

District will notify the Corps of Engineers' Archeology Staff within 24 hours. The Contractor shall immediately suspend all work in any area(s) where potential cultural resources are discovered. The Contractor shall not resume construction in the area surrounding the potential cultural resources until the Corps of Engineers Regulatory Division re-authorizes project construction, per 36 C.F.R. Section 800.13.

Should any of the above mentioned discoveries result in delays to the Contractor's work schedule, the Contractor shall be entitled only to an equivalent extension of time for the completion of the contract, and shall not be entitled to damages due to downtime and idle equipment or additional payments over and above the agreed upon contract prices.

6.21 Burrowing Owl Pre-Construction Survey - In compliance with CEQA and the MSHCP, the District must conduct a presence/absence survey for Burrowing Owl no more than 30 days prior to construction/disturbance. The Contractor shall not commence any work onsite, including equipment staging, clearing, grubbing, etc., until the District determines that Burrowing Owl is absent from the project site, or that an avoidance plan has been prepared should Burrowing Owl be detected onsite. If the Contractor does not commence construction within 30 days of said determination, the Contractor must notify the Engineer that another pre-construction survey is needed.

6.22 Burrowing Owl Avoidance Measures - If any Burrowing Owl is found within the project site during the nesting season (February 1st through August 31st), the Contractor shall not conduct any construction activities within 250 feet of occupied burrows or nests. Any Burrowing Owl found within the project site that cannot be avoided will be relocated by the District's biologist during the non-nesting season (September 1st through January 31st).

Should Burrowing Owl result in delays to the Contractor's work schedule, the Contractor shall be entitled only to an equivalent extension of time for the completion of the contract, and shall not be entitled to damages due to downtime and idle equipment or additional payments over and above the agreed upon contract prices.

6.23 Temporary Sound Mitigation Fencing - Per the contract drawings, the Contractor shall be required to protect in place and maintain the temporary sound mitigation fencing that has been installed by others. The Contractor will maintain the appearance and efficacy of the temporary sound mitigation fencing by performing such tasks as, but not limited to, mending or replacing any torn or missing sound blankets, repairing or replacing any damaged sections of fence, ensuring that the fence remains upright, etc. The Contractor is required to replace and/or repair at his own expense any temporary sound mitigation fencing damaged during the duration of the project.

6.24 Fire Prevention - When work is conducted adjacent to flammable vegetation appropriate fire-fighting equipment (e.g., extinguishers, shovels, water trucks) shall be available onsite during all phases of project construction to help minimize the chance of human-caused wildfires. Shields, protective mats, and/or other fire preventative methods shall be used during grinding, welding, and other spark-inducing activities.

6.25 Trail Access - The existing access road is also the Santa Ana River Trail (unimproved fire trail) that connects to the Lower Aliso Canyon Trail of the Chino Hills State Park. Installation of the proposed sheet piles is generally along the southerly edge of the existing Santa Ana River Trail. It is anticipated that one lane of vehicular and pedestrian access can be maintained on the Santa Ana River Trail during construction. In the event that one lane of access cannot be maintained, the Contractor shall coordinate with the California Department of Parks and Recreation to construct a temporary travel lane outside the limits of construction activity. An exhibit, contained in Appendix "H" of these specifications is provided to show potential locations of trail detours.

6.26 Overtime Work and Work at Night - It is intended that the Contractor prosecute the work on a five (5) day, forty (40) hour work week with no work on legal holidays. All work shall take place Monday through Friday from 7:00 a.m. to 3:30 p.m., with a half-hour off for lunch. If the Contractor feels it is necessary to work more than the normal 40-hour work week, he will make a written request for permission from the Engineer, outlining the reasons for the request. The decision of granting permission for overtime work shall be made by the Engineer and shall be final. A condition will be imposed on the granting of a request to work overtime, requiring the Contractor to pay the District the cost incurred at overtime rates for additional inspection and engineering time required in connection with the overtime work.

6.27 OCFCD Right-of-Way - Portions of the construction along Aliso Wash are on OCFCD right-of-way. It is not anticipated that construction activities will extend onto the existing adjacent golf course. If this is not possible then the Contractor shall coordinate with the golf course superintendent (Troy Thompson at 559.312.6270) to ensure that construction activities will not adversely impact the golf course or displace existing fencing or landscape. Any damages to golf course fencing or landscape shall be restored/replaced in kind at the sole expense of the Contractor.

6.28 Mandatory Pre-Bid Site Inspection - The Contractor's attention is directed to Section 8.08 of the General Provisions. To facilitate the Contractor's site examination, the District has scheduled a Mandatory Pre-Bid Site Inspection Tour on Wednesday, July 15, 2015. The tour will begin at 9:00 a.m. at the U.S. Army Corps of Engineers' parking lot on Auto Center Drive just north of the city of Corona, California 92883 (see Appendix "K" for map exhibit). A record of attendees will be maintained by the District. It is the responsibility of the Contractor to ensure that attendance is noted by the District. Any bid submitted by any Contractor who was not in attendance at the Mandatory Pre-Bid Site Inspection Tour will be considered non-responsive and disqualified.

SECTION 7 - SOILS REPORT

In conjunction with the geotechnical report prepared by CHJ Consultants dated November 21, 2013, the Contractor's attention is directed to Article 8.08 of the General Provisions. The geotechnical report is included for the convenience of the bidders, in conformance with Section 8.08 of the General Provisions, as Appendix "C" of these specifications.

SECTION 8 - NOT USED

SECTION 9 - PAYMENT

The contract prices shall include full compensation for all costs incurred under these Special Provisions and Detailed Specifications.

DETAILED SPECIFICATIONS

SECTION 10 - MOBILIZATION

10.1 Description - The contract item Mobilization shall consist of expenditures for all preparatory work and operations, including but not limited to, those costs necessary for the movement of personnel, equipment, supplies and incidentals to the project site; for the establishment of all offices, buildings, construction yards and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project site as well as the related demobilization costs anticipated at the completion of the project.

10.2 Payment - The amount credited for Mobilization on each monthly progress payment shall be equal to the total of the amounts credited for work on all the other contract items for that monthly progress payment, up to a cumulative limit of eighty percent (80%) of the lump sum price bid for Mobilization. The remaining twenty percent (20%) of the lump sum price bid for Mobilization will be paid with the final payment.

Payment of the lump sum contract price for Mobilization shall constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of this item of work.

The deletion of work or the addition of extra work as provided for herein shall not affect the price paid for Mobilization.

SECTION 11 - WATER CONTROL

11.1 Description - This section covers the contract item Water Control. Watersheds and/or urban runoff areas are tributary to the project site at various locations, but do not necessarily follow the alignment of the project under current conditions. Surface water in varying quantities can be expected at any time of the year, and substantial runoff can be expected during periods of rainfall. Groundwater was indicated at the time of the soils investigation for this project. All bidders shall make their own determination regarding what the surface and/or groundwater conditions will be at the time of construction, and their impact on the bidder's operations and construction phasing.

11.2 Water Control - The contract item Water Control includes the control and/or diversion of surface runoff as well as groundwater within the work area as required to complete the work. All work shall be carried on in areas free of water. Care should be exercised so that runoff or diversion flows do not erode, undermine or otherwise damage either facilities which have been constructed or adjacent private properties. The responsibility for the protection of all existing and proposed improvements lies with the Contractor.

11.3 Measurement and Payment - The methods of controlling both surface and groundwater will be the responsibility of the Contractor. The contract lump sum price paid for Water Control shall include full compensation for all direct and indirect costs incurred under this section, and

for doing all the work involved in controlling surface runoff and groundwater within the construction area, as specified in these Detailed Specifications, and as directed by the Engineer.

Payment will be made on a basis of the percentage of the work completed on the entire project.

SECTION 12 - TRAFFIC CONTROL

12.1 Description - The contract item Traffic Control shall include labor, flagmen, lights, barricades, signs, materials, temporary bridges and equipment necessary to ensure that the vehicular and pedestrian traffic conforms to requirements as set forth in this section and as shown on the drawings.

