention Time or Residence Time: Average detention time for the extended detention basin is 24 hours, the maximum drawdown time is 72 hours.

Design Discussion

The basin was designed as an online facility to capture the tributary watershed for water quality monitoring purposes. In addition, the basin will accommodate less frequent storm events. The site geometry requires a riprap deflection berm to prevent short circuiting the basin. A canal gate at the basin invert is provided to drain the basin should clogging of the orifice occur. An AC maintenance road is located above the basin.
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 3, Site 2

Project Location: Caltrans District 11. Area can be accessed from the I-5 southbound mainline. The basin is located on the west side of I-5 just north of the I-5 southbound offramp. It is bounded on the east by the I-5. It is bounded on the north by a gas station at the La Costa exit going west. The basin is bounded on the south by the Bataquitos lagoon. A steep vegetated hillside leading to non-industrial commercial buildings bounds the basin on the west.

Project Type: Infiltration Basin (IB)

Design References:
- Caltrans Storm Water Quality Handbook, Planning and Design Staff Guide
- Caltrans BMP Retrofit Pilot Program, Composite Siting Study, District 7, 11
- Scoping Study, Retrofit Pilot Program, Caltrans District 7, 11

General Description: The pilot is an off-line, infiltration basin with a tributary area that includes mainline freeway, an off ramp and some adjacent slope areas for a total tributary area of 5.5 acres. Inflow to the basin occurs at a single point, the total water quality design volume is 0.33 acre-feet. Flow percolates into the ground through permeable soils. The rim of the basin has been set at the 1-year, 24-hour storage elevation. Less frequent storms will overtop the basin and sheet flow towards the Bataquitos Lagoon, maintaining the existing flowpath. The surrounding watershed area has been stabilized to reduce erosion potential using a hydroseed mix as indicated in the project specifications.

Maintenance access is provided at the perimeter of the basin. Storm water samples will be obtained using automated equipment at a well located downstream from the infiltration basin. The discharge within the basin outlets onto a riprap pad. The basin side slopes are stabilized with the seed mix shown in the specifications.

Design Data

Water Quality Discharge: 4.6 cfs

Tributary Area: 5.5 acres

Design Rainfall or Volume: The 1-year, 24-hour rainfall. 0.33 Acre-ft.

Design Average Detention Time or Residence Time: A maximum drain time of 72 hrs.
Design Discussion

The basin was designed as an offline facility to capture the tributary watershed for water quality monitoring purposes. The existing inlets located at the southbound edge of shoulder will be replaced to accommodate the one-year storm water quality flow. The existing outflow pipes were reconnected to the proposed inlet at the existing invert elevation. A flow restrictor plate was used to reduce diversion of less frequent storm events. The depth of the infiltration basin was restricted by the intercept elevation location of the ground water table. A 30-foot clear zone setback was maintained adjacent to the basin. A driveway was provided to access the maintenance road located at the perimeter of the basin.
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 4, Site 1

Project Location: Caltrans District 11, San Diego, California. Area created by the southbound cloverleaf onramp from I-5 at Manchester Avenue. Area is north of Manchester Avenue and west of the I-5.

Project Type: Wet Basin (WB)

Design References:
- Caltrans Storm Water Quality Handbook, Planning and Design Staff Guide
- Caltrans BMP Retrofit Pilot Program, Composite Siting Study, District 11
- Scoping Study, Retrofit Pilot Program, Caltrans District 11

General Description: The pilot is an in-line, wet basin with a tributary area that includes mainline freeway, an on ramp and some adjacent slope areas for a total tributary area of 4 acres. Inflow to the basin occurs at a single point, the total water quality design volume is 0.22 acre-feet. Flow is discharged through an orifice cut into the wall of the riser outlet. A debris screen (1/4” openings) protects the orifice from clogging as well as providing a 300mm wide, 180° clear zone flow path. The rim of the riser has been set at the 1-year, 24-hour storage elevation. Less frequent storms will discharge through the top of the riser. A spillway designed for the 25-year storm recurrence interval has been incorporated to pass higher flows. The surrounding watershed area has been stabilized to reduce erosion potential using a hydoseed mix as indicated in the project specifications.

Maintenance access is provided at the perimeter of the basin. Storm water samples will be taken using automated equipment at both the basin inflow and outflow points. The discharge within the basin outlets into the permanent ground water pool. The invert of the basin immediately adjacent to the inflow is riprap lined. Storm frequencies less than 25-years discharge to an existing storm drain. The spillway discharges through a riprap pad into a sump. The basin side slopes are stabilized with the seed mix shown in the specifications. The basin geometry is a L:\W ratio of approximately 5:1.

Design Data

Water Quality Discharge: 3.5 cfs

Tributary Area: 4 acres

Design Rainfall or Volume: The 1-year, 24-hour rainfall. 0.22 Acre-ft.
Design Average Detention Time or Residence Time: Average detention time for the wet basin is 24 hours, the maximum drawdown time is 48 hours.

Design Discussion

The basin was designed as an online facility to capture the tributary watershed for water quality monitoring purposes. In addition, the basin will accommodate less frequent storm events. The location and orientation of the wet basin was restricted by the intercept elevation location of the ground water table. The ground water provides a permanent pool for the proper function of the wet basin. A canal gate at the basin invert is provided to drain the basin should clogging of the orifice occur. A 30-foot clear zone setback was maintained adjacent to the basin. A driveway was provided to access the maintenance road located at the perimeter of the basin.
BMP Retrofit Pilot Program
Pilot Project Design Information

General – Project 5, Site 1

Project Location: Located in the Escondido Maintenance Station on Mission Road, adjacent to State Route 78

Project Type: Sand Filter BMP


General Description: The proposed BMP consists of a sand filter structure located within the Escondido maintenance station. The tributary area, which totals 0.82 acres, is comprised of the northwest paved area of the maintenance station. The computed 1-year storm flow is 2.2 cfs. This storm flow will be intercepted using the proposed grate inlet and conveyed via underground drains through the BMP structure, discharging it into the existing 900mm RCP located on-site. The design storm flow will be monitored and sampled using automated equipment at both the inflow and outflow points of the proposed BMP system.

Access to the BMP site is through the maintenance station.

Design Data

Water Quality Discharge: 2.2 cfs

Tributary Area: 0.82 acres

Design Rainfall/Volume: Modified 1-year/24-hour rainfall value

Residence Time: 24 hours

Design Discussion:

Site constraints include lack of allowable grade differential between the drainage pickup and discharge points, and adverse impact to the current operation of the maintenance station. It was in consideration of both of these constraints that the Deleware type sand filter (lower storage volume requirement and underground structure) was chosen over the Austin type sand filter.

The Delaware design paper requires a total surface area within the filter structure to be equal to 720 square feet per acre of tributary area. Additionally, the design guidance requires that the first chamber volume be set to 540 cubic feet per acre of tributary area. The proposed BMP system is designed to meet these requirements.
General – Project 5, Site 2

Project Location: Located in the Interstate 5/State Route 78 Park and Ride facility on Moreno Street, adjacent to Interstate 5

Project Type: Sand Filter BMP


General Description: The proposed BMP is a sand filter structure located within the future expansion area of the I-5/SR78 Park and Ride facility. The tributary area totals approximately 0.78 acres. The total design storm flow is 1.6 cfs. The tributary storm runoff sheet flows into the proposed grate inlets located within the existing Park and Ride area. Storm water samples will be taken using automated equipment at both the inflow and outflow points of the BMP system.

Access to the BMP site is through the park and ride facility and the proposed pullout on Vista Way exit ramp.

Design Data

Water Quality Discharge: 2.3 cfs

Tributary Area: 2.78 acres

Design Rainfall: Modified 1-year/24-hour rainfall value

Residence Time: 24 hours

Design Discussion:

The proposed BMP site is a heavily used park and ride facility and therefore, intrusion into the parking area was kept to a minimum. For this reason the BMP structure was placed outside of the existing parking area and onto a fully landscaped area adjacent to the park and ride facility. This landscaped area will serve as the future park and ride expansion area.

The design flow will be intercepted at the two existing sump locations near the northeast side of the park and ride area. The existing GMP inlets will be replaced by grate inlets. These new grate inlets will have dual outlet pipes in order to route storm flows in excess of the 1-year storm event through the existing freeway drainage system.
BMP Retrofit Pilot Program
Pilot Project Design Information

General – Project 5, Site 3

Project Location: Located in the La Costa Park and Ride facility on La Costa Avenue, adjacent to Interstate 5

Project Type: Sand Filter BMP

Design Reference: Caltrans' Planning and Design Staff Guide, Scoping Study, Siting Study City of Austin Design Guide

General Description: The proposed BMP consists of a sand filter structure located within the La Costa Park and Ride area. Approximately 2.78 acres of paved area drains into the proposed BMP system. The total design flow for the 1-year storm event is 2.3 cfs. Storm water samples will be taken using automated equipment at both the inflow and outflow points of the proposed BMP system.

Access to the BMP site is through the park and ride facility.

Design Data

Water Quality Discharge: 2.3 cfs

Tributary Area: 2.78 acres

Design Rainfall/Volume: 1-year/24-hour rainfall value

Residence Time: 24 hours

Design Discussion:

The design of the BMP system was developed with consideration of the following design constraints:

- Available space between the existing park and ride parking/driveway area
- The existing lagoon access road
- Existing right-of-way
- Impact to the Bataquitos Lagoon

In order to avoid construction within the Bataquitos Lagoon, an inlet channel was designed to intercept and convey the design storm flows. Storm flows greater than the 1-year storm event will flow into the proposed overflow channel and will be discharged into the existing drainage culvert.

In order to provide positive drainage towards the proposed inlet channel, pavement reconstruction will be performed immediately adjacent to the BMP site.
BMP Retrofit Pilot Program
Pilot Project Design Information Summary

General – Project 5, Site 4

**Project Location:** Located in the Kearny Mesa Maintenance Station on Opportunity Road, adjacent to Interstate 805

**Project Type:** Compost Filter BMP

**Design Reference:** Caltrans' Planning and Design Staff Guide, Scoping Study, Siting Study, Compost Filter Design Guide

**General Description:** The proposed BMP consists of three (3) compost filter vaults located along the south side of the Kearny Mesa maintenance station. This BMP site is currently used as a storage area for small equipment and light construction materials. Approximately 0.75 acres of asphalt surface area is tributary to the proposed BMP system. The design 1-year storm flows of 2.6 cfs are conveyed through the existing concrete swale and discharged into the proposed drainage inlet. These flows are routed through a system of small underground pipes and three compost filter vaults, outletting them into the existing 900mm RCP located on-site. The design storm flows will be monitored and sampled using automated equipment at both the inflow and outflow points of the BMP system.

Access to the BMP site is through the maintenance station.

**Design Data**

**Water Quality Discharge:** 2.6 cfs

**Tributary Area:** 0.75 acres

**Design Rainfall/Volume:** 1-year/24-hour rainfall value

**Residence Time:** Not Applicable

**Design Discussion:**

The size of the proposed facility is based upon by the manufacturer's design criteria of 78 compost canisters per one cfs of storm runoff, requiring three 2.438m (8') x 5.486m (18') vaults. The layout of the system is controlled by the required vault sizes and the minimum hydraulic head differential of 0.71m (2.3') between the inlet and outlet elevations of the compost filter structures.
Appendix A.2
Geotechnical Information
GEOTECHNICAL ENGINEERING SERVICES
LKR Project No. 97-1019D
March 18, 1998

PRE-CONSTRUCTION
GEOTECHNICAL
EVALUATION REPORT

Caltrans Storm Water Runoff Study
Retrofit Facilities, District 11,
San Diego County
California

Prepared for:
Robert Bein, William Frost and Associates
14725 Alton Parkway
Irvine, CA 92618-2069

Prepared By:
The L.K.R. Group, Inc.
2341 W. 205th Street
Suite 103
Torrance, CA 90501
Robert Bein, William Frost and Associates
14725 Alton Parkway
Irvine, CA 92618-2069

March 18, 1998
97-1019D

Attention: Mr. Scott Taylor

Subject: GEOTECHNICAL PRE-CONSTRUCTION REPORT
Caltrans Storm Water Runoff Retrofit Study
San Diego County, California

Mr. Taylor:

The L.K.R. Group, Inc. (LKR) is herewith submitting a pre-construction Geotechnical Evaluation Report for the subject sites. The authorized scope of services included site reconnaissance, determination of possible geotechnical constraints that could inhibit construction or change the design of the proposed devices, engineering and geological analysis, the preparation of this report. This report includes site description and general conclusions and recommendations to help assist in the design and bidding process of the storm water retrofit facilities.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions pertaining to this report, or if we can be of further service, please do not hesitate to contact The LKR Group.

Respectfully submitted,

THE L.K.R. GROUP, INC.

Michael D. Reader, RCE 44918, GE 2259
President, Project Manager

Steven H. Koltzoff CEG 1965
Project Geologist

sk\project\971019rpд.doc
## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0 SITE EVALUATION</td>
<td>2</td>
</tr>
<tr>
<td>2.1 Carlsbad Maintenance Station</td>
<td>2</td>
</tr>
<tr>
<td>2.1.1 Conclusions and Recommendations</td>
<td>2</td>
</tr>
<tr>
<td>2.2 Kearny Mesa Maintenance Station</td>
<td>4</td>
</tr>
<tr>
<td>2.2.1 Conclusions and Recommendations</td>
<td>5</td>
</tr>
<tr>
<td>2.3 Escondido Maintenance Station</td>
<td>6</td>
</tr>
<tr>
<td>2.3.1 Conclusions and Recommendations</td>
<td>7</td>
</tr>
<tr>
<td>2.4 La Costa Park and Ride</td>
<td>8</td>
</tr>
<tr>
<td>2.4.1 Conclusions and Recommendations</td>
<td>9</td>
</tr>
<tr>
<td>2.5 SR-78 / I-5 Park and Ride</td>
<td>10</td>
</tr>
<tr>
<td>2.5.1 Conclusions and Recommendations</td>
<td>10</td>
</tr>
<tr>
<td>2.6 South I-5 / Palomar Airport Road</td>
<td>12</td>
</tr>
<tr>
<td>2.6.1 Conclusions and Recommendations</td>
<td>12</td>
</tr>
<tr>
<td>2.7 I-5 South / La Costa Avenue</td>
<td>14</td>
</tr>
<tr>
<td>2.7.1 Conclusions and Recommendations</td>
<td>14</td>
</tr>
<tr>
<td>2.8 South I-5 / Manchester Avenue East</td>
<td>16</td>
</tr>
<tr>
<td>2.8.1 Conclusions and Recommendations</td>
<td>17</td>
</tr>
<tr>
<td>2.9 South I-5 / Manchester Avenue West</td>
<td>18</td>
</tr>
<tr>
<td>2.9.1 Conclusions and Recommendations</td>
<td>19</td>
</tr>
<tr>
<td>2.10 South I-5 / SR-56 Interchange</td>
<td>21</td>
</tr>
<tr>
<td>2.10.1 Conclusions and Recommendations</td>
<td>21</td>
</tr>
<tr>
<td>2.11 I-15 / SR-78 Interchange</td>
<td>23</td>
</tr>
<tr>
<td>2.11.1 Conclusions and Recommendations</td>
<td>24</td>
</tr>
<tr>
<td>2.12 West SR-78 / Melrose Drive</td>
<td>26</td>
</tr>
<tr>
<td>2.12.1 Conclusions and Recommendations</td>
<td>26</td>
</tr>
<tr>
<td>3.0 CLOSURE</td>
<td>28</td>
</tr>
<tr>
<td>4.0 FIGURES</td>
<td>29</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

This report presents the conclusions and recommendations for the geotechnical portion for the Storm Water Runoff Study performed for selected sites by THE L.K.R. GROUP, INC. (LKR) for proposed Caltrans Retrofit Facilities in San Diego County, California. Site location map and selected site plans that were available at the time of this report are depicted as figures in the back of this report. The site plans that are not included with this report will be submitted upon completion.

To improve the potential quality of storm water runoff from Caltrans facilities, several types of storm water controls have been designed by RBF as part of the Best Management Practice (BMP) in the San Diego County area.

As part of the BMP, the 12 sites were selected for the Facilities Retrofit Pilot Study after an evaluation by RBF. A site reconnaissance was performed by both LKR and RBF to evaluate constructibility of the proposed storm water runoff retrofit structures.

The following sites are part of this study:

Table 1: Retrofit Pilot Study Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Location Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlsbad M. S.</td>
<td>SR-78 / I-5 P &amp; R</td>
</tr>
<tr>
<td>Kearny Mesa M.S.</td>
<td>S I-5 / Palomar Airport Road</td>
</tr>
<tr>
<td>Escondido M.S.</td>
<td>S I-5 / La Costa Ave. W.</td>
</tr>
<tr>
<td>La Costa P &amp; R</td>
<td>S I-5 / Manchester Ave. E.</td>
</tr>
<tr>
<td></td>
<td>S I-5 / Manchester Ave. W.</td>
</tr>
<tr>
<td></td>
<td>SR-56 / I-5 Interchange</td>
</tr>
<tr>
<td></td>
<td>SR-78 / I-15 Interchange</td>
</tr>
<tr>
<td></td>
<td>E. SR-78 / Melrose Dr.</td>
</tr>
</tbody>
</table>

M. S. = Maintenance Station
P & R = Park and Ride

Refer to Figure 1, Vicinity Map, for a generalized description of the location of the sites.
2.0 SITE EVALUATION

The following sites are arranged in the order of Maintenance Stations, Park and Rides and others that were visited during the site evaluation reconnaissance on February 10, 1998. The sites were evaluated by conducting limited field exploration, literature searches and/or site visits.

2.1 Carlsbad Maintenance Station

The Carlsbad Maintenance Station is located at 6050 Paseo Del Norte near the south east intersection of Palomar Airport Road and Paseo Del Norte in the City of Carlsbad. At the Carlsbad yard, infiltration trench is proposed along the south side of an asphalt parking area near a cut/fill slope ranging 4 to 6 feet (1.2 to 1.8 m) in height.

Based on geologic maps, this site is on the lowest Pleistocene on-shore marine terrace. Asphalt pavement encountered on site during the exploration phase, was 3-inches (7.6 cm) thick on top of 6-inches (15.4 cm) of aggregate base. Below the aggregate base, a light brown silty fine- to medium-grained sandstone unit of the Eocene Santiago Formation was encountered throughout the total depth to 15 feet (4.6 m). No ground water was encountered in the exploration boring.

The proposed BMP facility will consist of an Infiltration Trench (IT) and a Biofiltration Strip (BSt). Values of the in-drill hole permeability test performed in the exploration boring for the feasibility study were $2.8 \times 10^{-5}$ ft/s or $8.7 \times 10^{-4}$ cm/s. Figure 2 & 3 contain a depiction of the proposed facility and the adjacent cut/fill slope.

2.1.1 Conclusions and Recommendations

Based on the feasibility study and site visit, it was concluded that this site is feasible for the construction of an IT facility in conjunction with a BSt. During construction of the IT, isolated hard cemented zones or isolated lenses of gravels, cobbles and bedded conditions could be encountered. Ground water should not be a problem during construction except after or during a rain storm. Groundwater was not encountered in the exploration boring. With the lack of cementation and the presents of possible thin beds of clay along bedding, the bedrock materials if excavated could be subject to excavation failures and collapses.

Since the proposed storm water retrofit facility is within a bedrock unit of good permeability properties and the geologic conditions suggests that the water table may be greater than 50 feet, a ground water monitoring well is not recommended at this time.
The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the IT, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This would include shoring of the excavation and setting up areas of exit before a worker enters.

Large cobble size material may not be common but if encountered could inhibit excavating with standard earthwork equipment.

To protect the present southern slope from water seeps or failure due to saturation from the IT, the top 4 feet to 6 feet (1.2 to 1.8 m) of the IT shall be sealed off.

Root barriers should be installed to prevent nearby trees from invading into the IT.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.
Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the IT in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the IT or plugged to prevent drainage.

Prior to placing the filtering media into the excavation, a geofabric should be installed along the excavation walls and bottom to prevent natural materials from migrating into the filtering media and reducing the performance of the IT. After installing the geofabric, the filtering media can be placed.

No material greater than 3-inches (7.6 cm) in diameter shall be used as backfill.

All backfill, except for the bedding, filter media and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

A swale freeboard shall be installed to prevent organics (leaves, trash, etc.) from entering the BST.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.2 Kearny Mesa Maintenance Station

The Kearny Mesa Maintenance Station is located at 7179 Opportunity Road adjacent to the north I-805 in the City of San Diego. At the Kearny Mesa yard, the retrofit facility is proposed in an asphalt parking area along the north I-805 near where the yard drains along a swale to storm drain inlet structure. This site is on a possible terrace of unknown age or origin based on field observations made by the engineer. The asphalt pavement encountered during the exploration phase was 3-inches (7.6 cm) thick on top of 6-inches (15.4 cm) of aggregate base. Below the aggregate base, the bedrock material consisted of a hard moist to dry reddish brown silty fine- to medium-grained sandstone. This material was encountered throughout the total depth to 15 feet (15.4 m). No ground water was encountered.

The proposed BMP facility will consist of constructing a vault and filling the open space with a Compost Media Filter (CMF). Figure 4 contains a depiction of the proposed facility.
2.2.1 Conclusions and Recommendations

Based on limited feasibility study and a site visit, it was concluded that this site is feasible for the construction of a CMF facility. During construction of the CMF excavation, dense sandstone and bedded conditions could be encountered. Fracturing and bedding within the bedrock could cause localized blocky cavities. Ground water should not be a problem except after or during a rain storm.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the CMF, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This would include shoring of the excavation and setting up areas of exit before a worker enters.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

The dense nature of the on site bedrock could inhibit excavating with standard earthwork equipment.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.
If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the CMF in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the excavation and plugged to prevent drainage of the CMF.

All backfill, except for the bedding, media filter and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

No material greater than 3-inches (7.6 cm) in diameter shall be used as backfill.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.3 Escondido Maintenance Station

The Escondido Maintenance Station is located at 1780 West Mission Avenue adjacent to the SR-78 in the City of Escondido. At the Escondido yard, the retrofit facility is proposed along the western end of an asphalt parking area. At the proposed location, a large open culvert and head wall structure is present.

During the feasibility phase of this project, drilling by the engineer determined that the existing asphalt pavement was 3-inches (7.6 cm) thick on top of 6-inches (15.4) of aggregate base. The natural materials consisted of a moist to wet gray to dark brown silty to clayey fine-grained micaceous sand to gravelly to cobbly sand alluvium material. This material was encountered to a total depth of 20 feet (6.1 m). Ground water was encountered during drilling at approximately 8 feet (2.4 m) from the surface.

The proposed BMP facility will consist of a Sand Media Filter (SMF). Figure 5 contains a depiction of the proposed facility.
2.3.1 Conclusions and Recommendations

Based on a feasibility study and site visit, it was concluded that this site is feasible for the construction of a SMF facility. During construction, it is understood that there will be minimal excavating and earthwork. Excavating will exist of removing asphalt concrete and excavating a shallow pit. Shallow ground water could cause problems during construction. Ground water was found to be at approximately 3 feet (.9 m) from the surface. With the presents of shallow ground water and the lack of cementation within the on site alluvial materials, excavations could be subject to caving. Since the facility will be confined to a vault SMF, no ground water monitoring wells are recommended.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

Since the proposed storm water retrofit device may be below ground water, the site may need to be dewatered prior to and/or during the construction of any excavation.

During construction of the SMF, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This should include shoring if needed.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Reevaluation might include further investigations.
If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the SMF in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the SMF.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.4 La Costa Park and Ride

The La Costa Park and Ride is located just east of southbound I-5 and south of La Costa Avenue in the City of Carlsbad. At the La Costa parking area, the retrofit facility is proposed in a grassy area along an approximately 15 foot (4.6 m) high 2:1 horizontal to vertical slope adjacent to the Batiquitos Lagoon by an existing catch basin. This site is on a possible fill brought up to grade to construct the parking area.

The proposed BMP facility will consist of constructing a vault and filling the open space with a Sand Media Filter (SMF). No geotechnical exploration or testing was performed for this project. *Figure 6* contains a depiction of the proposed facility.
2.4.1 Conclusions and Recommendations

Based on a site visit, it was concluded that this site is feasible for the construction of a SMF facility. During construction, there will be minimal excavating. Excavating is expected to consist of brushing existing vegetation and excavating a small pit. Shallow ground water may not be a problem during construction except after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. The excavations could be subject to caving.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the SMF, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This should include shoring if needed.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.
Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the SMF in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the SMF.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.5 SR-78 / I-5 Park and Ride

The SR-78 / I-5 Park and Ride is located at the west terminus of SR-78 just west of southbound I-5 in the City of Oceanside. At the SR-78 / I-5 parking area, the retrofit facility is proposed in a asphalt concrete parking area along an approximately 5 foot (1.5 m) high 2:1 horizontal to vertical slope adjacent to the south bound I-5 by an existing catch basin. This site is on a possible cut/fill brought to grade to construct the parking area and I-5 freeway.

The proposed BMP facility will consist of constructing a vault and filling the open space with a Sand Media Filter (SMF). No geotechnical exploration or testing was performed for this project. Figure 7 contains a depiction of he proposed facility.

2.5.1 Conclusions and Recommendations

Based on a site visit, it was concluded that this site is feasible for the construction of a SMF facility. During construction, there will be minimal excavating. Excavating should consist of brushing existing vegetation and excavating a small pit. Shallow ground water may not be a problem during construction except after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. The excavations could be subject to caving.
The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the SMF, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This should include shoring if needed.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the SMF in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the SMF or plugged to prevent drainage.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.
All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.6 South I-5 / Palomar Airport Road

The south I-5 / Palomar Airport Road site is located along the southbound I-5 shoulder approximately 200 to 300 feet (61 to 91 m) south prior to the Palomar Airport Road offramp up to the offramp to Palomar Airport Road in the City of Carlsbad. This site seems to be on an undetermined thickness of fill brought to grade to construct the I-5 freeway and offramp.