12.2 Notification of Agencies - The Contractor shall notify the following agencies a minimum of 48 hours in advance of start of any street work and inform them of the proposed construction schedule and provide any additional pertinent information they may request:

California Department of Parks and Recreation	951.443.2423
California Department of Transportation	909.383.6348
California Highway Patrol	951.637.8000
City of Corona Police Department	951.736.2330
Riverside County Sheriff's Department	951.955.2400
Riverside County Transportation Department	951.955.6899
Santa Ana Watershed Project Authority	951.354.4223
Southern California Edison	951.928.8363
Underground Service Alert	800.227.2600

The Contractor is not relieved of his responsibility of notifying the various departments and agencies mentioned above, even if their telephone numbers may have changed without notice.

The above agencies shall also be advised by the Contractor of any major change in the construction schedule that could restrict pedestrian or vehicular traffic.

Contractor shall note the elimination of access to north bound Highway 71 as shown via "delta revision" on Sheet 10 of 10 of the contract drawings. Contractor shall also note the alternate project access as shown in Appendix "K".

The Contractor shall notify the California Highway Patrol Area Commander and schedule a pre-job meeting with the Caltrans' representative, Ray Behbahani (909.383.6348), at least SEVEN (7) WORKING DAYS prior to installing any of the traffic control signs within Caltrans right-of-way along Highway 71.

12.3 Public Convenience and Access - The Contractor shall comply with the requirements of Section X of the General Provisions and shall provide continuous access to all private property. Additional provisions shall be made as necessary to protect the public and accommodate traffic with a minimum of inconvenience.

Installation of the proposed sheet piles is generally along the southerly edge of the existing Santa Ana River Trail. It is anticipated that one lane of vehicular and pedestrian access can be maintained on the Santa Ana River Trail during construction. In the event that one lane of access cannot be maintained, the Contractor shall coordinate with the California Department of Parks and Recreation to construct a temporary travel lane outside the limits of construction activity. An exhibit, contained in Appendix "H" of these specifications is provided to show potential locations of trail detours.

12.4 Construction Signs and Traffic Control Plans - All construction signs, barricades, delineators, etc., shall conform with the U.S. Department of Transportation, Federal Highway Administration, "Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Part 6, latest edition", and the MUTCD California Supplement, Part 6 along with the Uniform Sign Chart as shown on the drawing.

12.5 Flaggers - All personnel utilized as flaggers must be trained in the proper fundamentals of flagging and signaling.

12.6 Payment - The contract prices paid for Traffic Control shall include full compensation for all material and labor costs incurred under this section. Contractor is advised that traffic plans as shown on the drawings may be modified as field conditions require. No additional payment shall be made for modifications to the traffic plan. No additional payment shall be made for the installation and removal of a temporary travel lane along the Santa Ana River Trail.

This payment will be made on a basis of the percentage of work completed on the entire project.

SECTION 13 - CLEARING AND MISCELLANEOUS WORK

13.1 Description - This section covers the contract item Clearing and Miscellaneous Work as required for construction of the work. All objectionable materials shall be removed and disposed of outside of the limits of the construction easements and permanent rights of way.

13.2 Clearing and Miscellaneous Work - The contract item Clearing and Miscellaneous Work includes the removal and disposal of all vegetation, trees, roots, stumps, fences, pipes, all abandoned facilities, culverts, rocks, structures, concrete and asphalt excluding those items defined specifically as excavation in the appropriate section.

Included in this item are the following:

1. The removal of the interfering portion of abandoned electric conduit along the alignment of the sheet pile.
2. The protection in place of existing oak trees as called out on the improvement plans and as directed the by Engineer.

3. The adherence to California Department of Parks and Recreation **Fire Contingency Requirements** as set forth in Section 35 of these specifications.
4. The protection in place of abandoned gas/oil well as called out on plans (see Note 7 on Sheet 2) and as directed by the Engineer. If any plugged and abandoned or unrecorded wells are damaged or uncovered during excavation or grading, remedial plugging operations may be required. If such damage or discovery occurs, the California Department of Conservation Division of Oil Gas and Geothermal Resources - Cypress District Office must be contacted at 714.816.6847 to obtain information on the requirements for and approval to perform remedial operations.

Finally, included in this item are those types of work as shown on the drawings not specified for pay under any other individual contract item.

13.3 Payment - The contract price paid for Clearing and Miscellaneous Work shall be full compensation for all costs incurred under this section.

This payment will be made on a basis of the percentage of work completed on the entire project.

SECTION 14 - EARTHWORK

14.1 Description - This section covers the contract items Excavation; and Backfill.

14.2 General Excavation Requirements - Access to trenches shall be in conformance with Section 306-1.1.4 and the manner of bracing excavations shall be in conformance with Section 306-1.1.6 of the Greenbook Specifications.

Excavation shall be kept to the minimum widths required for efficient placing of the sheet pile tie-backs.

In excavating for surfaces against which concrete is to be placed, care shall be exercised in removing the final lift. The foundation for all concrete structures including concrete channels and sideslopes will be inspected and tested after excavation. The subgrade shall be ninety percent (90%) relative compaction prior to the placement of concrete. Surfaces against which concrete is to be placed shall be free of debris, mud or ponded water. If subgrade compaction is deficient, subgrade shall be scarified, moisture conditioned to or slightly above optimum moisture content, and the surface proof rolled to a minimum ninety percent (90%) relative compaction. Subgrade preparation will not be measured or paid separately and no additional compensation will be allowed unless overexcavation is directed by Engineer.

Material which will not provide a suitable foundation shall be removed and replaced with compacted select material as directed by the Engineer.

Any overexcavation shall be filled with select material compacted to ninety percent (90%) relative compaction and meeting the material requirements for backfill.

The Contractor shall remove slides and materials eroding into the work, and the slopes and grades refinished to original grades as specified.

The Contractor shall dispose of all surplus excavated material outside of the limits of the construction easements and permanent rights of way.

The removal of rock material from within the excavation paylines which requires the use of blasting or equipment beyond that normally necessary to accomplish the excavation (as determined by the Engineer) shall be paid for in accordance with Section VII, Article 7.03 of the General Provisions. The cost of removal and disposal (including trucking) of rock away from the jobsite will be paid for under the contract item Excavation and no additional compensation will be allowed.

Blasting, when necessary, as approved by the Engineer shall be in accordance with Section 19-2.03E of the Caltrans Specifications.

The Contractor's attention is directed to the General Provisions, Section V, Article 5.09 on the use of explosives and Article 5.11 in regard to unforeseen difficulties.

14.3 Excavation - The contract item Excavation covers the removal of all material including asphalt, aggregate base, abandoned pipelines and concrete from within the excavation paylines as specified and as required for the construction and installation of the sheet pile tie-backs and other appurtenances.

14.4 General Backfill Requirements - Whenever fill is specified or required the work shall be performed as set forth in Sections 300-4.1 to 300-4.8 of the Greenbook Specifications.

No backfill materials shall be placed against the outside walls of cast-in-place concrete structures until the concrete has developed eighty percent (80%) of its design strength. No fill or traffic will be permitted on the top of any cast-in-place concrete structure until the concrete in the structure has attained its design strength. Compressive strength will be determined by test cylinders taken by the Engineer.

Regardless of the method of densification, backfill material shall not be placed against any reinforced concrete structure until the structure has been inspected and approved for backfilling by the Engineer.

Backfill will be accomplished by either mechanical methods or by placement of Controlled Low Strength Material (CLSM) as described in (1) and (2) below.

- (1) Mechanical Compaction - Backfill shall be mechanically compacted by means of tamping rollers or other mechanical tampers. Impact-type pavement breakers (stompers) will not be permitted unless otherwise approved by the Engineer.

All backfill material for structures shall be placed in uniform layers and shall be brought up uniformly on each side of the structure. The thickness of each

layer of backfill shall not exceed 8 inches before compaction unless otherwise approved by the Engineer. For hand directed mechanical compactors, the thickness of each layer shall not exceed 4 inches before compaction.

All relative compaction tests will be made by the Engineer in conformance with ASTM D1557. Whenever relative compaction is specified to be determined by ASTM D1557.

- (2) Controlled Low Strength Material (CLSM) – Controlled Low Strength Material (CLSM) placement for backfill shall be used when specified or approved by the Engineer. CLSM backfill shall conform to Section 201-6 of the Greenbook Specifications and as specified in Section 16.

Approval to use specific methods and compaction equipment shall not be construed as guaranteeing or implying that the use of such methods and equipment will not result in damage to adjacent ground, existing improvements or improvements installed under the contract, nor shall it be construed as guaranteeing proper compaction. The Contractor shall make his own determination in this regard.