The proposed BMP facility will consist of constructing a Biofiltration Swale (BSw). No geotechnical exploration or testing was performed for this project. Figure 8 contains a depiction of the proposed facility.

2.6.1 Conclusions and Recommendations

Based on a site visit, it was concluded that this site is feasible for the construction of a BSw facility. During construction, there will be minimal excavating. Excavating may consist of brushing existing vegetation and minimal excavating. Shallow ground water should not be a problem during construction except after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

For lane closure, Caltrans Standard Plans Traffic Control System for Lane Closure on Freeways and Expressways shall be followed.
Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the BSw, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This should include shoring if needed.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the BSw in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the BSw.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.
2.7 I-5 South / La Costa Avenue

The south I-5 / La Costa Avenue site is located along the southbound I-5 approximately 200 feet south from the start of the I-5 / La Costa Avenue offramp exit in the City of Leucadia. The proposed basin is bound to the east by the south I-5 / La Costa Avenue offramp, the south by a Chevron gas station at the La Costa Avenue exit. The Batiquitos Lagoon defines the north boundary and the west by a steep vegetated slope ascending to a residential or non-industrial commercial area for an estimated 20 to 30 feet (6.1 to 9.1 m). To the south of the nearby gas station on the slope, a small earthen failure was noticed.

During the feasibility phase of this project, drilling by the engineer determined that approximately 5 feet (1.5 m) of fill was present. Below the fill a fine-grained to silty sands derived from the nearby lagoon was encountered.

Ground water was measured from two open hole exploration borings on December 14, 1997 to be approximately 8 feet (2.4 m) from the surface. On February 10, 1998 after a series of rain storms, the water level was re-measured in the now monitoring well. At that time, the water level was approximately 3 feet (.9 m) from the surface. The ground was saturated and ponded water was observed on the surface.

The proposed BMP facility will consist of an Infiltration Basin (IB). Values of the in-drill hole permeability test performed in the exploration boring for the feasibility study were 2.0x10^-5 ft/s or 6.2x10^-4 cm/s.

2.7.1 Conclusions and Recommendations

Based on a feasibility study and site visit, it was concluded that this site is feasible for the construction of an IB facility. During construction of the IB, shallow ground water may be a problem especially after or during a period of rain storms or seasonal high tides. With the saturated conditions of the on site alluvial and fill materials, excavations could be subject to sloughing.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.
All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

For lane closure, Caltrans Standard Plans Traffic Control System for Lane Closure on Freeways and Expressways shall be followed.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the IB, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This would include shoring of the excavation and setting up areas of exit before a worker enters.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

All fill shall be removed from the proposed basin site. Prior to replacing the fill with a Caltrans Standard Permeable Backfill per 68-1.025 type class 1A, a geogrid should be installed along the excavation bottom to prevent equipment from bogging down and help support the imported filtering media. After installing the geogrid, the filtering media can be placed.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the IB in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the IB or plugged to prevent drainage.

No material greater than 3-inches (7.6 cm) in diameter shall be used as backfill.
In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

Since the proposed storm water retrofit facility will utilize natural on-site and imported fill materials as an infiltration media, and after major rain storms ground water was approximately 3 feet (.9 m) from the surface and the northern boundary being close to the Batiquitos lagoon. It is highly advised that ground water monitoring wells be installed.

Installation of a ground water monitoring well should be constructed following California Well Standards. The well casing and screened sections shall be constructed out of 4-inch diameter schedule 40 PVC or better. The screen section shall have .020-inch slots or smaller with a filter pack per design.

The monitoring well shall be installed down gradient from the IB into the water table for not more than 15 feet. Care should be taken to prevent drilling through aquicludes or into other aquifers below the uppermost water table. The well will need to be developed to achieve low turbidity and help set the filter pack.

Sampling waters from the monitoring well should be taken prior to constructing the IB for an initial screening. After the infiltration facility is constructed, a sampling schedule should be assigned for periodic sampling prior to and after the rainy season.

2.8 South I-5 / Manchester Avenue East

The north I-5 / Manchester Avenue East site is located within the cloverleaf created by the north bound I-5 offramp to Manchester Avenue in the City of Encinitas. The San Elijo Lagoon is south of Manchester Avenue. At the south east corner of the proposed site, a sewer pump station is present.

During the feasibility phase of this project, drilling by the engineer determined that approximately 5 foot (1.5 m) of thick fill was present. Below the fill was a fine-grained to silty sands derived from the nearby lagoon. Ground water was measured to be approximately 3.75 (1.1 m) feet from the surface on December 15, 1997. On February 10, 1998, the ground was saturated and ponded water was observed on the surface. During heavy rain storms, the sewer pump station has overflowed into the proposed site.
The proposed BMP facility will consist of an Extended Detention Basin (EDB) and a small basin to detain sewage from the sewer pump station overflow. Minor geotechnical exploration and testing was conducted at this site.

2.8.1 Conclusions and Recommendations

Based on a site visit and nearby feasibility studies, it was concluded that this site is feasible for the construction of an EDB facility. During construction, there will be minimal excavating. Excavating may consist of brushing existing vegetation and removal of the existing fill sough in the upper few feet of existing material. There should be minimal impact to the existing freeway connector fills. Ground water was found to be from approximately 3.75 feet (1.1 m) from the surface. Shallow ground water could be a problem during construction and after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. With the lack of abundant clays or cementation within the on site fill and alluvium materials matrix, any excavation could be subject to caving.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All fill stockpiles shall be removed from the area of the proposed EDB. All other deleterious material must be removed from the proposed area prior to construction.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the EDB, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.
If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

All cut or fill slopes shall not be greater than 2:1 horizontal to vertical or greater than 20 feet (6.1 m) in height.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the EDB in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the EDB and plugged to prevent drainage.

Fill to be placed on slopes should be benched into competent fills or native soils.

All backfill, except for the bedding and six (6) inches of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.9 South I-5 / Manchester Avenue West

The south I-5 / Manchester Avenue West site is located within the cloverleaf created by the south bound I-5 onramp from Manchester Avenue in the City of Encinitas. The San Elijo Lagoon is south of Manchester Avenue.

The proposed site consists of an approximately 5 foot (1.5 m) thick fill brought to grade to construct the I-5 freeway and the Manchester Avenue onramp. Below the fill was a fine-grained to silty sands derived from the nearby lagoon. Ground water was measured to be approximately 2.35 feet (.71 m) from the surface on December 15, 1997. On February 10, 1998, the ground was saturated. No ponded water was observed on the surface.
The proposed BMP facility will consist of a Wet Basin (WB). Minor geotechnical exploration and testing was conducted at this site.

2.9.1 Conclusions and Recommendations

Based on a site visit and nearby feasibility studies, it was concluded that this site is feasible for the construction of a WB facility. During construction, there should be minimal excavating. Excavating should consist of brushing existing vegetation and removal of the existing fill sough in the upper few feet of existing material. There should be minimal impact to the existing connector fills. Ground water was found to be from approximately 2.35 feet (.71 m) from the surface. Shallow ground water could be a problem during construction and after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. With the lack of abundant clays or cementation within the on site fill and alluvium materials matrix, any excavation could be subject to caving.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All fill stockpiles shall be removed from the area of the proposed WB. All other deleterious material must be removed from the proposed area prior to construction.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the WB, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.
If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

All cut or fill slopes shall not be greater than 2:1 horizontal to vertical or greater than 20 feet (6.1 m) in height.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the WB in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the WB and plugged to prevent drainage.

Fill to be placed on slopes should be benched into competent fills or native soils.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

Since the proposed storm water retrofit facility maybe subject to infiltration into natural on site materials and the ground water was found to be approximately 2.35 feet (.71 cm) from the surface, it is advisable that a ground water monitoring well be installed.

Installation of a ground water monitoring well shall be constructed following California Well Standards. The well casing and screened sections shall be constructed out of 4-inch diameter schedule 40 PVC or better. The screen section shall have .020-inch slots or smaller with a filter pack per design.
The monitoring well shall be installed down gradient from the WB into the water table for not more than 15 feet (4.6 m). Care should be taken to prevent drilling through aquicludes or into aquifers below the upper most water table. The well will need to be developed to achieve low turbidity and help set the filter pack.

Sampling waters from the monitoring well should be taken prior to constructing the WB for an initial screening. After the infiltration facility is constructed, a sampling schedule should be assigned for periodic sampling prior to and after the rainy season.

2.10 South I-5 / SR-56 Interchange

The south I-5 / SR-56 Interchange site is located west of the SR-56 onramp to the I-5 south in the City of San Diego. The Soledad Creek and the Carmel Valley Road Park and Ride is north of the proposed project.

The proposed site was visited on February 15, 1998, It was noticed that an existing Detention Basin perched on a fill bench was approximately 2/3 the way down from the interchange. This existing basin was estimated to be approximately 30 feet (9.1 m) wide and 60 feet (18.3 m) long and filled with water approximately 1 foot (.31 m) deep maximum. A culvert inlet structure with a head wall was present at the basin level. For the west a spill way lined with 1 foot (3.1 m) diameter rip rap acts as an overflow structure to an asphalt concrete roadway. West of the roadway to the west was a marshy wetlands of the Soledad Creek delta is present. The spill way and fill supporting the detention basin was saturated with minor seeps noticed along the lower section of the spill way and fill toe. Piping and erosion was noticed around the inlet structure.

Ground water is estimated to be approximately 10 feet (3.1 m) or less below the level of the wetlands adjacent to the asphalt roadway.

It is proposed to increase the size of the existing detention basin for the construction of an Extended Detention Basin (EDB). To construct the EDB, the upper fill slope between the freeway interchange and detention basin will have to be graded. No geotechnical exploration or testing was conducted at this site.

2.10.1 Conclusions and Recommendations

Based on a site visit, it was concluded that this site is feasible for the construction of an EDB facility. During construction, there should be major earthwork. Excavating should consist of removing existing fills and expanding the existing detention basin. This could impact existing connector fills. Shallow ground water could be a problem during construction in the winter months when the existing detention basin is full and after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. With the presents of saturated fills, any excavation may be subject to caving.
The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All fill stockpiles shall be removed from the area of the proposed EDB. All other deleterious material must be removed from the proposed area prior to construction.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the EDB, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

All cut or fill slopes shall not be greater than 2:1 horizontal to vertical or greater than 20 feet (6.1 m) in height.
Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the EDB in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the EDB and plugged to prevent drainage.

Fill to be placed on slopes should be benched into competent fills or native soils.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.

2.11 I-15 / SR-78 Interchange

The I-15 / SR-56 Interchange site is located between the east SR-78 onramp to the I-15 south and the east SR-78 onramp to the I-15 north in the City of Escondido.

The proposed site is at an existing Basin that is connected with a culvert inlet and outlet structure within a large fill constructed for the freeway interchange. The existing basin is approximately 20 feet (6.1 m) wide and 40 feet (12.2 m) long. Reeds, tall grass and bamboo is common plant growth within the basin. The embankments forming the basin consists of fill materials.

At the I-15 and SR-78 interchange between the SR-78 east bound to I-15 north and south off-ramps a feasibility exploration boring was drilled 6 to 8 feet (1.8 to 2.4 m) above a small basin. The first 6 feet (1.8 m) of drilling encountered large gravel to boulder size rip rap fill material with a clayey to silty sand matrix. Below the fill, natural material encountered consisted of a moist to wet dark gray clayey to silty fine- to coarse-grained sand alluvium to a total depth of 25 feet (7.6 m). At 25 feet (7.6 m), weathered granitic rock was encountered to 30 feet (9.1 m). Ground water and fresh granitic rock was encountered at 30 feet (9.1 m).
After drilling the exploration boring and prior to installing the 4-inch PVC well, bentonite chips were placed in the bottom of the exploration boring. From 10 to 20 feet (3.1 to 6.1 m) a .040-inch slot screened section was installed and gravel packed with medium aquarium filter pack. A blank section of PVC was installed and sealed with medium bentonite chips from the surface to 10 feet (3.1 m). The well was pre-saturated with potable water to hydrate the bentonite chips sealing off and saturating the gravel packed zone and side wall test interval prior to performing in-drill hole permeability tests. Values of the in-drill hole permeability test performed in the exploration boring for the feasibility study were 7.5 x10-7 feet/s or 2.4 x10-5 cm/s.

It is proposed to increase the size of the existing detention basin for the construction of an Extended Detention Basin (EDB). To construct the EDB, fill between the freeway interchange and detention basin and the inlet structure will have to be removed. Minimal geotechnical exploration and testing was conducted at this site. Figure 10 contains a depiction of the proposed facility.

2.11.1 Conclusions and Recommendations

Based on a site visit and a limited feasibility study, it was concluded that this site is feasible for the construction of an EDB facility. During construction, there will be major earthwork. Excavating may consist of removing existing fills and expanding the existing detention basin. This could impact existing connector fills. Shallow ground water should be a problem during construction except after or during a rain storm where ponding on the surface and saturation of the sub-grade could develop. With the presents of saturated soils on site, any excavation could be subject to caving.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All fill stockpiles shall be removed from the area of the proposed EDB. All other deleterious material must be removed from the proposed area prior to construction.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.
Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.

During construction of the EDB, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

All cut or fill slopes shall not be greater than 2:1 horizontal to vertical or greater than 20 feet (6.1 m) in height.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the EDB in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the EDB and plugged to prevent drainage.

Fill to be placed on slopes should be benched into competent fills or native soils.

All backfill, except for the bedding and six (6) inches of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.
2.12 West SR-78 / Melrose Drive

The west SR-78 / Melrose Drive site is located along the eastbound SR-78 shoulder where the Buena Vista Creek flows through a box structure under Hacienda Drive in the City of Vista. This site is approximately 10 feet above the creek bottom. The proposed facility is designed to flow along the freeway shoulder then cascade over an existing creek bank to the creek below. The creek had approximately 6-inches (15.4 cm) of sheet flow into the box structure. Ground water at this site should be at the creek bed elevation or approximately 10 feet (3.1 m) from grade.

The proposed BMP facility will consist of constructing a Biofiltration Swale (BSw). No geotechnical exploration or testing was performed for this project. Figure 11 contains a depiction of the proposed facility.

2.12.1 Conclusions and Recommendations

Based on a site visit, it was concluded that this site is feasible for the construction of a BSw facility. During construction, there should be minimal excavating. Excavating will consist of brushing existing vegetation and minimal excavating and constructing erosional devices along the proposed outflow or spillway into the creek. Shallow ground water should not be a problem except at the creek bed level, in the creek channel and after or during a rain storm where ponding on the surface and saturation of the subgrade could develop.

The following is recommended.

The grading contractor is responsible for notifying the appropriate governmental agency and the engineer of a pre-grading meeting, prior to the start of site cleanup, grading operations and anytime that grading operations are resumed after an interruption. Each step of the operations described below must be approved in a specific area by the engineer and, where required, by the appropriate governmental agency or agencies before proceeding with subsequent work. Where such approval is not obtained, the contractor, at his own expense, will re-do the work at the discretion of the engineering geologist/geotechnical engineer.

All site cleanup and grading will be subject to the approval of the engineer and must conform to the requirements of the pertinent governmental agencies and the following recommendations.

For lane closure, Caltrans Standard Plans Traffic Control System for Lane Closure on Freeways and Expressways shall be followed.

Prior to the start of grading, all trash, asphalt concrete and debris, shall be removed and disposed of or hauled off-site. If possible the deleterious material should be recycled.
During construction of the BSw, all excavations, trenches and earthwork shall follow the California Code of Regulations Title 8, Construction Safety Orders Sections 1504, 1539 – 1543. This should include shoring if needed.

Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the engineer.

If during the course of the grading, conditions are encountered which, in the opinion of the engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

If, in the opinion of the engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures or construction, or any off-site properties or persons.

Erosional features such as piping, downcutting and rilling can develop where the storm water runoff exits the BSw over the creek bank. This could erode both the existing creek bank and nearby box structure. Where the BSw exits into the creek, the area shall be protected from erosion by constructing a rip rap and gunite, concrete ramp, culvert system or any of the combination of from the top of the slope to the creek channel bottom.

Existing active or abandoned underground utilities or other structures should be removed, destroyed, decommissioned or rerouted from the BSw in accordance with requirements of the appropriate governing agencies. Any concrete or tile lines should be removed or rerouted away from the BSw or plugged to prevent drainage.

All backfill, except for the bedding and six (6) inches (15.4 cm) of cover, should be compacted to at least 90 percent of maximum density as determined by ASTM D1557-91.

In areas of new construction, where topsoil is of good quality, it should be stockpiled during construction and respread during the final stages of construction per Caltrans Highway Design Manual Topic 706.2.

All excess excavated material if found to be within Caltrans standards can be recycled for other Caltrans Projects. If Caltrans decides not to use the excavated material or the material is found to be sub-standard, the spoils can be hauled off site to an appropriate refuse or landfill location.
3.0 CLOSURE

The findings and recommendations contained in this report are based upon specific limited field exploration, literature searches and/or site visits. The materials immediately adjacent to or beneath those observed may have different characteristics and no representations are made as to the quality or extent of materials not observed.

This report has not been prepared for use by parties or projects other than those named or described above. It may not contain sufficient information for other parties or other purposes. It has been prepared in accordance with generally accepted geotechnical practice and makes no other warranties, either expressed or implied, as to the professional advice or data included in it.

Evaluation of the sites where plans were not available during the preparation of this report were based on verbal and written descriptions, and the analysis during a site visit and/or limited field exploration programs.
The following Figures 1 through 11 consist of a site Vicinity Map and selected site Plans. At the time that this report was submitted, not all of the site Plans were complete. The Plans within this report are what was completed at the time of submittal.
Appendix A.3
Construction Plans
Procurement Projects
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SAN DIEGO COUNTY
AT VARIOUS LOCATIONS
To be supplemented by Standard Plans dated July, 1997

LOCATION MAP
The name of Boltafr and its offices or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

LOCATION OF CONSTRUCTION

<table>
<thead>
<tr>
<th>LOC</th>
<th>CO</th>
<th>ROUTE</th>
<th>KP</th>
<th>PM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SD</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>KEARY MESA MAINTENANCE STATION</td>
</tr>
<tr>
<td>2</td>
<td>SD</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>ESCONDIDO MAINTENANCE STATION</td>
</tr>
<tr>
<td>3</td>
<td>SD</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>LA COSTA AVENUE PARK AND RIDE</td>
</tr>
<tr>
<td>4</td>
<td>SD</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>SR-78 / I-5 PARK AND RIDE</td>
</tr>
<tr>
<td>5</td>
<td>SD</td>
<td>78</td>
<td>-</td>
<td>-</td>
<td>SR-78 WEST OF MELROSE DRIVE INTERCHANGE</td>
</tr>
<tr>
<td>6</td>
<td>SD</td>
<td>5</td>
<td>75-75.5</td>
<td>46-46.5</td>
<td>1-5 NORTH OF PALOMAR AIRPORT ROAD INTERCHANGE</td>
</tr>
<tr>
<td>7</td>
<td>SD</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>CARLSBAD MAINTENANCE STATION</td>
</tr>
</tbody>
</table>

The Contractor shall possess the Class (or classes) of license as specified in the "Notice to Contractors".
Bearing and coordinates as shown hereon are in terms of the California Coordinate System of 1983 (Epoch 1989, 501).

Zone 6, based locally upon the following continuously operating reference stations as published by the National Geodetic Survey.

<table>
<thead>
<tr>
<th>STATION</th>
<th>NORTHING(Y)</th>
<th>EASTING(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONP</td>
<td>580,447.214</td>
<td>1,983,875.610</td>
</tr>
<tr>
<td>S103</td>
<td>577,862.544</td>
<td>1,806,310.297</td>
</tr>
<tr>
<td>TRAK</td>
<td>682,024.000</td>
<td>1,850,856.672</td>
</tr>
</tbody>
</table>

BENCHMARK

Elevations as shown hereon are in terms of the North American Vertical Datum of 1988 based locally upon the following benchmarks.

BENCHMARK SOURCE

NAVAG ELEV. SOURCE

DASH COUNTY OF ORANGE NOS
F 1415 75.015 NOS

PROJECT CONTROL

<table>
<thead>
<tr>
<th>STA</th>
<th>NORTHING(Y)</th>
<th>EASTING(X)</th>
<th>EPOCH DATE</th>
<th>ELEVATION METERS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>607,042.310</td>
<td>1,919,034.574</td>
<td>1991.35</td>
<td>203.433</td>
<td>PK NAIL &amp; NUTTER OF SOUTH END OF MAINTENANCE YARD</td>
</tr>
<tr>
<td>14</td>
<td>607,128.622</td>
<td>1,919,084.344</td>
<td>1991.35</td>
<td>203.906</td>
<td>PK NAIL &amp; NUTTER OF SOUTH END OF MAINTENANCE YARD</td>
</tr>
</tbody>
</table>

CONSTRUCTION STAKING SURVEY
CONTROL DATA

SCALE 1:1000

C88-2
BEARINGS AND COORDINATES AS SHOWN HEREON ARE IN TERMS OF
THE CALIFORNIA COORDINATE SYSTEM OF 1983 (EPOCH 1955.53), ZONE 6,
BASED LOCALY UPON THE FOLLOWING CONTINUOUSLY OPERATING
REFERENCE STATIONS AS PUBLISHED BY THE NATIONAL GEODETIC SURVEY.

<table>
<thead>
<tr>
<th>STATION</th>
<th>NORTHING (Y)</th>
<th>EASTING (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHP</td>
<td>580,442,284</td>
<td>1,985,876,610</td>
</tr>
<tr>
<td>5103</td>
<td>577,863,244</td>
<td>1,986,370,287</td>
</tr>
<tr>
<td>TRAX</td>
<td>662,024,000</td>
<td>1,935,836,872</td>
</tr>
</tbody>
</table>

BENCHMARK

ELEVATIONS AS SHOWN HEREON ARE IN TERMS OF THE
NORTH AMERICAN VERTICAL DATUM OF 1988 BASED
LOCALY UPON THE FOLLOWING CALIFORNIA DEPARTMENT
OF TRANSPORTATION BENCHMARK.

BM 5-44, 11 14.361
(NAVQDS-GPS 2ND ORDER)
2" BRASS DISC STAMPED "CAL. DEPT. TRANS." BM 5-44, 11 1997,
LOCATED AT THE NORTHEAST BRIDGE RETURN AT I-5 & LA COSTA AVE.

PROJECT CONTROL

<table>
<thead>
<tr>
<th>STA</th>
<th>NORTHING (Y) METERS</th>
<th>EASTING (X) METERS</th>
<th>EPOCH DATE</th>
<th>ELEVATION METERS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>593,995,410</td>
<td>1,905,121,982</td>
<td>1995.50</td>
<td>4.444</td>
<td>Tie Rod-Manchester</td>
</tr>
<tr>
<td>6</td>
<td>594,109,694</td>
<td>1,905,326,472</td>
<td>1995.50</td>
<td>4.070</td>
<td>Tie Rod-Northside of Manchester</td>
</tr>
</tbody>
</table>

CONSTRUCTION STAKING SURVEY
CONTROL DATA

SCALE: 1:1000

C88-3
1. ALL STORM FILTERS REQUIRE REGULAR MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR DETAILS.

2. PRECAST CONCRETE VAULT CONSTRUCTED IN ACCORDANCE WITH ASTM C855.

3. FLEXIBLE COUPLINGS TO BE SET 0.45M OUTSIDE FACE OF WALL TO BE APPROVED BY RESIDENT ENGINEER.

4. SEE PRECAST STORM FILTER DATA SHEET FOR VAULT DIMENSIONS, ELEVATIONS AND NUMBER OF CARTRIDGES.
### Dimension Table

<table>
<thead>
<tr>
<th>No</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>L</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>T1</th>
<th>T2</th>
<th>W1</th>
<th>Inlet Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.763</td>
<td>1.778</td>
<td>2.623</td>
<td>21.240</td>
<td>15</td>
<td>6</td>
<td>0.240</td>
<td>0.412</td>
<td>3.657</td>
<td>WEIR</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.000</td>
<td>3.008</td>
<td>3.848</td>
<td>12.740</td>
<td>8</td>
<td>4.5</td>
<td>0.240</td>
<td>0.412</td>
<td>2.134</td>
<td>PIPE</td>
<td></td>
</tr>
</tbody>
</table>

### Emergency Overflow

**Emergence Overflow**

- See Std Plan BS-1, Typ H=0.4, T=2
- See Det 'A'

**Section A-A**

- See Std Plan BS-1, Typ H=0.4, T=2 (Shown on Sh5 D-23)
- See Det 'A'

**Inflow Pipe Per Plan**

**Level Line**

**Perforated Riser Schedule**

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>150 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vert Hole Spacing</td>
<td>64 mm</td>
</tr>
<tr>
<td>Perforations Per Row</td>
<td>9</td>
</tr>
<tr>
<td>Dia of Perforation</td>
<td>25 mm</td>
</tr>
</tbody>
</table>

**Drainage Details**

**Detail 'A'**

- Type I Sand Filter BMP
- See Std Plan BS-1, Typ H=0.4, T=2
- See Det 'A'
- See Std Plan BS-1, Typ H=0.4, T=2 (Shown on Sh5 D-23)
- See Std Plan BS-1, Typ H=0.4, T=2 (Shown on Sh5 D-23)

**Perforated Riser Schedule**

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>150 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vert Hole Spacing</td>
<td>64 mm</td>
</tr>
<tr>
<td>Perforations Per Row</td>
<td>9</td>
</tr>
<tr>
<td>Dia of Perforation</td>
<td>25 mm</td>
</tr>
</tbody>
</table>
TYPE II SAND FILTER BMP

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

NO SCALE

DRAINAGE DETAILS

NOTE: SEE DETAIL SHEET D-23 FOR SIDE WALL REINFORCING AND JOINT DETAILS
MONITORING MANHOLE

GENERAL NOTES

1. RISERS MAY BE MADE UP OF 150 mm, 200 mm, 450 mm, 600 mm, OR 1200 mm SECTIONS.
2. EACH RISER SHALL HAVE A LADDER, AS DETAILED ON STANDARD PLAN D74C, WHICH SHALL BE SUSPENDED INTO BASE STRUCTURE.
3. ALL PRECAST COMPONENTS FOR UPPER PORTION TYPE MH SHALL BE REINFORCED WITH 6 mm DIAMETER STEEL WOUND SPIRALLY @ 100 mm CENTERS.
4. BOTTOMS SHALL HAVE A WOOD TROWEL FINISH.
5. H AND HB SHALL BE AS SPECIFIED ON PLANS.
6. REINFORCING STEEL SHALL BE @ 13 BARS @ 450 mm CENTERS PLACED 40 mm CLEAR TO INSIDE OF BOX UNLESS OTHERWISE SHOWN.
7. PIPE(S) MAY BE PLACED IN ANY WALL.
8. NO DEDUCTION IN STRUCTURE CONCRETE QUANTITIES WILL BE MADE FOR PIPE OPENINGS.
9. DESIGN UNIT STRESSES: \( f_u = 140 \text{ MPA}, \) \( n = 10, \) \( f_c = 10 \text{ MPA}, \)
10. UPPER PORTION OF TYPE MH WILL BE PAID FOR AS 900 mm RISER,
11. CENTER OF RISER SHALL BE LOCATED OVER THE CENTERLINE OF MAIN STORM DRAIN.
12. THICKNESS OF DECK SHALL VARY WHEN NECESSARY TO PROVIDE LEVEL MANHOLE SEAT.