All backfill around structures shall be compacted to not less than ninety percent (90%) relative compaction. Where such material is placed under existing or proposed paved roadways, the top 3 feet, measured from the subgrade plane, shall be compacted to ninety-five percent (95%) and shall be compacted by Method (1).

Trench bottoms for structures shall be graded to provide firm and uniform bearing throughout the entire length of the structures and pipe.

14.5 Testing – District personnel shall perform compaction tests as described below using either the ASTM D1556 (sand cone) or ASTM D6938 (nuclear) test method. These tests represent the minimum required. Additional tests may be taken at the Engineer's discretion.

1. Mainline Trenches – A complete series of compaction tests will be taken for each 4-foot thickness of backfill placed. Each series will consist of tests taken at approximate maximum intervals of 300 feet.
2. Any failed test will result in a retest.

14.6 Backfill - The contract item Backfill includes all mechanical backfill material compacted as specified within the paylines to preconstruction grades as shown on the improvement plans.

14.7 Measurement - Excavation; and Backfill beyond the limits established by the drawings, unless ordered in writing by the Engineer, will not be measured for payment.

The excavated material shall be measured from the ground surface existing at the start of excavation, as determined from surveyed cross sections taken by the District, to the lines, grades and dimensions shown on the drawings. Longitudinal limits of the excavations as shown on the

profile drawings terminate at a vertical plane at the limits of the structure, measured along the longitudinal axis of the various structures.

Measurement for payment for the contract item Excavation will be the number of cubic yards of material excavated as shown on the drawings. Longitudinal limits of the excavations terminate at a vertical plane at the limits of structures, measured along the longitudinal axis of the structure.

Measurement for payment for the contract item Backfill will be the number of cubic yards of material placed in final position as specified and within the limits of the payment lines shown on the drawings. The longitudinal limits shall terminate at a vertical plane at the limits of the structure, measured along the longitudinal axis of the structure. Volumes occupied by structures and other feature for which a separate payment is made will be deducted from the gross volume.

14.8 Payment - The contract prices paid for Excavation; and Backfill shall include full compensation for all costs incurred under this section.

SECTION 15 - TRENCH SAFETY SYSTEM

15.1 Description - This section covers the contract item Trench Safety System. This item is defined as a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Trench safety systems include support systems, sloping and benching systems, shield systems and other systems that will provide necessary protection. The item includes the furnishing and implementation of the safety system as required by Section 306-1.1.6 of the Greenbook Specifications or as directed by the Engineer.

15.2 Trench Safety System - Excavation for any trench five (5) feet or more in depth shall not begin until the Contractor has provided to the Engineer, a detailed plan for worker protection from the hazards of caving ground during the excavation of the trench. The plan shall show the details of the design of shoring, bracing, sloping or other provisions to be made for worker protection including any design calculations done in the preparation of the plan. No such plan shall allow the use of shoring, sloping or a protective system less effective than that required by the Construction Safety Orders of the California Department of Industrial Relations, Division of Occupational Safety and Health Administration (Cal-OSHA). The plan shall be prepared and signed by an engineer who is registered as a civil engineer in the State of California, and the plan and design calculations shall be submitted for review at least two (2) weeks before the Contractor intends to begin trenching operations.

All safety plans shall reflect surcharge loadings imparted to the side of the trench by equipment and stored materials. Surcharge loads shall be monitored to verify that such loads do not exceed the design assumptions for the system.

The Contractor should not assume that only one type of trench safety system such as a shield or "trench box" will be adequate for all trenching situations encountered on a given

project. The Contractor should be prepared with alternative safety system designs (such as solid sheeting) should construction circumstances dictate the use of such.

Trench safety system designs for support systems, shield systems or other protective systems whether drawn from manufacturers' data, other tabulated data or designed for this particular project must be signed by a civil engineer registered in the State of California prior to submittal to the District for review. A shoring plan for the specific use of a shield shall be prepared. Catalogs or engineering data for a product should be identified in the plan as supporting data. All specific items or applicable conditions must be outlined on the submittal.

The State of California Department of Transportation "Trenching and Shoring Manual" will be used as a guide for plan review and approval.

Also included in this item is the fencing and barricading of the open trench as required for the safety of pedestrians and vehicular traffic as directed by the Engineer.

15.3 Measurement and Payment - The contract price paid for the item Trench Safety System shall include full compensation for all costs incurred under this section.

This payment will be made on a basis of the percentage of the work completed on the items related to trenching operations.

SECTION 16 - CONCRETE CONSTRUCTION

16.1 Description - This section includes the contract item Class "A" Concrete, Pile Cap.

16.2 General Requirements - Concrete for all purposes shall be composed of Portland Cement, aggregates and water of the quantities and qualities herein specified, and in the required proportions. The ingredients are to be well mixed and brought to the proper consistency and to have a compressive strength at the age of 28 days of not less than the amount shown in the following tabulation for each type of work listed:

<u>CONCRETE CLASS</u>	<u>MINIMUM SACKS CEMENT/C.Y.</u>	<u>TYPE OF WORK</u>	<u>POUNDS PER SQUARE INCH</u>
A	6	Pile Caps	4000

16.3 Material and Methods - All concrete materials, methods, forms and proportioning shall conform to Sections 51 and 90 of the Caltrans Specifications. Concrete test specimens will be made in accordance with ASTM Designation C-31 and C172. Test for concrete compressive strengths will be performed in accordance with ASTM Designation C-39. Combined aggregate grading for all concrete shall be in conformance with Section 90-1.02C(4)(d) of the Caltrans Specifications and the following tabulation for each type of work listed:

<u>TYPE OF WORK</u>	<u>COMBINED AGGREGATE GRADING</u>
Pile Caps	1-1/2" Maximum

Fly Ash, Class F may be substituted for cement, up to a maximum of 15 percent by weight for all concrete. Fly Ash shall meet the standards of ASTM Designation: C-618. Water reducing agents meeting ASTM Designation: C-494 will be permitted in amounts recommended by the supplier and approved by the Engineer in writing.

No other admixture shall be used in any class of concrete without written permission from the Engineer.

Supplementing Section 90-1.01 of the Caltrans Specifications, prior to placement of any concrete the Contractor shall submit mix designs, for all types of concrete to be placed, to the Engineer for approval. Supplementing Section 90-1.02G(3) of the Caltrans Specifications, concrete delivered to the job site shall be accompanied by a ticket containing the weight of each of the individual ingredients in the mix.

16.4 General Reinforcing Steel Requirements - Reinforcing steel for all reinforced concrete structures shall be Grade 60 Low-Alloy or Grade 60 Billet-Steel. Cleaning, bending, placing and spacing of reinforcement shall conform to the applicable provisions of Section 52 of the Caltrans Specifications and to the drawings. The Contractor shall furnish a "Certificate of Compliance" with the specification of ASTM Designation: A-706/A or A-615/A. All splices shall conform to the requirements of A.C.I. Manual, Standard 318, latest edition. Splices requested by the Contractor for his convenience shall be subject to approval by the Engineer. Longitudinal lap shall be 16 inches minimum for #4 bars and 19 inches minimum for #5 bars.

16.5 Consistency - The consistency of the concrete shall be such as to allow it to be worked into place without segregation. Unless otherwise specified, the slump shall be 3 inches plus or minus 1 inch for all concrete, except the concrete for the cast-in-place concrete pipe which shall have a slump of 2 inches plus or minus 1 inch.

The slump test shall be performed in accordance with the requirements of ASTM Designation: C-143. Slumps greater than those specified may be cause for rejection of the concrete by the Engineer.

16.6 Placing - Supplementing Section 51-1.03D(1) of the Caltrans Specifications, concrete shall not be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications before concrete is delivered for placing.

Formed concrete shall be placed in horizontal layers in lifts of not more than 20 inches. Hoppers and chutes, pipes and "elephant trunks" shall be used as necessary to prevent segregation of the concrete.

16.7 Form Removal and Finish - Forms shall be removed only when the Engineer has given his approval. Forms shall be removed in such a way as to prevent damage to the concrete.

Supports shall be removed in a manner that will permit the concrete to take stresses due to its own weight uniformly.