FOR USE WITH EITHER TYPE X OR TYPE Y BASE STRUCTURES

TYPICAL UPPER STRUCTURE
AND MANHOLE JUNCTION

UPPER STRUCTURE
LOAD SCHEDULE

LOCATION: OUTDOOR
125 AMPS BUSH 40A 1P 2P MAIN SURFACE MOUNTED

<table>
<thead>
<tr>
<th>REMARKS</th>
<th>LOAD (WATTS)</th>
<th>OUTLETS</th>
<th>CIR NO</th>
<th>ALL BREAKERS</th>
<th>CIR NO</th>
<th>OUTLETS</th>
<th>LOAD (WATTS)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 L2</td>
<td>OTHER REC LGT</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>SPARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFLOW MON.</td>
<td>1800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFLOW MON.</td>
<td>1800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1800 1800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL CONNECTED LOAD: 1800VA(L1) + 1800VA(L2) + 3600VA
6120/240V, 1P 15, 60AMPS

NOTES:

1. EXISTING TYPE III SERVICE ENCLOSURE
   CABINET S.O.G.B.E. METER NO. 210206,
   120/240V, 1P WITH PP-100A CB (MAIN)
   ADDP 2P-40A CB (FOR PHN, PPA)

2. NEW PANEL BOARD PPA IN NEMA 3R ENCLOSURE
   (1) PP-40A CB (MAIN)
   (1) PP-20A CB (INFLOW MONITORING)
   (1) PP-20A CB (OUTLET MONITORING)
   (2) PP-20A CB (SPARE)

3. INSTALL PULL BOX NO. 3/4 (FOR DETAIL SEE
   STD. PLAN ES-81)

4. INSTALL PULL BOX NO. 3/4 (FOR DETAIL SEE
   STD. PLAN ES-81)

CONDUIT & WIRE NOTES:

1. 40 PVC, 3/4" THW CU & 1/10 GROD
   L=1300 (429') VO=2, 615

2. 40 PVC, 2/0" THW CU & 1/40 GROD
   L=25M (82') VO=2, 41

3. 40 PVC, 2/12" THW CU & 1/142 GROD

ELECTRICAL PLAN

SCALE 1:500

LA COSTA AVE PARK AND RIDE
1. EQUIP METAL PULL BOX EXPOSED TO WEATHER WITH WEATHER PROOF REMOVABLE COVER.
2. USE THREADED WATERTIGHT HUBS FOR TOP ENTRY.
3. USE KNOCKOUT FOR BOTTOM ENTRY ONLY.
MODIFIED GCP MONITORING MANHOLE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DRAINAGE DETAILS
NO SCALE
D-18
TYPICAL SECTION WITH DIKE
NO SCALE

TYPICAL PULLOUT DETAIL
NO SCALE

TYPICAL PULLOUT
NO SCALE

NOTES:
1. WHERE PIPES OF DIFFERENT DIAMETERS ARE JOINED WITH A CONCRETE COLLAR, 'L' AND 'T' SHALL BE THOSE OF THE LARGER PIPE. D-01 OR 02, WHICHEVER IS GREATER.
2. FOR PIPE SIZE NOT LISTED USE NEXT SIZE LARGER.
3. OMIT REINFORCING ON PIPES 600 mm AND LESS IN DIAMETER AND ON ALL PIPES WHERE ANGLE A IS LESS THAN 10°. REINFORCEMENT SHALL BE PLACED 40 mm CLEAR FROM OUTSIDE DIAMETER OF PIPE.
4. JOIN PIPES AT INVERTS.
5. INSIDE LAYER OF REINFORCEMENT SHALL BE PLACED 40 mm CLEAR FROM OUTSIDE DIAMETER OF PIPE. PLACE OUTSIDE LAYER OF REINFORCEMENT 200 mm FROM INSIDE LAYER OF REINFORCEMENT.

CONCRETE COLLAR

DRAINAGE DETAILS
NO SCALE

D-19
NOTES

1. "H" is the difference in elevation between the outlet pipe flow line and the flow line of the grate.

2. Steps - None required when "H" is 1.05 m or less. Install one step for each additional 1.05 m of "H". A 150 mm step should be evenly spaced 300 mm intervals from 400 mm above floor to within 300 mm of the top of the box. Place steps in wall without pipe openings. See Standard Plan D74c for step detail.

3. Pipe can be placed in any wall.

4. Reinforcing steel not required in walls when "H" ≤ 1.80 m or less.

5. Reinforcing steel in walls shall be ≤ 10 bars at 300 mm centers placed 40 mm clear of inside of box.

6. GRATE TYPE SHALL BE 600-12 UNLESS OTHERWISE SHOWN ON DRAINAGE PLAN.

MISCELLANEOUS IRON & STEEL

<table>
<thead>
<tr>
<th>Inlet Type</th>
<th>Grate Type</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD-1 &amp; GD-2</td>
<td>600 ≤ 12</td>
<td>285</td>
</tr>
<tr>
<td>GD-1 &amp; GD-2</td>
<td>600-105</td>
<td>173</td>
</tr>
<tr>
<td>GD-1 &amp; GD-2</td>
<td>600-12X</td>
<td>197</td>
</tr>
<tr>
<td>GD-1 &amp; GD-2</td>
<td>600-13</td>
<td>160</td>
</tr>
</tbody>
</table>

DRAINAGE DETAILS

NO SCALE
TYPE GO INLET DETAIL

DRAINAGE DETAILS
NO SCALE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

D-21
1.9m X 1.9m CONCRETE PAD DETAILS

DRAINAGE DETAILS

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN
1. STRUCTURAL CONCRETE SHALL BE CLASS 'A'.

2. ALL LONGITUDINAL BARS SHALL BE AS SHOWN, PLACE BARS IN BOTTOM SLAB SYMMETRICALLY ABOUT CENTERLINE. PLACE BARS IN WALLS STARTING AT TOP WITH 50mm OF CLEAR COVER.

3. CLEAR COVER FOR STEEL SHALL BE 50mm FOR WALLS AND 75mm EACH FACE FOR BOTTOM SLAB.

4. STEEL IS DimensionED TO BACK OF BAR BEND.

5. FOR CONSTRUCTION ON CURVES, STRAIGHT TRANSVERSE BARS SHALL BE ALIGNED RADIALLY WITH SPACING MEASURED AT FACE OF WALL. FOR L-BARS IN WALLS, SPACING SHALL BE MEASURED BETWEEN THE VERTICAL LEGS OF BARS.

6. ALL TRANSVERSE CONSTRUCTION JOINTS SHALL BE IN A VERTICAL PLANE NORMAL TO THE CENTERLINE AND THE SPACING THEREOF SHALL NOT EXCEED 15 METERS OR BE LESS THAN 3 METERS. CONTINUOUS KEYWAYS SHALL BE CONSTRUCTED AS SHOWN IN DETAIL A. A COMPLETE CURTAIN OF TRANSVERSE STEEL SHALL BE PLACED 75mm FROM EACH FACE OF THE JOINTS AND LONGITUDINALS AND continue TO CONTINUE THROUGH THE JOINTS. IN ADDITION, EXPANSION JOINTS SHALL BE CONSTRUCTED BETWEEN REINFORCED CONCRETE CHANNEL AND REINFORCED CONCRETE BOX SECTIONS AS SHOWN IN DETAIL B. DOWELS SHALL BE PLACED AT 300mm SPACING CENTERED IN THE MIDDLE THIRD OF THE BOTTOM SLAB AND THE TOP THIRD OF SIDE WALLS. A MINIMUM OF 3 DOWELS PER SLAB AND WALLS SHALL BE PLACED.

7. ALL QUANTITIES SHOWN ARE APPROXIMATE.

8. ALL SPLICES ARE SUBJECT TO APPROVAL BY THE RESIDENT ENGINEER.

9. THE BAR LENGTH SHALL VARY UNIFORMLY THROUGHOUT THE TRANSITIONS.

---

**DATA**

<table>
<thead>
<tr>
<th>W</th>
<th>3.272</th>
<th>3.774</th>
<th>4.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td>2.770</td>
<td>3.000</td>
<td>3.272</td>
</tr>
<tr>
<td>WALL</td>
<td>3.000</td>
<td>3.500</td>
<td>4.000</td>
</tr>
<tr>
<td>BOTTOM SLAB</td>
<td>3.000</td>
<td>3.500</td>
<td>4.000</td>
</tr>
<tr>
<td>LONGITUDINAL BAR</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>T' BAR</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>D' BAR</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>H' BAR</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Vertical (L)</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>Horizontal (L)</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>&quot;A&quot; BAR</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>&quot;B&quot; BAR</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>&quot;C&quot; BAR</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
<tr>
<td>&quot;D&quot; BAR</td>
<td>1.030</td>
<td>1.030</td>
<td>1.030</td>
</tr>
</tbody>
</table>

---

**CONCRETE**

| Concrete | 43 | 3.44 | 0.85 |

---

**REINFORCEMENT**

| Reinforcement | 233 | 462 | 85 |

---

**DESIGN DATA**

- LIVE LOAD = 7.26 Tonne
- SOIL DENSITY = 1.76 Tonne/m3

**ALLOWABLE STRESSES**

- f'0 = 28 MPA
- f'0 = 12 MPA
- f'0 = 414 MPA
- f'0 = 165 MPA

**MIN LAPS**

- "A" BARS = 450 mm
- "B" BARS = 775 mm
- "C" BARS = 400 mm

---

**DRAINAGE DETAILS**

NO SCALE

---

**WALL SECTION**

---

**EXHIBIT 13**

---

**SHEET 24**

---

**SHEET 25**

---

**SHEET 26**

---

**SHEET 27**

---

**SHEET 28**

---

**SHEET 29**

---

**SHEET 30**

---

**SHEET 31**

---

**SHEET 32**

---

**SHEET 33**

---

**SHEET 34**

---

**SHEET 35**

---

**SHEET 36**

---

**SHEET 37**

---

**SHEET 38**

---

**SHEET 39**

---

**SHEET 40**

---

**SHEET 41**

---

**SHEET 42**

---

**SHEET 43**

---

**SHEET 44**

---

**SHEET 45**

---

**SHEET 46**

---

**SHEET 47**

---

**SHEET 48**

---

**SHEET 49**

---

**SHEET 50**

---

**SHEET 51**

---

**SHEET 52**

---

**SHEET 53**

---

**SHEET 54**

---

**SHEET 55**

---

**SHEET 56**

---

**SHEET 57**

---

**SHEET 58**

---

**SHEET 59**

---

**SHEET 60**

---

**SHEET 61**

---

**SHEET 62**

---

**SHEET 63**

---

**SHEET 64**

---

**SHEET 65**

---

**SHEET 66**

---

**SHEET 67**

---

**SHEET 68**

---

**SHEET 69**

---

**SHEET 70**

---

**SHEET 71**

---

**SHEET 72**

---

**SHEET 73**

---

**SHEET 74**

---

**SHEET 75**

---

**SHEET 76**

---

**SHEET 77**

---

**SHEET 78**

---

**SHEET 79**

---

**SHEET 80**

---

**SHEET 81**

---

**SHEET 82**

---

**SHEET 83**

---

**SHEET 84**
<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. PLACE AC (MISC AREA)</td>
<td>B. MINOR CONCRETE (MINOR STRUCTURE)</td>
</tr>
<tr>
<td>C. TYPE I SAND FILTER BMP</td>
<td>D. TYPE II SAND FILTER BMP</td>
</tr>
<tr>
<td>E. MISCELLANEOUS IRON AND STEEL</td>
<td>F. MILL FRAME AND COVER</td>
</tr>
<tr>
<td>G. CHECKERED PLATE</td>
<td>H. TYPE 600-12</td>
</tr>
<tr>
<td>I. TYPE 900R</td>
<td>J. FLARED END SECTION (AP)</td>
</tr>
<tr>
<td>K. TRAPEZOIDAL FLUME</td>
<td>L. PARSHALL FLUME</td>
</tr>
<tr>
<td>M. XXXX</td>
<td>N. XXXX</td>
</tr>
<tr>
<td>O. COMPOST FILTER BMP</td>
<td>P. CCP MONITORING MANHOLE</td>
</tr>
<tr>
<td>Q. INTEGRATING TRENCH BMP</td>
<td>R. C. CATE</td>
</tr>
<tr>
<td>S. A. 50 mm PLASTIC CONDUIT</td>
<td>T. A. 150 mm</td>
</tr>
<tr>
<td>U. A. 200 mm</td>
<td>V. A. 250 mm</td>
</tr>
<tr>
<td>W. A. 300 mm</td>
<td>X. A. 450 mm</td>
</tr>
<tr>
<td>Y. A. 500 mm</td>
<td>Z. B. BIO-FILTER SWALE BMP</td>
</tr>
<tr>
<td></td>
<td>A. B. BIO-FILTER STRIP BMP</td>
</tr>
<tr>
<td></td>
<td>C. TEE</td>
</tr>
<tr>
<td></td>
<td>PIPE JOINT CLASSIFICATION</td>
</tr>
<tr>
<td></td>
<td>HEIGHT OF INLET &quot;H&quot; OR &quot;V&quot;</td>
</tr>
<tr>
<td></td>
<td>MAXIMUM COVER</td>
</tr>
</tbody>
</table>

**DRAINAGE SYSTEM NO**

**DRAINAGE UNIT**

**REMOVE DRAINAGE FACILITY**

**REMOVE PIPE**

**REMOVE CONCRETE GUTTER**

**REMOVE ASPHALT CONCRETE DIKE**

**REMOVE PAVEMENT**

**REMOVE ASPHALT CONCRETE**

**REMOVE TREE**

**DITCH EXCAVATION**

**RESET UTILITY**

**RESET DRAINAGE FACILITY**

**ASPHALT CONCRETE DIKE**

**TYPE A-I-150 CURB**

**AGGREGATE BASE (CLASS II)**

**ASPHALT CONCRETE (TYPE B)**

**PLACED AC (MISC AREA)**

**MINOR CONCRETE (MINOR STRUCTURE)**

**MINOR CONCRETE (MISC CONST)**

**TYPE I SAND FILTER BMP**

**TYPE II SAND FILTER BMP**

**MISCELLANEOUS IRON AND STEEL**

**MILL FRAME AND COVER**

**CHECKERED PLATE**

**TYPE 600-12**

**TYPE 900R**

**FLARED END SECTION (AP)**

**TRAPEZOIDAL FLUME**

**PARSHALL FLUME**

**XXXX**

**XXXX**

**COMPOST FILTER BMP**

**CCP MONITORING MANHOLE**

**MONITORING MANHOLE**

**STAINLESS STEEL MONITORING WELL**

**INTEGRATING TRENCH BMP**

**C. CATE**

**50 mm PLASTIC CONDUIT**

**150 mm**

**200 mm**

**250 mm**

**300 mm**

**450 mm**

**500 mm**

**500 mm**

**BIO-FILTER SWALE BMP**

**BIO-FILTER STRIP BMP**

**ELBOW**

**TEE**

**PIPE JOINT CLASSIFICATION**

**HEIGHT OF INLET "H" OR "V"**

**MAXIMUM COVER**
<table>
<thead>
<tr>
<th>Element</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage Facility</td>
<td>R</td>
<td>Remove</td>
</tr>
<tr>
<td>Pipe</td>
<td>P</td>
<td>Remove</td>
</tr>
<tr>
<td>Concrete Gutter</td>
<td>G</td>
<td>Remove</td>
</tr>
<tr>
<td>Asphalt Concrete Dike</td>
<td>D</td>
<td>Remove</td>
</tr>
<tr>
<td>Pavement</td>
<td>P</td>
<td>Remove</td>
</tr>
<tr>
<td>Asphalt Concrete</td>
<td>C</td>
<td>Remove</td>
</tr>
<tr>
<td>Tree</td>
<td>T</td>
<td>Ditch</td>
</tr>
<tr>
<td>Utility</td>
<td>U</td>
<td>Reset</td>
</tr>
<tr>
<td>Drainage Facility</td>
<td>D</td>
<td>Reset</td>
</tr>
<tr>
<td>Asphalt Concrete Dike</td>
<td>D</td>
<td>Type A1-150 Curb</td>
</tr>
<tr>
<td>Aggregate Base (Class II)</td>
<td>AB</td>
<td>Place AC (Misc Area)</td>
</tr>
<tr>
<td>Minor Concrete (Minor Structure)</td>
<td>M</td>
<td>Minor Concrete (Misc Const)</td>
</tr>
<tr>
<td>Sand Filter BMP</td>
<td>SFB</td>
<td>Type I Sand Filter BMP</td>
</tr>
<tr>
<td>Miscellaneous Iron and Steel</td>
<td>MIS</td>
<td>Frame and Cover</td>
</tr>
<tr>
<td>Checkered Plate</td>
<td>CP</td>
<td>Type 600-12</td>
</tr>
<tr>
<td>Door</td>
<td>D</td>
<td>Type Door</td>
</tr>
<tr>
<td>Flared End Section</td>
<td>AES</td>
<td>Trapezoidal Flume</td>
</tr>
<tr>
<td>Parshall Flume</td>
<td>PF</td>
<td>Parshall Flume</td>
</tr>
<tr>
<td>Catch Basin</td>
<td>CB</td>
<td>Catch Basin</td>
</tr>
<tr>
<td>50 mm Steel Conduit</td>
<td>SC</td>
<td>50 mm Plastic Conduit</td>
</tr>
<tr>
<td>150 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 mm DIP</td>
<td>DIP</td>
<td>BIO-Filter Swale BMP</td>
</tr>
<tr>
<td>BIO-Filter Strip BMP</td>
<td>BF</td>
<td>BIO-Filter Strip BMP</td>
</tr>
<tr>
<td>Elbow</td>
<td>EL</td>
<td>Elbow</td>
</tr>
<tr>
<td>Tee</td>
<td>TE</td>
<td>Tee</td>
</tr>
<tr>
<td>Pipe Joint Classification</td>
<td>PJ</td>
<td>Height of Inlet &quot;H&quot; or &quot;V&quot;</td>
</tr>
<tr>
<td>Max Cover</td>
<td>MC</td>
<td>Max Cover</td>
</tr>
</tbody>
</table>

**DRAINAGE SYSTEM NO:**

**DRAINAGE UNIT:**

**CALCULATED/DESIGNED BY:**

**CHECKED BY:**

**DATE:**

**REVISED BY:**

**DATE REVISION:**

---

**DRAINAGE QUANTITIES**

<table>
<thead>
<tr>
<th>Element</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage Plan Sheet No</td>
<td>DP</td>
<td>Drainage Plan Sheet No</td>
</tr>
<tr>
<td>Drainage System No</td>
<td>DS</td>
<td>Drainage System No</td>
</tr>
</tbody>
</table>

---

**SITE PLAN:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

**SCALE:**

**DATE:**

**SHEET NUMBER:**

---

**TIME:**

**SCALE:**

**DATE DRAWN:**

**STATE:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

---

**DATE:**

**SHEET NUMBER:**

---

**TIME:**

**SCALE:**

**DATE DRAWN:**

**STATE:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

---

**DATE:**

**SHEET NUMBER:**

---

**TIME:**

**SCALE:**

**DATE DRAWN:**

**STATE:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

---

**DATE:**

**SHEET NUMBER:**

---

**TIME:**

**SCALE:**

**DATE DRAWN:**

**STATE:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

---

**DATE:**

**SHEET NUMBER:**

---

**TIME:**

**SCALE:**

**DATE DRAWN:**

**STATE:**

**REFERENCE STATE DRAWER:**

**REFERENCES:**

---
LEGEND

- TEMP X-RAIL
- INSTALL TEMPORARY WARNING SIGN AND POST
- INSTALL DELINEATOR AT 15m INTERVAL

INSTALL ARRAY "TJ" CRASH CUSHION

QUANTITY

- TEMP X-RAIL
- 1 EA
- C24 (1200mm x 1200mm)
- 1 EA
- "SHOULDER CLOSED" SIGN (900mm x 900mm)
- 1 EA
- POST (150mm x 150mm)
- 1 EA
- ARRAY "TJ" CRASH CUSHION
- 8 EA
- DELINEATOR

8R-78/1-5 PARK AND RIDE

TRAFFIC HANDLING PLAN
LOCATION 4
SCALE 1:200
TH-1
LEGEND

- **TEMP K-RAIL**
  - INSTALL TEMPORARY WARNING SIGN AND POST
  - INSTALL DELINEATOR AT 15m INTERVAL
- **SHOULDER CLOSED SIGN**
- **ARRAY "TJ" TEMPORARY CRASH CUSHION**

**QUANTITY**

- **TEMP K-RAIL**
  - C24 (1200mmX1200mm) = 158 m
  - "SHOULDER CLOSED" SIGN (900mm X 900mm) = 1 EA
  - POST (150mm X 150mm) = 2 EA
  - ARRAY "TG" CRASH CUSHION = 1 EA
  - DELINEATOR = 8 EA

**TRAFFIC HANDLING PLAN**

**LOCATION 5**

SCALE 1:200

TH-2
<table>
<thead>
<tr>
<th>LEGEND</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP K-RAIL</td>
<td>203 m</td>
</tr>
<tr>
<td>INSTALL TEMPORARY WARNING SIGN AND POST</td>
<td>1 EA</td>
</tr>
<tr>
<td>INSTALL DELINEATOR AT 15m INTERVAL</td>
<td>1 EA</td>
</tr>
<tr>
<td>INSTALL ARRAY 'T' CRASH CUSHION</td>
<td>2 EA</td>
</tr>
</tbody>
</table>

![Diagram of traffic handling plan](image-url)
PSE Projects
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ADJACENT TO
STATE HIGHWAY

IN SAN DIEGO COUNTY
AT VARIOUS LOCATIONS

To be supplemented by Standard Plans dated July, 1997

LOCATION OF CONSTRUCTION

<table>
<thead>
<tr>
<th>LOC</th>
<th>ROUTE</th>
<th>KP</th>
<th>PM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>52.5</td>
<td>32.6</td>
<td>MANCHESTER AVE SB LOOP ON RAMP</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>52.5</td>
<td>32.6</td>
<td>MANCHESTER AVE NB LOOP OFF RAMP</td>
</tr>
<tr>
<td>3</td>
<td>5/56</td>
<td>52.9</td>
<td>32.9</td>
<td>I-5/SR-56 JCT WS CONNECTOR</td>
</tr>
<tr>
<td>4</td>
<td>18/15</td>
<td>26.6</td>
<td>16.54</td>
<td>SR-78/1-5 JCT ES CONNECTOR</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>70.9</td>
<td>44.1</td>
<td>NORTH OF LA COSTA AVE SB EXIT RAMP</td>
</tr>
</tbody>
</table>

The Contractor shall possess the Class (or Classes) of license as specified in the "Notice to Contractors."
BASIS OF BEARING AND COORDINATES

Bearings and coordinates as shown herein are in terms of the California Coordinate System of 1983 (ED50, NAD83) zone 6, based locally upon the following continuously operating reference stations as published by the National Geodetic Survey:

<table>
<thead>
<tr>
<th>STATION</th>
<th>NORTHING (ED50)</th>
<th>EASTING (ED50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/03</td>
<td>580,447.284</td>
<td>1,983,875.610</td>
</tr>
<tr>
<td>5/10</td>
<td>577,862.544</td>
<td>1,906,370.297</td>
</tr>
</tbody>
</table>

BENCHMARK

Elevations as shown herein are in terms of the North American Vertical Datum of 1988 based locally upon the following California Department of Transportation Benchmark. BM 5-39.1 33.665 (NAVD88)

California Division of Highways Brass Cap set at BM 5-39.1 on southbound side of I-5, adjacent to the View Turnout Parking Lot.