Forms shall not be removed sooner than the following minimum time or strength after the concrete is placed. These times represent cumulative number of days and fractions of days, not necessarily consecutive, during which the temperature of the air adjacent to the concrete is above 50 degrees Fahrenheit. If the temperature falls below 50 degrees Fahrenheit at any time after the concrete is placed in the forms, the Engineer will advise the Contractor of additional time required before forms can be removed.

<u>Element</u>	<u>Strength or Time</u>
Pile Caps	16 hours

The finish on all exposed formed surfaces shall conform to Section 51-1.03F(3) Class 1 Surface Finish of the Caltrans Specifications. A tight wood float finish will be required on the surface of trapezoidal channels and bridge decks and excessive surface working will not be permitted. The exposed concrete surfaces shall be broomed in a transverse direction with a fine textured hair push broom to produce a uniform surface and eliminate float marks. Brooming shall be done when the surface is sufficiently set to prevent deep scarring. If directed by the Engineer, a fine spray of water shall be applied to the surface immediately in advance of brooming.

Exposed corners of all concrete structures shall be finished with a 3/4" chamfer.

Concrete flatwork shall match adjacent surfaces. The concrete shall be struck off and tamped or vibrated until a layer of mortar has been brought to the surface. The top surface and face of curbs, gutters, catch basins and sidewalks shall be finished to match adjacent surfaces.

16.8 Curing - All concrete shall be prevented from drying for a curing period of at least seven (7) days after it is placed. Surfaces exposed to air during the curing process shall be kept continuously moist for the entire period or until curing compound is applied.

Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged. Water for curing shall be clean and free from any substances that will cause discoloration of the concrete.

Concrete may be coated with curing compound in lieu of the continued application of moisture. The curing compound shall comply with the requirements of Section 90-1.03B(3) of the Caltrans Specifications and ASTM Designation C-309. The curing compound shall be No. 2 White Pigmented Curing Compound, Type 2, Class B for all concrete surfaces other than for flatwork which shall be coated with No. 6 Nonpigmented Curing Compound, Type 1-D, Class A containing a red fugitive dye.

The curing compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and

finishing of that surface are completed. The curing compound shall be thoroughly mixed immediately before applying, and shall be applied at a uniform rate of not less than one gallon per 150 square feet of surface. No separate payment will be made for the curing compound or its application.

16.9 Joints - Joints shall be made at the locations shown on the drawings, or as approved by the Engineer.

The Contractor shall construct, in one continuous concrete placing operation, all work comprised between such joints. Joints shall be kept moist until adjacent concrete is placed.

All construction joints having a keyed, stepped, or roughened surface shall be cleaned by sandblasting prior to placement of the adjacent concrete, unless otherwise directed by the Engineer.

The sandblasting operations shall be continued until all unsatisfactory concrete, laitance, coatings, stains, debris, and other foreign materials are removed. The surface of the concrete shall be washed thoroughly to remove all loose material.

Construction joints, when required, shall be located between the transverse joints and, unless otherwise specified on the plans, shall utilize 1/2 inch diameter deformed bars 30 inches long, spaced at 18-inch centers as tie bars. The construction joints shall be straight and finished in a workmanlike manner.

Surfaces of construction joints shall be cleaned as set forth in Section 51-1.03D(4) of the Caltrans Specifications.

16.10 Class "A" Concrete, Pile Cap - The contract item Class "A" Concrete, Pile Cap covers the concrete incorporated in the construction of all pile caps.

Pile Caps shall be constructed by placing the concrete directly against timber or steel sheeting used as the outside form and shoring. Sheeting shall be closely fitted and extend a minimum of 12 inches above the ground surface. Unless otherwise directed, all sheeting shall be removed and the void created shall be immediately backfilled with a well graded sand and thoroughly jetted to the relative densities specified in Backfill.

16.11 Measurement - Measurement for payment for the contract item Class "A" Concrete, Pile Cap will be the number of cubic yards placed as specified, measured to the neat lines as shown on the drawings.

No measurement for payment for reinforcing steel will be allowed.

No measurement or payment will be made for dowels, tie bars, tie wires, blocks, chairs and other accessories.

16.12 Payment - The contract price paid for Class "A" Concrete, Pile Cap shall include full compensation for all costs incurred under this section.

SECTION 17 THROUGH SECTION 25 - NOT USED

SECTION 26 - STONEWORK

26.1 Description - This section covers the contract items Rock Slope Protection of various classes; Filter Blanket, No. 2 Backing; and Rock Slope Protection Fabric.

26.2 General - All rock materials shall meet the gradation requirements of Section 72-2.02 of the Caltrans Specifications and the quality requirements of Sections 200-1.6.1 and 200-1.6.3 of the Greenbook Specifications.

Rock materials shall be blocky and predominantly angular in shape. Not more than 25% of the rock shall have a length more than 2.5 times the breadth or thickness. No rock shall have a length exceeding 3.0 times its breadth or thickness. All oversize rocks, as determined by the Engineer, shall be removed.

Rock materials shall be placed on a firm dry foundation in conformance with Method B of Section 72-2.03 of the Caltrans Specifications, however, additional placement effort shall be required to meet the lines and grades as shown on the drawings and to fill and chink oversize voids with selected rock to establish a stable interlock. Chinking of voids will not be required for rock specified to be concreted.

Permeable materials such as filter blankets shall be consolidated and the surface trimmed to final grade as directed by the Engineer.

26.3 Rock Slope Protection, 1-Ton Class - The contract item Rock Slope Protection, 1-Ton Class covers the rock furnished and placed as shown on the drawings as specified. Rock shall conform to 1-Ton Class, for Method B placement per Section 72-2.02 of the Caltrans Specifications.

26.4 Filter Blanket, No. 2 Backing - The contract item Filter Blanket, No. 2 Backing covers the 9-inch filter blanket installed under the Rock Slope Protection.

The filter blanket shall be permeable material conforming to Section 72-2.02A of the Caltrans Specifications for No. 2 Backing, and shall be placed to the lines and grades as shown on the plans. Material shall be placed on firm, dry foundation. Soft, spongy material shall be removed and replaced with acceptable compacted material as directed by the Engineer. The cost of foundation preparation shall be included in the price bid for excavation and no additional allowance will be made for such work. The permeable material shall be consolidated and the surface trimmed to final grade as shown on the drawings or as directed by the Engineer.

26.5 Rock Slope Protection Fabric - Rock Protection Fabric placed beneath rock shall conform to Class 10 per Section 88-1.02I of the Caltrans Specifications.

26.6 Measurement - Measurement for payment for the contract items Rock Slope Protection, 1-Ton Class; and Filter Blanket, No. 2 Backing, including all rock to be concreted, shall be the number of cubic yards placed as specified.

Measurement for payment for the contract item Rock Slope Protection Fabric shall be the number of square yards placed as specified. No measurement for payment will be made for laps required for installation or for convenience to the Contractor.

26.7 Payment - The contract prices paid for Rock Slope Protection, 1-Ton Class; Filter Blanket, No. 2 Backing; and Rock Slope Protection Fabric shall include full compensation for all costs incurred under this section with the exception of concrete for concreted rock which shall be measured and paid for as specified under the Concrete Construction Section of these Specifications.

SECTION 27 - DUST ABATEMENT

27.1 Description - This section covers the implementation of dust control measures necessary to prevent harm and nuisance from dust. Supplementing Section 8.06 of the General Provisions, the Contractor shall comply with all the provisions of the South Coast Air Quality Management District (SCAQMD) Rule 403 as described in Appendix "A".

27.2 Dust Abatement - The contract item Dust Abatement includes the action necessary to prevent, reduce or control dust within the work area as required to complete the work. The Contractor shall carry out proper and efficient measures to prevent his operations from producing dust in amounts damaging to property or causing a nuisance, or harm to persons living nearby or occupying buildings in the vicinity of the work. The methods to be used for controlling dust in the construction area and along haul roads shall be approved by the Engineer prior to starting any work included in this contract. The Rule 403 Implementation Handbook published by the SCAQMD contains a detailed listing of reasonably available dust control measures and is available for inspection at the District office.

27.3 Payment - The contract lump sum price paid for Dust Abatement shall include full compensation for all direct and indirect costs incurred under this section.

This payment will be made on a basis of the percentage of work completed on the entire project.