CONSTRUCTION STAKING SURVEY
CONTROL DATA
(LOCATION 1 & 2)
I-5/Manchester Ave

<table>
<thead>
<tr>
<th>STA</th>
<th>NORTHING</th>
<th>EASTING</th>
<th>EPOCH</th>
<th>ELEVATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>593,995.410</td>
<td>1,905,121.882</td>
<td>1995.50</td>
<td>4.444</td>
<td>Tie &amp; Tack - Southside of Manchester</td>
</tr>
<tr>
<td>6</td>
<td>594,109.694</td>
<td>1,905,326.472</td>
<td>1995.50</td>
<td>4.070</td>
<td>Tie &amp; Tack - Northside of Manchester</td>
</tr>
</tbody>
</table>

Scale: 1:1000

CSS-1
BASIS OF BEARING AND COORDINATES

COORDINATES AS SHOWN HERE ON ARE IN TERMS OF
THE CALIFORNIA COORDINATE SYSTEM OF 1983 (ERDDCN 1995, RGN)
ZONE 6, BASED LOCALLY UPON THE FOLLOWING CONTINUOUSLY OPERATING
REFERENCE STATIONS AS PUBLISHED BY THE NATIONAL GEODETIC SURVEY.

STATION      NO.     EASTING(east)      NORTING(north)

MNP     580,447.284     1,885,875.110
5103    577,862.544     1,908,372.297
FRA     662,024.000     1,885,858.672

BENCHMARK

ELEVATIONS AS SHOWN HERE ON ARE IN TERMS OF THE NORTH AMERICAN
VERTICAL DATUM OF 1988 BASED LOCALLY UPON THE FOLLOWING CALIFORNIA
DEPARTMENT OF TRANSPORTATION CONTROL MONUMENT DATA.

BM 5-32.6     14,968 INAV0881

2' UP DRSC. FROM THE INTERSECTION W/CARMEL VALLEY RD., GO SOUTH ON
CARMEL VALLEY RD. 0.37 MILES TO FIRST HILL ON LEFT. FOLLOW DIRT RD.
UP HILL APPROX. 90M TO MON. STAMPED "S-32.6 61997"
BASIS OF BEARING AND COORDINATES


STATION   NORTHING(N)   EASTING(E)
MONX       580,447.164     1,963,875.722
SI03       571,862.412     1,926,370.402
TRAX       662,033.898     1,855,859.790

BENCHMARK

ELEVATIONS AS SHOWN HEREON ARE IN TERMS OF THE NORTH AMERICAN VERTICAL DATUM OF 1988 BASED LOCALLY UPON THE FOLLOWING BENCHMARKS.

BENCHMARK    NAVD88 ELEV   SOURCE
TRAX          191.604    COUNTY OF ORANGE
DASH          462.113    NGS
F1415         75.015      NGS

CONSTRUCTION STAKING SURVEY
CONTROL DATA
(LOCATION 4)
I-5/ SR-78

PROJECT CONTROL

STA NAME   NORTHING (Y) METERS   EASTING (X) METERS   EPOCH DATE   ELEVATION METERS   DESCRIPTION
15          606,707.769     1,920,134.709     1991.35     201.893         "TP MARKER & SHAPER 1-5/2018"
16          608,584.116     1,920,231.693     1991.35     204.534         "TP MARKER & SHAPER 1-5/2018"
BASIS OF BEARING AND COORDINATES

Bearings and coordinates as shown hereon are in terms of the California Coordinate System of 1983 (1991), zone 6, based locally upon the following continuously operating reference stations as published by the National Geodetic Survey and transformed to the 1991.35 epoch using the HTP Model Version 2.1.

<table>
<thead>
<tr>
<th>STATION</th>
<th>NORTING (Y)</th>
<th>EASTING (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOA</td>
<td>580,447.164</td>
<td>1,985,875.722</td>
</tr>
<tr>
<td>SI03</td>
<td>577,862.412</td>
<td>1,906,370.402</td>
</tr>
<tr>
<td>TRAX</td>
<td>662,023.898</td>
<td>1,855,858.790</td>
</tr>
</tbody>
</table>

BENCHMARK

Elevations as shown hereon are in terms of the North American Vertical Datum of 1988 based locally upon the following benchmarks.

<table>
<thead>
<tr>
<th>BENCHMARK</th>
<th>NAVD88 ELEV</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAX</td>
<td>151.604</td>
<td>COUNTY OF ORANGE</td>
</tr>
<tr>
<td>DASH</td>
<td>492.112</td>
<td>NCS</td>
</tr>
<tr>
<td>F1415</td>
<td>75.015</td>
<td>NCS</td>
</tr>
</tbody>
</table>

CONSTRUCTION STAKING SURVEY
CONTROL DATA
(LOCATION 5)
I-5/LA COSTA AVE
SCALE: 1:2000

CSS-4
DRAINAGE SYSTEM NO. 30

IDENTICAL

DRAINAGE SYSTEM NO. 31

DRAINAGE PROFILES

SCALE: HORIZ 1:500
VERT: 1:1000

D-10
RACK BARS IS O.C.

TYPE L OBJECT MARKER

BASIN ACCESS RD

NOTE:
3. ALL HARDWARE AND FABRICATION MATERIAL SHALL BE STAINLESS STEEL.

SIDE VIEW

DEBRIS RACK CAGE

NOTE:
1. FORM MODIFIED CONCRETE APRON ADJACENT TO THE CANAL GATE CONNECTION, AS NECESSARY, TO ACCOMMODATE CANAL GATE HARDWARE.

ELEVATION

CAULK SEAL

FIELD JOINT

OUTLET PIPE

ELEV A

ELEV B

ELEV C

ELEV D

PIPE AND INLETS PER DRAINAGE PLANS

ALUMINIZED CSP PER DRAINAGE PLANS

3.51 (10 GAGE)

SEE DRAINAGE PLANS FOR ALUMINIZED CSP DIAMETER

VAR

SAMPLE

RIM ELEVATION

NOTE:
SUPPORT FOOTING IS 0.3M SQUARE.

EARTH OR CONCRETE LINED BASIN PER DRAINAGE PLANS

PLACE PIPE SO BARS OF GATE WILL BE PARALLEL WITH PRIMARY SURFACE FLOW

INLET PER DRAINAGE PLANS

SEE NOTE 31

SECTION A-A

MODIFIED GMP INLET WITH DEBRIS RACK CAGE

NO SCALE

D-13

CALTRANS METRIC

SCHOOL DISTRICT CIVIL ENGINEER

PLANS APPROVAL DATE

ROBERT BEIN, WILLIAM FROST & ASSOCIATES

I-420 A. LEMON AVE

IRVINE, CA 92612

The Director of Caltrans or the Director of Public Works for the County. For the counties of San Diego and Los Angeles the Director of Public Works shall be the County Civil Engineer.

150 (MIN)

FOR ADDITIONAL DETAILS AND NOTES SEE STANDARD CALTRANS PLAN D15

REVISIONS
TRASH RACK FASTENER

DETAIL 1

SECTION A-A

SECTION B-B

SECTION D-D

SECTION A-A

ORIFICE OPENING AND DEBRIS SCREEN FRAME

DRAINAGE DETAILS

NO SCALE

D-14
STORM DRAIN & MANHOLE STRUCTURE (TYPE X BASE)

NOTES:
1. RISERS MAY BE MADE UP OF 150mm, 200mm, 450mm, 600mm, OR 1200mm SECTIONS.
2. EACH RISER SHALL HAVE A LADDER, AS DETAILED ON STANDARD PLAN DTAC.
3. THE LADDER SHALL BE SUSPENDED INTO BASE STRUCTURE.
4. ALL PRECAST COMPONENTS FOR UPPER PORTION TYPE MH SHALL BE
   REINFORCED WITH 6 DIAMETER STEEL MOUND SPIRAIALLY @ 100mm CENTERS.
5. REINFORCING STEEL SHALL BE @13 BARS @ 450mm CENTERS PLACED 40
   CLEAR TO INSIDE OF BOX UNLESS OTHERWISE SHOWN.
6. PIPE(S) MAY BE PLACED IN ANY MALL.
7. DESIGN UNIT STRESSES: F_p = 140 MPa, F_p = 10 MPa.
8. CENTER OF RISER SHALL BE LOCATED OVER THE CENTERLINE OF MANHOLE DRAIN.
9. THICKNESS OF DECK SHALL VARY WHEN NECESSARY TO PROVIDE LEVEL
   MANHOLE SEAT.
10. INSTALLED AT WATER QUALITY MONITORING MANHOLE LOCATIONS ONLY.
NOTE:
FILTER FABRIC TO BE PLACED UNDER ALL ROCK SLOPE PROTECTION.

SECTION A-A

SECTION B-B

ROCK SLOPE PROTECTION (METHOD B)

| SYSTEM | CULVERT DIAMETER | WIDTH "W1" | WIDTH "W2" | LENGTH "L1" | TYPE | (THICKNESS) "D"
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>600</td>
<td>SEE D-2</td>
<td>SEE D-2</td>
<td>20 m</td>
<td>1/4 TONNE</td>
<td>SEE D-2</td>
</tr>
<tr>
<td>21g</td>
<td>450</td>
<td>3 m</td>
<td>3 m</td>
<td>3 m</td>
<td>FACING</td>
<td>GROUTED</td>
</tr>
<tr>
<td>21½</td>
<td>N/A</td>
<td>3 m</td>
<td>7 m</td>
<td>15 m</td>
<td>1/4 TONNE</td>
<td>1.5 m</td>
</tr>
<tr>
<td>31g</td>
<td>600</td>
<td>4 m</td>
<td>4 m</td>
<td>4 m</td>
<td>1/4 TONNE</td>
<td>1.5 m</td>
</tr>
<tr>
<td>31½</td>
<td>N/A</td>
<td>SEE D-18</td>
<td>SEE D-18</td>
<td>30 m</td>
<td>FACING</td>
<td>SEE D-18</td>
</tr>
<tr>
<td>50g</td>
<td>750</td>
<td>3 m</td>
<td>10 m</td>
<td>8 m</td>
<td>FACING</td>
<td>GROUTED</td>
</tr>
<tr>
<td>50½</td>
<td>600</td>
<td>SEE D-2</td>
<td>SEE D-2</td>
<td>20 m</td>
<td>1/4 TONNE</td>
<td>SEE D-2</td>
</tr>
</tbody>
</table>

ROCK SLOPE PROTECTION

DRAINAGE DETAILS

NO SCALE

D-16
TYPE L-3 COLLAR

SECTION A-A

L-2 COLLAR

NOTES (CONCRETE COLLAR)

1. WHERE PIPES OF DIFFERENT DIAMETER ARE JOINED WITH A CONCRETE COLLAR, D SHALL BE THE DIAMETER OF LARGER PIPE.

2. FOR PIPE SIZE NOT LISTED, USE NEXT SIZE LARGER.

3. DEEP REINFORCING ON PIPES 630MM AND LESS IN DIAMETER AND ON ALL PIPES WHERE ANGLE A IS LESS THAN 10°.

4. REINFORCEMENT SHALL BE PLACED 45MM CLEAR FROM OUTSIDE DIAMETER OF PIPE.

DRAINAGE DETAILS

NO SCALE

D-17
EXPOSED PIPE ON BASIN INVERT LINING DETAIL

ACCESS RAMP DETAIL

DRAINAGE DETAILS
PIPE ENTRANCE TO BASIN

NOTES:
1. PROVIDE 38.1mm MIN CONCRETE COVER OVER REINFORCING.
2. FINISH EXPOSED SURFACE OF PCC WITH WOOD FLOAT.
3. LATERALS OF 600mm OR LESS MAY BE BEVELED PIPE. 675mm OR LARGER SHALL BE BARRELED OR DESIGNED STRUCTURE.