SECTION 28 - HYDROSEEDING

28.1 Description - This section covers the contract item Hydroseeding as directed by the Engineer. The outside of levee and channel embankments, cut or fill slopes, disturbed creek bottom, and all exposed or stripped areas (including TCE's) within the project limits shall be hydroseeded.

28.2 Hydroseeding - This item includes the furnishing of all materials, incidentals, labor and equipment necessary to complete the work as specified herein, and as directed by the Engineer. All hydroseeding work shall be done by fully qualified and experienced personnel.

The hydroseeding materials shall not be stored onsite without prior approval of the Engineer as to location, duration and method of storage. All debris and excess materials shall be removed on a daily basis, unless otherwise authorized by the Engineer. The Contractor shall leave the work area in a clean and finished appearance upon completion of hydroseeding.

28.3 Equipment and Materials - The equipment shall be a mobile mounted unit in a fully operational and well maintained condition, meeting the requirements of Section 21-1.03E of the Caltrans Specifications. Fiber shall be produced from natural or recycled (pulp) fiber and shall meet the requirements of Section 21-1.02E of the Caltrans Specifications. Stabilizing binder upon drying shall allow water and air penetration, shall be non-flammable, shall have an effective life of at least 1 year, and shall not be toxic to plants and animals.

All seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code. Seed shall be of a quality which has a minimum pure live seed content (% of purity x % germination) as specified and weed seed shall not exceed 0.5% of the aggregate of pure live seed and other material.

A commercial Ammonium Phosphate fertilizer shall be used containing a minimum of 16% nitrogen, 20% available phosphoric acid and 0% water soluble potash, uniform in composition, dry and free flowing, pelleted or granular. All fertilizer shall be delivered in unbroken or unopened containers, labeled in accordance with applicable State regulations and bearing the warranty of the producer for the grade furnished.

28.4 Application - The Engineer shall review and approve completion of all construction and grading prior to any section being approved as ready for hydroseeding application.

The Contractor shall provide a written per load mix tabulation, ratioed to the tank capacity of the equipment to be used on the project, for review and approval by the Engineer well in advance of anticipated start of hydroseeding.

The Contractor shall provide a sample demonstration area for application by preparing one load of hydroseed mix. The demonstration areas shall be wet down thoroughly prior to application. The Engineer shall review and approve the sample section for compliance and workmanship. Upon approval, this area shall become the sample for all remaining application. No hydroseeding shall take place during high winds or during periods of rainfall.

Areas designated for hydroseeding shall receive an application made with an overlapping fan motion to provide a full and even spread throughout the coverage area.

The hydroseed mix, per acre of coverage, shall be as follows:

2,000 lbs./acre Fiber Mulch
250 lbs./acre 16-20-0 Commercial Fertilizer
120 lbs./acre Stabilizing binder
23 lbs./acre Seed Mix as follows:

Species	Lbs/ac	P/G
Black Sage/Salvia mellifera	1	70/50
California Buckwheat/Eriogonum fasciculatum	8	10/65
Yerba santa/Erodictyon trichocalyx	4	20/40
Vulpia microstachys	4	90/80
Deerweed/Lotus scoparius	3	90/60
Coyote bush/Baccharis pilularis	1	2/40
Scale broom/Lepidospartum squamatum	2	20/30

28.5 Measurement and Payment - The contract lump sum price paid for Hydroseeding shall include full compensation for all costs incurred under this section.

SECTION 29 – STORMWATER AND NON-STORMWATER POLLUTION CONTROL

29.1 Description – This section covers the contract items Stormwater and Non-Stormwater Pollution Control; and Non-Stormwater Discharge or Dewatering. The contract item Stormwater and Non-Stormwater Pollution Control shall include preparing, obtaining approval of, amending and implementing the Permit Registration Documents (PRDs) as required by the State Water Resources Control Board (SWRCB) and the California Regional Water Quality Control Board (CRWQCB) - Santa Ana Region. The contract item Non-Stormwater Discharge or Dewatering shall include compliance with Santa Ana Regional Water Quality Board Order No. R8-2009-0003.

29.2 General Requirements – All activities performed by the Contractor for this project shall conform to the requirements of the State-wide National Pollutant Discharge Elimination System (NPDES) General Permit (Board Order No. 2009-0009-DWQ, NPDES No. CAS000002 as amended by Board Order No. 2010-0014-DWQ) for Stormwater Discharges Associated with Construction and Land Disturbance Activities, hereafter referred to as the "General Permit", issued by the SWRCB. This General Permit regulates both stormwater and non-stormwater discharges associated with Contractor's construction activities. This General Permit can be downloaded at http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

The PRDs mentioned above consist of:

1. Notice of Intent
2. Risk Assessment (Section VIII of the General Permit)
3. Site Map
4. Stormwater Pollution Prevention Plan (SWPPP) (Section XIV of the General Permit)
5. Annual Fee
6. Signed Certification Statement

Notice of Intent - The District will complete and submit the Notice of Intent.

Risk Assessment - Using the methodology in Appendix 1 of the General Permit, the District has calculated the preliminary Risk Level to be 1 based on returning disturbed areas to pre-construction conditions at the end of the day.

Site Map – The Contractor shall revise District provided site map of the project area if Contractor's Qualified SWPPP Developer (QSD) deems necessary. Site Map shall conform to requirements of General Permit Attachment A, Section B.

SWPPP – For the convenience of the Contractor and to expedite the SWPPP preparation and approval, a "90%" SWPPP Template has been prepared by the District. This SWPPP Template has been tailored to the referenced project and can be downloaded from http://rcflood.org/Documents/SWPPP_Template_2000105.pdf or obtained from the District in CD form. Winning bidder will be provided two (2) hard copies and a Word document of the "90%" SWPPP Template to amend. The Contractor shall review and amend this SWPPP Template based on the requirements of the General Permit and per the construction schedule and work plan proposed by the Contractor. The Contractor shall then submit a SWPPP certified by the Contractor's QSD which conforms to Section 29.3 for District review and approval.

The Contractor shall amend and finalize the complete "90%" SWPPP Template referenced above. The Contractor shall, at a minimum, provide and/or prepare the following:

1. Name and contact information for the Contractor's Qualified SWPPP Practitioner (QSP) and QSD
2. Contractor name and contact information
3. Contractor site contact person and emergency contact person information
4. Verification of disturbance area due to construction
5. Construction commencement date
6. Anticipated construction completion date
7. Construction Activity Schedule/Best Management Practices (BMPs) Installation Schedule
8. Name and contact information for personnel responsible for pre-storm, post-storm and storm event BMP inspections – this should be the project's QSP
9. Name of the lab responsible for testing any stormwater samples for non-visible pollutants
10. Verification of project risk level and permit type (Linear Underground/Overhead Project (LUP) or Traditional)
11. List of all subcontractors that will be working on the project
12. Review and finalize water pollution control drawings

The SWPPP shall be certified by the Contractor's QSD and implemented by the Contractor's QSP. The SWPPP shall be developed based on the format outlined in the CASQA SWPPP Template located in the California Stormwater Quality Association (CASQA) Construction BMP Handbook Portal and modified as required to meet the LUP specific requirements set forth in the General Permit Attachment A. The portal can be found on the CASQA Website: www.casqa.org. The SWPPP shall identify site specific BMPs to be implemented during and after construction to minimize the potential pollution of stormwater runoff and downstream receiving waters. The identified BMPs shall be practices designed to minimize or eliminate the discharge of pollutants from the construction site and Contractor's construction activities, including, but not limited to:

1. Good housekeeping practices for solid and sanitary/septic waste management, vehicle and equipment cleaning/maintenance, and material handling and storage.
2. Construction procedures such as stabilized construction access points, scheduling/phasing to minimize areas of soil disturbance, soil stabilization and erosion/sediment control.

The SWPPP shall also stipulate an ongoing program for monitoring and maintenance of all BMPs.

The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;
2. Where not otherwise required to be under a Regional Water Board permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
3. Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Conventional Technology (BAT/BCT) standard;
4. Calculations and design details as well as BMP controls for site run-on are complete and correct; and
5. Stabilization BMPs, installed to reduce or eliminate pollutants after construction, are completed.

To demonstrate compliance with requirements of the General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

The Contractor shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Regional Board inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

Annual Fee – The District will pay any necessary fees.

Signed Certification Statement – The Contractor's QSD shall submit a signed certification certifying the SWPPP is a true, accurate and complete representation of the proposed project and mitigation measures.

In the event the District incurs any Administrative Civil Liability or Mandatory Minimum (fine) imposed by the CRWQCB - Santa Ana Region, as a result of Contractor's failure to fully implement the provisions of this section and permit requirements,

"Stormwater and Non-Stormwater Pollution Control", the Engineer may, in the exercise of his sole judgment and discretion, withhold from payments otherwise due Contractor a sufficient amount to cover the Civil Liability. Liability for "Negligent Violations" may be in an amount up to \$50,000 per day per deemed occurrence while "Knowing Violations" can result in fines as high as \$250,000 and imprisonment.

Stormwater and Non-Stormwater Pollution Control work shall conform to the requirements in the latest version of the CASQA Handbook, entitled "**California Stormwater BMP Handbook – Construction**" updated November 2009. A copy of the "California Stormwater BMP Handbook – Construction", updated November 2009, hereafter referred to as the "CASQA Handbook", may be obtained from CASQA, Post Office Box 2105, Menlo Park, California 94026-2105. Telephone: 650.366.1042. Copies of the CASQA Handbook can also be downloaded from the CASQA Construction BMP Handbook Portal.

The Contractor shall be responsible for all costs and for any liability imposed by law as a result of the Contractor's failure to comply with the requirements set forth in this section, "Stormwater and Non-Stormwater Pollution Control", including but not limited to, compliance with the applicable provisions of the CASQA Handbook, General Permit, General De Minimus Permit, Federal, State and local regulations. For the purpose of this paragraph, costs and liabilities include, but are not limited to, fines, penalties and damages whether assessed against the District or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Act.

The Contractor shall become fully informed of and comply with the applicable provisions of the CASQA Handbook, General Permit, General De Minimus Permit, and Federal, State and local regulations that govern the Contractor's activities and operation pertaining to both stormwater and non-stormwater discharges from both the project site and areas of disturbance outside the project limits during construction. The Contractor shall, at all times, keep copies of the General Permit, General De Minimus Permit, approved SWPPP and all amendments at the project site. The SWPPP shall be made available upon request of a representative of the SWRCB, CRWQCB, United States Environmental Protection Agency (USEPA) or local stormwater management agency. Requests by the public shall be directed to the Engineer.

The Contractor is solely and exclusively responsible for any arrangements made between the Contractor and other property owners or entities that result in disturbance of areas or construction activities being conducted outside limits of the designated rights-of-way and temporary construction easements as shown on the project drawings.

The Contractor shall, during work hours, allow authorized agents of the CRWQCB, SWRCB, USEPA or local stormwater management agency, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the construction site and the Contractor's facilities pertinent to the work;
2. Have access to and copy any records required to be kept as specified in the General Permit;

3. Inspect the construction site, including any offsite staging areas or material storage areas, and related soil stabilization practices and sediment control BMPs; and
4. Sample or monitor for the purpose of ensuring compliance with the General Permit.

The Contractor shall notify the Engineer immediately upon request from regulatory agencies to enter, inspect, sample, monitor or otherwise access the project site or the Contractor's records.

29.3 PRDs Preparation and Approval - The Contractor shall prepare and obtain approval of the PRDs as part of the Stormwater and Non-Stormwater Pollution Control work for this contract. The SWPPP shall include an appropriate Monitoring and Reporting Program (M&RP) as required by Section M, "Monitoring and Reporting Requirements" of Attachment A of the General Permit. A guidance document titled "Field Monitoring and Analysis Guidance" is available from the CASQA internet site in their Construction BMP Handbook Portal. The Contractor shall prepare and implement the SWPPP in accordance with the CASQA Handbook, the General Permit and these Detailed Specifications.

In case of conflict between the CASQA Handbook and these Detailed Specifications, the Detailed Specifications shall govern; in case of conflict between these Detailed Specifications and the General Permit, the latter shall govern.

Within five (5) working days after the award of the contract, the Contractor shall submit two (2) copies of the PRDs to the Engineer for review and approval. The Contractor shall allow ten (10) working days for the Engineer to review the PRDs. If revisions are required as determined by the Engineer, the Contractor shall revise and resubmit the PRDs within three (3) working days of receipt of the Engineer's comments and shall allow ten (10) working days for the Engineer to review the revisions. The Contractor shall submit four (4) hard copies and one (1) pdf copy of the approved SWPPP to the Engineer prior to the pre-construction meeting. **The Contractor must have approved PRDs prior to the pre-construction meeting.**

The SWPPP shall incorporate BMPs in each of the following categories:

1. Soil stabilization practices;
2. Sediment control practices;
3. Sediment tracking control practices;
4. Wind erosion control practices; and
5. Non-stormwater management, and waste management and disposal control practices.

Specific objectives and minimum requirements for each category of BMPs are described in the CASQA Handbook. The Contractor shall consider the objectives and minimum requirements presented in the CASQA Handbook for each of the above categories. When minimum requirements are listed for any category, the Contractor shall incorporate one or more of the listed minimum BMPs required into the SWPPP and implement them on the project to meet the pollution control objectives for the category. In addition, the Contractor shall consider

other BMPs presented in the CASQA Handbook to supplement the minimum BMPs required when necessary to meet the objectives of the SWPPP and maintain compliance with the General Permit. The Contractor shall document the selection process in accordance with the procedure specified in the CASQA Handbook.

The Contractor should not assume that the minimum BMPs required for each category presented in the CASQA Handbook are adequate to meet the pollution control objectives. The Contractor may use other effective BMPs, as approved by the Engineer, in addition to the minimum as required in the CASQA Handbook to achieve the pollution control objectives.

The SWPPP shall include the following items as described in the CASQA Handbook and General Permit:

Section 1 - SWPPP Requirements:

- 1.1 Introduction
- 1.2 PRDs
- 1.3 SWPPP Availability and Implementation
- 1.4 SWPPP Amendments
- 1.5 Retention of Records
- 1.6 Required Non-Compliance Reporting
- 1.7 Annual Report
- 1.8 Changes to Permit Coverage
- 1.9 Notice of Termination

Section 2 - Project Information:

- 2.1 Project and Site Description
- 2.2 Permits and Governing Documents
- 2.3 Stormwater Run-on from Offsite Areas
- 2.4 Findings of the Construction Site Sediment and Receiving Water Risk Determination
- 2.5 Construction Schedule
- 2.6 Potential Construction Site Pollutant Sources
- 2.7 Identification of Non-Stormwater Discharges
- 2.8 Required Site Map Information

Section 3 - Best Management Practices:

- 3.1 Schedule for BMP Implementation
- 3.2 Erosion Control and Sediment Control
- 3.3 Non-Stormwater Controls, Waste and Material Management
- 3.4 Post-Construction Stormwater Management Measures

Section 4 - BMP Inspection and Maintenance:

- 4.1 BMP Inspection and Maintenance

Section 5 - Training

Section 6 - Responsible Parties and Operators:

- 6.1 Responsible Parties
- 6.2 Contractor List

Section 7 – Monitoring and Reporting Program (M&RP):

- 7.1 Objectives
- 7.2 M&RP Implementation Schedule
- 7.3 LUP Monitoring and Reporting Requirements
- 7.4 Monitoring for Non-Visible Pollutants

To ensure that the preparation, implementation, and oversight of the SWPPP is sufficient for effective pollution prevention, individuals responsible for creating, revising, overseeing, and implementing the SWPPP should participate in applicable training programs and document such training in the SWPPP. A copy of the SWPPP should be located at the construction site.

The following notes (or notes of substantially similar intent) that address pollution prevention to the Maximum Extent Practicable during the construction phase of a project on a year-round basis need to be placed on the Stormwater and Non-Stormwater Pollution Control Drawings:

- ◆ Erosion control BMPs shall be implemented and maintained to minimize and/or prevent the entrainment of soil in runoff from disturbed soil areas on construction sites.
- ◆ Sediment control BMPs shall be implemented and maintained to prevent and/or minimize the transport of soil from the construction site.
- ◆ Stockpiles of soil shall be properly contained to eliminate or reduce sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tracking or wind.
- ◆ Appropriate BMPs for construction-related materials, wastes, spills or residues shall be implemented to eliminate or reduce transport from the site to streets, drainage facilities or adjoining properties by wind or runoff.
- ◆ Runoff from equipment and vehicle washing shall be contained at construction sites and must not be discharged to receiving waters or the local storm drain system. Washwaters or rinsate from ready mix, concrete, or cement vehicles must be handled appropriately and may not be discharged to receiving waters or any storm drain system.
- ◆ All construction contractor and subcontractor personnel are to be made aware of the required BMPs and good housekeeping measures for the project site and any associated construction staging areas.
- ◆ At the end of each day of construction activity all construction debris and waste materials shall be collected and properly disposed in trash or recycle bins.