PCC CLASS "A"

SECTION A-A

SLOPE ANCHOR

PIECE DRIPAGE PLANS

PIECE PER DRAINAGE PLANS

3-100MM WID HOLES EQUALLY SPACED LATERALLY & CENTERED VERTICALLY

108305 BOTH WAYS

800 RSP SEE SHEET D-16

305 ABOVE THE HIGHER OF EXISTING OR DESIGN GRADE LINE

1.8m PIPE INTERIOR DIA

B-450

BARRELED OUTLET

76.2 RADIUS

BARREL OUTLET

SYSTEM NO D L

1 147

31 155

305 LAP MIN

38.1 CLEAR
<table>
<thead>
<tr>
<th>O</th>
<th>1224.0x792.0</th>
<th>[Image 0x0 to 1224x792]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRAINAGE QUANTITIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHEET TOTAL</td>
<td>SHEET TOTAL</td>
<td></td>
</tr>
<tr>
<td>D-23</td>
<td>D-23</td>
<td></td>
</tr>
<tr>
<td>LOCATION</td>
<td>DESCRIPTION</td>
<td>DRAGAGE SHEET NO.</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>3.5</td>
<td>ORIFICE PLATE</td>
<td>1154138, 4038/1905212, 0157</td>
</tr>
<tr>
<td>1.3</td>
<td>NH</td>
<td>1154137, 2384/1905216, 2742</td>
</tr>
<tr>
<td>1.3</td>
<td>L-3 COLLAR</td>
<td>1194083, 2089/1905233, 1901</td>
</tr>
<tr>
<td>1.3</td>
<td>NH</td>
<td>1294074, 4444/1905244, 6483</td>
</tr>
<tr>
<td>3.4</td>
<td>HEADWALL, SINGLE PIPE</td>
<td>1194139, 2194/1905231, 1878</td>
</tr>
<tr>
<td>1.3</td>
<td>L-3 COLLAR</td>
<td>1194135, 1720/1905235, 6551</td>
</tr>
<tr>
<td>1.3</td>
<td>CI INLET</td>
<td>1194112, 8193/1905266, 8316</td>
</tr>
</tbody>
</table>
## Drainage Quantities

### Description
- **LOCATION**: [Insert Location Information]
- **DRAINAGE SYSTEM NO**: [Insert System Number]
- **DRAINAGE UNIT**: [Insert Unit Information]
- **ABANDONED DRAINAGE FACILITY**: [Insert Details]
- **REMOVED DRAIN**: [Insert Details]
- **REMOVED PIPE**: [Insert Details]
- **CLASS "A" CONCRETE STRUCTURE**: [Insert Details]
- **MINOR CONCRETE STRUCTURE**: [Insert Details]
- **METAL, IRON AND STEEL**: [Insert Details]
- **MINOR CONCRETE METAL CONSTRUCTION**: [Insert Details]
- **RIP RASPBERRY**: [Insert Details]
- **INLET GRATE**: [Insert Details]
- **INLET FRAME AND COVER**: [Insert Details]
- **STAINLESS STEEL, (UN FRAMED & COVER)**: [Insert Details]
- **FILTER FABRIC**: [Insert Details]
- **H-450**: [Insert Information]
- **H-750**: [Insert Information]
- **H-1000**: [Insert Information]
- **DRAIN SYSTEM CLASSIFICATION**: [Insert Details]
- **DRAINAGE TIME**: [Insert Details]
- **DRAINAGE PLAN SHEET NO**: [Insert Sheet Number]

### Table

<table>
<thead>
<tr>
<th>Description</th>
<th>Location</th>
<th>Drainage System No</th>
<th>Drainage Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table and diagram contain specific measurements and details that are not clearly visible in the image.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE HEADWALL</td>
<td></td>
</tr>
<tr>
<td>MOD GWP INLET</td>
<td></td>
</tr>
<tr>
<td>MOD GWP W/APRON</td>
<td></td>
</tr>
<tr>
<td>MOD GWP W/APRON</td>
<td></td>
</tr>
<tr>
<td>MOD GWP W/APRON</td>
<td></td>
</tr>
<tr>
<td>MOD GWP W/APRON</td>
<td></td>
</tr>
</tbody>
</table>

**DRAINAGE QUANTITIES**

D-26
<table>
<thead>
<tr>
<th>REF</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.6</td>
<td>TYPE ENTRANCE TO BASIN</td>
<td>02507, 7435/C-10/1948, 5672</td>
</tr>
<tr>
<td>0.5</td>
<td>1.1</td>
<td>TYPE L-2 COLLAR</td>
<td>02512, 2877/C-10/1944, 5550</td>
</tr>
<tr>
<td>1.2</td>
<td>MOD CMP INLET</td>
<td>02554, 0055/C-10/1933, 5508</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>MOD CMP INLET</td>
<td>02607, 3142/C-10/1820, 5418</td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>MOD CMP INLET</td>
<td>02662, 9610/C-10/1906, 3599</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>MOD CMP INLET</td>
<td>02717, 0312/C-10/1877, 7264</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>MOD CMP INLET</td>
<td>02763, 6024/C-10/1852, 6733</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>MOD CMP INLET</td>
<td>02811, 5192/C-10/1826, 6913</td>
<td></td>
</tr>
</tbody>
</table>

**SHEET TOTAL:**

**DRAINAGE QUANTITIES:**

**D-27**
NOTES

1. PLACE TEMP RAILING (TYPE K) WITH SCUPPERS AT EDGE OF STRIPING DETAIL 278.

2. INSTALL CONSTRUCTION AREA SIGN

TRAFFIC HANDLING PLAN
(LOCATION 1)
I-5/Manchester Ave

SCALE: 1:500

TH-1
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

RAMP
CONSTRUCTION AHEAD

NOTE:
1. PLACE TEMP RAILING (TYPE K) WITH SCUPPERS
2. INSTALL CONSTRUCTION AREA SIGN
3. TEMP RAILING (TYPE K) WITH SCUPPERS
4. CONSTRUCTION AREA SIGN (SIZE PER PLAN)
5. TEMP RAILING (TYPE K) WITH SCUPPERS
6. EXISTING TRAFFIC STRIPING DETAIL NUMBER
7. SIGN NUMBER

TRAFFIC HANDLING PLAN
(LOCATION 2)
I-5/MANCHESTER AVE
SCALE: 1:500

TH-2
NOTES
1. NO TRAFFIC CONTROL DEVICES REQUIRED.
SORRENTO VALLEY ROAD IS CLOSED TO NORMAL TRAFFIC AND IS USED ONLY AS MAINTENANCE ACCESS ROAD

TRAFFIC HANDLING PLAN
(LOCATION 4)
I-5/SR-56 NE CONNECTOR
SCALE: 1"=200
TH-3
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

TRAFFIC HANDLING PLAN
(LOCATION 4)
I-15/SR-78 ES CONNECTOR

SCALE: 1:500

TH-4
TRAFFIC HANDLING PLAN
(LOCATION 5)
I-5/LA COSTA AVE
SCALE: 1"=500

NOTES:
1. PLACE TEMP RAILING (TYPE K) WITH SCUPPERS AT EDGE OF STRIPING DETAIL 21B.
2. INSTALL CONSTRUCTION AREA SIGN
3. CLOSURE OF RIGHT LANE ADJACENT TO THE SHOULDER OR CLOSURE OF OFF-RAMP SHALL BE IN ACCORDANCE WITH STANDARD PLANS 710 AND 14.

LEGEND:
- DIRECTION OF TRAFFIC
- TEMP CRASH CUSHION (ARRAY PER PLANS)
- CHANNELIZER (SURFACE MOUNTED OR GRUM)
- CONSTRUCTION AREA SIGN (SIZE PER PLANS)
- TEMP RAILING (TYPE K) WITH SCUPPERS
- EXISTING TRAFFIC STRIPING DETAIL NUMBER
- SIGN NUMBER

Section B-B

EXIST

21B

OFFSET

VARI

CONST AREA

VAR

TEMP RAILING
TYPE K WITH SCUPPERS

ETW
ES

120
30

2.4

1

ROUTE 5

1-5/LA COSTA AVE

TH-5
LEGEND

- DIRECTION OF TRAFFIC
- TEMP CRASH CUSHION (ARRAY PER PLAN)
- CHANNELIZER (SURFACE MOUNTED OR DRUM)
- CONSTRUCTION AREA SIGN (SIZE PER PLAN)
- TEMP RAILING (TYPE K) WITH SCUPPERS
- EXISTING TRAFFIC STRIPING DETAIL NUMBER
- SIGN NUMBER

NOTES

1. PLACE TEMP RAILING (TYPE K) WITH SCUPPERS AT EDGE OF STRIPING DETAIL 27B.
2. INSTALL CONSTRUCTION AREA SIGN
3. CONTRACTOR MAY CLOSE RIGHT LANE ADJACENT TO THE SHOULDER OR CLOSE OFF-RAMP BETWEEN HOURS OF 7:00 AM AND 10:00 AM THE FOLLOWING MORNING. MONDAY THROUGH THURSDAY FOR MATERIAL LOADING AND UNLOADING. CLOSURES SHALL BE IN ACCORDANCE TO STANDARD PLANS T10 AND T14.

TRAFFIC HANDLING PLAN
(LOCATION 5)
1-5/LA COSTA AVE
SCALE: 1"=500
TH-7
### CONSTRUCTION AREA SIGNS & QUANTITIES

<table>
<thead>
<tr>
<th>SHEET NO</th>
<th>SIGN ID</th>
<th>CODE</th>
<th>PANEL SIZE (in)</th>
<th>NO OF WOOD POSTS PER SIGN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TH-1</td>
<td>1</td>
<td>C18</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-2</td>
<td>2</td>
<td>C29</td>
<td>500x80</td>
<td>1</td>
<td>&quot;550 FT&quot;</td>
</tr>
<tr>
<td>TH-1</td>
<td>3</td>
<td>C15</td>
<td>1200x450</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-2</td>
<td>4</td>
<td>C18/900</td>
<td>900x900</td>
<td>1</td>
<td>&quot;RAMP CONSTRUCTION AHEAD&quot;</td>
</tr>
<tr>
<td>TH-2</td>
<td>5</td>
<td>C3/A</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-2</td>
<td>6</td>
<td>C1B</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-2</td>
<td>7</td>
<td>C3/A</td>
<td>900x900</td>
<td>1</td>
<td>&quot;500 FT&quot;</td>
</tr>
<tr>
<td>TH-2</td>
<td>8</td>
<td>C13</td>
<td>1200x450</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TH-4</td>
<td>9</td>
<td>C1B</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-4</td>
<td>10</td>
<td>C3/A</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-4</td>
<td>11</td>
<td>C15</td>
<td>1200x450</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TH-5</td>
<td>12</td>
<td>C13</td>
<td>1200x450</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TH-7</td>
<td>13</td>
<td>C3/A</td>
<td>900x900</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TH-7</td>
<td>13</td>
<td>C29</td>
<td>500x80</td>
<td>1</td>
<td>&quot;650 FT&quot;</td>
</tr>
<tr>
<td>TH-7</td>
<td>14</td>
<td>C1B</td>
<td>1200x1200</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ROADWAY ITEMS

<table>
<thead>
<tr>
<th>LOCATION &amp; DESCRIPTION</th>
<th>ASPHALT CONC/AGGREGATE BASE</th>
<th>PLACE AC OR AS</th>
<th>1500mm PCC</th>
<th>RECONSTRUCT DAILY LIMIT TONS</th>
<th>ROADWAY EXCAVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TYPE B1</td>
<td>TYPE B1</td>
<td></td>
<td>m²</td>
<td>m²</td>
</tr>
<tr>
<td></td>
<td>m²</td>
<td>m²</td>
<td></td>
<td>m²</td>
<td>m³</td>
</tr>
<tr>
<td>1 - S /MANCHESTER WEST</td>
<td>770</td>
<td>770</td>
<td>4492</td>
<td>55</td>
<td>1808</td>
</tr>
<tr>
<td>2 - S /MANCHESTER EAST</td>
<td>610</td>
<td>610</td>
<td>783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - S/ SR-56</td>
<td>450</td>
<td>450</td>
<td>125</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>4 - S /SR-78</td>
<td>982</td>
<td>982</td>
<td>5022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - S/ LA COSTA</td>
<td>281</td>
<td>281</td>
<td>2028</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3093</td>
<td>3093</td>
<td>11808</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SUMMARY OF QUANTITIES**

Q-1
LOCATION NO 1
(MANCHESTER EAST)
SECTION A-A

LOCATION NO 2
(MANCHESTER WEST)
SECTION B-B

LOCATION NO 3
(I-5/ SR-56)
SECTION C-C

LOCATION NO 4
(I-5/ SR-78)
SECTION D-D

LOCATION NO 5
(I-5/LA COSTA)
SECTION E-E

DRAINAGE CROSS SECTIONS
SCALE: 1 IN 2 = 500 FT
VENT: 1 IN 100
<table>
<thead>
<tr>
<th>PACKAGE No.</th>
<th>PROJECT No.</th>
<th>District 7</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
<th>COST (PS&amp;E - Package 1)</th>
<th>CONSTRUCTION COST (Procurement - Package 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Extended Detention Basins and Biofilter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Site 1: Extended Detention Basin</td>
<td>I-15/SR78 Interchange</td>
<td>282,000</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Site 2: Extended Detention Basin</td>
<td>I-5 NB at Manchester Avenue</td>
<td>282,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 3: Biofiltration Swale</td>
<td>I-5 SB at Palomar Airport Road</td>
<td></td>
<td>75,000</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Infiltration Trench and Biofilters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 1: Infiltration Trench</td>
<td>Carlsbad Maintenance Station</td>
<td></td>
<td>50,000</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 2: Biofiltration Strip</td>
<td>Carlsbad Maintenance Station</td>
<td></td>
<td>105,000</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 3: Biofiltration Swale</td>
<td>SR 78 EB at Melrose Place</td>
<td></td>
<td>75,000</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Extended Detention/Infiltration Basins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>X</td>
<td>Site 1: Extended Detention Basin</td>
<td>I-5/SR 56</td>
<td>282,000</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Site 2: Infiltration Basin</td>
<td>I-5 SB at La Costa Blvd.</td>
<td>355,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Wet Basin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Site 1: Wet Basin</td>
<td>I-5 SB at Manchester Avenue</td>
<td>355,000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Media Filters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 1: Media Sand Filter</td>
<td>Escondido Maintenance Station</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 2: Media Sand Filter</td>
<td>I-5 SB/SR 79 Park &amp; Ride</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 3: Media Sand Filter</td>
<td>I-5 NB at La Costa Blvd. Park &amp; Ride</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>X</td>
<td>Site 4: Compost Filter</td>
<td>Kearny Mesa Maintenance Station</td>
<td>200,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TOTAL PACKAGE COST</td>
<td></td>
<td>1,556,000</td>
<td>955,000</td>
</tr>
</tbody>
</table>