- ◆ Construction sites shall be maintained in such a condition that a storm does not carry wastes or pollutants off the site. Discharges other than stormwater (non-stormwater discharges) are prohibited, except as authorized by an individual NPDES Permit or the State-wide General Permit for Stormwater Discharges Associated with Construction Activity. Potential pollutants include but are not limited to: solid or liquid chemical spills; wastes from paints, stains, sealants, solvents, detergents, glues, lime, pesticides, herbicides, fertilizers, wood preservatives and asbestos fibers; paint flakes or stucco fragments; fuels, oils, lubricants and hydraulic, radiator or battery fluids; concrete and related cutting or curing residues; floatable wastes; wastes from engine/equipment steam cleaning or chemical degreasing; wastes from street cleaning; and super-chlorinated potable water from line flushing and testing. During construction, disposal of such materials should occur in a specified and controlled temporary area onsite physically separated from potential stormwater runoff, with ultimate disposal in accordance with local, State and Federal requirements.
- ◆ Discharging contaminated groundwater produced by dewatering groundwater that has infiltrated into the construction site is prohibited. Discharging of contaminated soils via surface erosion is also prohibited.
- ◆ The Contractor is required to notify and obtain approval from the District ten (10) days prior to any non-stormwater discharge or dewatering associated with Contractor's construction activities.
- ◆ Construction sites shall be managed to minimize the exposure time of disturbed soil areas through phasing and scheduling of grading to the extent feasible and the use of temporary and permanent soil stabilization.
- ◆ BMPs shall be maintained at all times. In addition, BMPs shall be inspected prior to predicted storm events and following storm events.

In addition, any spillage of fuel, oil or hazardous materials from vehicles or construction equipment on OCFCD right-of-way must be immediately and properly cleaned up and removed from the OCFCD right-of-way. For spills of significant volume, notifications must be immediately made to OC Public Works/Water Quality Compliance for assessment of appropriate corrective action. Contaminated soil, sand or material and hazardous wastes generated from cleanup must be disposed of by approved methods. Contractor assumes full responsibility for costs to investigate extent of contamination, cleanup, waste removal and implementation of an approved remedial action plan for the release of any wastes or hazardous materials that result in soil, surface water and groundwater contamination. Notifications to OC Public Works/Water Quality Compliance should be directed to: Duc Nguyen at 714.955.0676. For emergency/after-hours notification of spills, call 877.897.7455.

29.4 PRD and Rain Event Action Plan (REAP) Amendments - If the scope or schedule of the project changes, the Contractor shall immediately notify the Engineer. The Engineer will determine if the Contractor will be required to recalculate the Risk Assessment. If it is determined by the Engineer that a new Risk Assessment is required, the Engineer will notify the Contractor to resubmit amended PRDs and in the case that the risk level increases, the Contractor shall comply with additional applicable requirements of the General Permit, including preparation and implementation of REAPs, M&RP, Numeric Action Level (NAL) Exceedance Reports, and annual reporting requirements. The Contractor shall also prepare amendments to

the PRDs, both graphically and in narrative form, whenever there is a change in Contractor's construction activities or operations which may result in the discharge of pollutants to surface waters, groundwaters, municipal storm drain systems, or as deemed necessary by the Engineer. The Contractor shall also amend the PRDs if they are in violation of any condition of the General Permit, or has not effectively achieved the objective of reducing pollutants in stormwater discharges. Amendments shall show additional BMPs, revised Contractor's construction activities or operations, including those in areas not shown in the initially approved SWPPP, which are required on the project to effectively control water pollution.

Amendments to the PRDs shall be submitted for review and approval by the Engineer in the same manner specified for the initial approval of the PRDs. The Contractor shall date and attach all approved amendments to any of the PRDs. Upon approval of the amendment, the Contractor shall implement the approved changes, revised construction activities or operations.

29.5 Non-Compliance Reporting - If the project is in non-compliance at any time, the Contractor shall make a written report to the Engineer within two (2) calendar days of identification of non-compliance activities.

29.6 SWPPP Implementation - Upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for placing, installing, constructing, inspecting and maintaining the BMPs as well as conducting the M&RP as included in the SWPPP and any amendments thereto, and for removing and disposing of temporary BMPs. All SWPPP implementation shall be performed or supervised by a QSP. Unless otherwise directed by the Engineer or specified in these Detailed Specifications, the Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of work ordered in accordance with Section 6.05, "TEMPORARY SUSPENSION OF THE WORK", of the General Provisions. Requirements for installation, construction, inspection, maintenance, removal and disposal of BMPs are specified in the CASQA Construction BMP Handbook Portal and these Detailed Specifications.

The Engineer may order the suspension of construction operations if the Contractor fails to comply with the requirements of this section, "Stormwater and Non-Stormwater Pollution Control", as determined by the Engineer.

The Contractor will not be compensated for sampling and analysis work because of the Contractor's failure to properly implement, inspect, maintain and repair BMPs in the approved SWPPP and any amendments thereto, or for failing to store construction materials or wastes in watertight containers.

- (a) Stormwater Pollution Control - **The Contractor shall implement soil stabilization practices and sediment control BMPs, including minimum requirements as presented in the CASQA Construction BMP Handbook Portal, on all disturbed areas of the project site throughout the duration of the project.**

Implementation of soil stabilization practices and sediment control BMPs for soil-disturbed areas, including but not limited to, rough graded access roads,

slopes, channel inverts, operational inlets and outlets of the project shall be completed prior to soil disturbance. The General Permit requires BMPs to be deployed throughout the duration of the project.

The Engineer may require the Contractor, on a case-by-case basis, to reduce the active, soil-disturbed area limit of the project. The Contractor shall demonstrate the ability and preparedness to fully deploy soil stabilization practices and sediment control BMPs to protect soil-disturbed areas of the project site by maintaining an adequate quantity of soil stabilization and sediment control materials onsite to protect exposed, soil-disturbed areas and a detailed plan for the mobilization of sufficient labor and equipment to fully deploy the required BMPs prior to the onset of precipitation and for the duration of the project.

Throughout the duration of the project, soil-disturbed areas of the project site shall be considered to be inactive whenever soil disturbing activities are expected to be discontinued for a period of fourteen (14) calendar days or more. Areas that will become inactive shall be fully protected with soil stabilization practices such as covering with mulch, temporary seeding, fiber rolls, blankets, etc., within ten (10) calendar days of the discontinuance of soil disturbing activities or two (2) calendar days prior to the onset of precipitation, whichever is first to occur. Areas that will become inactive shall be fully protected with sediment control BMPs within ten (10) calendar days of the discontinuance of soil disturbing activities or two (2) calendar days prior to the onset of precipitation, whichever is first to occur.

Throughout the duration of the project, the project site shall be fully protected with soil stabilization practices and sediment control BMPs. The Contractor shall monitor the weather forecast on a daily basis. The National Weather Service forecast shall be used.

- (b) Non-Stormwater Pollution Control - **The Contractor shall implement, year-round and throughout the duration of the project, BMPs included in the SWPPP for sediment tracking, wind erosion, non-stormwater management, and waste management and disposal.**
- (c) Inspections and Reporting - The Contractor shall ensure that a QSP regularly inspects the construction site for BMPs identified in the SWPPP to ensure the proper implementation and functioning of BMPs. The QSP shall identify corrective actions and time frames to address any damaged BMPs or reinstate any BMPs that have been discontinued. All repairs and design changes shall begin to be implemented within 72 hours of identification.

At a minimum, the Contractor shall inspect the construction site as follows:

1. Prior to a forecast storm;
2. After any precipitation which causes runoff capable of carrying sediment from the construction site;

3. At 24-hour intervals during extended precipitation events; and
4. At a regular interval of once every week.

The construction site inspection checklist provided in the CASQA SWPPP Template shall be used to ensure that the necessary BMPs are being properly implemented and are functioning adequately. The Contractor shall submit one copy of each site inspection record to the Engineer.

- (d) Maintenance - The Contractor's QSP shall maintain construction site BMPs identified in the SWPPP to ensure the proper implementation and functioning of BMPs. If the QSP or the Engineer identifies a deficiency in the deployment or functioning of an identified BMP, the QSP shall begin implementing repairs or design changes within 72 hours of identification and complete as soon as possible. The correction of deficiencies shall be at no additional cost to the District.
- (e) Training – The Contractor shall ensure that all persons responsible for implementing requirements of the General Permit shall be appropriately trained in accordance with Section VII "Training Qualifications and Certification Requirements" of the General Permit. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. All training shall be documented and included in the SWPPP as an appendix.

The Contractor shall ensure that SWPPPs are written, amended and certified by a QSD. The Contractor shall also ensure that all inspection, maintenance, repair and sampling activities shall be performed or supervised by a QSP. A QSP is a person responsible for non-stormwater and stormwater visual observations, sampling and analysis.

29.7 REAP – The REAP is applicable to LUP Risk Level 2 construction sites only. The Contractor shall ensure a QSP develop a REAP and submit a copy to the Engineer for review 48 hours prior to any likely precipitation event. The Contractor shall amend and implement the REAP as directed by the Engineer. If no comments are received prior to the precipitation event, the REAP shall be implemented as proposed. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall ensure a QSP obtain a printed copy of the precipitation forecast information from the National Weather Service Forecast Office (e.g., enter the zip code of the project's location at <http://www.srh.noaa.gov/forecast>).

The Contractor's QSP shall ensure that the REAP include, at a minimum, the following site information:

- a. Site Address
- b. Calculated Risk Level

- c. Site Stormwater Manager information including the name, company and 24-hour emergency telephone number
- d. Erosion and Sediment Control Provider information including the name, company and 24-hour emergency telephone number
- e. Stormwater Sampling Agent information including the name, company and 24-hour emergency telephone number

29.8 Water Quality Monitoring, Sampling and Analysis – **The Water Quality Monitoring, Sampling and Analysis is applicable to LUP Risk Level 2 construction sites only.** The Contractor's QSD shall be responsible for preparing an M&RP and implementing the monitoring, sampling and analysis requirements as described in Attachment A of the General Permit. Records of all visual observations and sampling results required by the General Permit shall be kept using the forms contained in Attachment 3 of the CASQA Construction BMP Handbook Portal. Copies of the forms shall be maintained in the SWPPP and submitted to the Engineer within 24 hours of the visual observation or sampling event.

29.9 NAL Exceedance Report - **The NAL Exceedance Report is applicable to LUP Risk Level 2 construction sites only.** The Contractor shall be responsible for submitting a NAL Exceedance Report to the Engineer in the event that any effluent sample exceeds an applicable NAL.

- a. The Contractor shall submit all storm event sampling results for each discharge point to the Engineer no later than 24 hours after the conclusion of the storm event.
- b. The Contractor shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.
- c. The Contractor shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three (3) years after the date the annual report is filed.
- d. The Contractor shall include in the NAL Exceedance Report:
 - i. The analytical method(s), method reporting unit(s) and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit").
 - ii. The date, place, time of sampling, visual observation (inspections) and/or measurements, including precipitation.
 - iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

29.10 Non-Stormwater Discharge or Dewatering - **Dewatering activity should only be considered after other methods have been determined to be inadequate for construction by the Engineer.** If groundwater will be encountered during the project activities, the dewatering activity must be covered by the General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant Threat to Water Quality (De Minimus Permit), Santa Ana Regional Water Quality Control Board Order No. R8-2009-0003. The Contractor shall comply with this Order, and notify and obtain approval from the Engineer fifteen (15) days prior to any non-stormwater discharging of groundwater dewatering. If an emergency or unforeseen dewatering activity that will discharge to Waters of the United States occurs, the Contractor shall contact the Engineer immediately.

When discharging groundwater from dewatering activities to surface waters, the Contractor shall comply with and implement the Monitoring and Reporting Program required under Order No. R8-2009-0003. This Order can be downloaded from http://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders/orders/2009_orders.shtm. Under the Monitoring and Reporting Program, the Contractor shall prepare the monitoring report in accordance with Attachment E of the Order. The Contractor must submit the Monitoring Reports to the Engineer by the 15th day of each month following the monitoring period. The District will submit the Monitoring Reports to the Santa Ana Regional Water Quality Control Board. The Monitoring Reports shall cover the previous month's monitoring activities.

If there is any other form of non-stormwater discharge from the project to surface waters, the Contractor shall immediately contact the Engineer to determine appropriate actions required for coverage under the De Minimus Permit.

Failure of the Contractor to fully comply with this requirement may result in the suspension of construction operations and liability for any associated monitoring, fines, penalties and remediation activities related to the discharge.

29.11 Reports -

- (a) Annual Report - The Contractor shall be responsible for preparing an Annual Report to meet the requirements of Section XVI of the General Permit covering the preceding period of construction from July 1st to June 30th. The Annual Report shall be structured in accordance with the CASQA Construction BMP Handbook Portal Section 1.7. The Contractor shall submit two (2) copies of the Annual Report to the Engineer by July 15th of each year for review and approval. The Contractor shall allow ten (10) working days for the Engineer to review the Annual Report. If revisions are required as determined by the Engineer, the Contractor shall revise and resubmit the Annual Report within three (3) working days of receipt of the Engineer's comments. The Contractor shall submit four (4) copies of the approved Annual Report to the Engineer prior to August 15th of each year. **The Contractor shall be responsible for providing an Annual Report to the Engineer for any construction occurring for part of the year after July 1st prior to receiving final payment on the project.**

- (b) Monthly Report – The Contractor shall prepare and submit to the Engineer a Monthly Report within five (5) working days of the end of the month including:
1. All visual observation reports;
 2. All sampling and analysis reports;
 3. All NAL Exceedance Reports; and
 4. Summary of changes to the SWPPP and or REAP based on inspection results for the preceding month.

29.12 Payment - The contract lump sum price paid for Stormwater and Non-Stormwater Pollution Control work shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising and amending the PRDs, and installing, constructing, maintaining, removing and disposing of BMPs as shown in the SWPPP, as specified in the CASQA Handbook, General Permit and these Detailed Specifications, and as directed by the Engineer.

The contract lump sum price paid for Non-Stormwater Discharge or Dewatering De Minimus Permit shall include full compensation for compliance of Section 29.10, "Non-Stormwater Discharge or Dewatering De Minimus Permit". **Contractor shall not be paid any portion of the contract lump sum if coverage under the De Minimus Permit is not required.**

Monthly payment will be made on a basis of the percentage of work completed on the entire project and subject to the submittal of a complete Monthly Report as specified in Section 29.11(b). Failure to complete or report required visual inspections, monitoring, sampling and analysis requirements, NAL Exceedance Reports, and/or other necessary follow-up actions to ensure that the project stays in compliance with the General Permit can be the basis for reducing monthly progress payments for the project. Monthly progress payments will be reduced by the amount of direct costs, overhead costs and engineering costs incurred by the Engineer to address compliance deficiencies, including costs to conduct inspections, monitoring, reporting and supplemental BMP implementation necessary to comply with the General Permit and costs incurred by the Engineer to address complaints, additional State inspections and violations and/or fines issued by the State or USEPA associated with failure to properly comply with the General Permit. Progress payment reductions can exceed the monthly percentage or total contract lump sum price for Stormwater and Non-Stormwater Pollution Control work.

Payment will be made on a basis of the percentage of work completed on the entire project.

SECTION 30 AND SECTION 31 - NOT USED

SECTION 32 – CONTRACTOR QUALIFICATIONS

32.1 Description - This section covers the Contractor Qualifications and the contents of the Experience Statement submittal that shall accompany the Contractor's bid. **Inadequate proof of the qualifications, as judged by the Engineer, shall be cause for rejection of the bid or for withholding contract award.**

32.2 Press-In Method Experience Requirements - The Contractor/Subcontractor performing the sheet pile installation using the Press-In Method described in Section 34 of these Detailed Specifications shall have the minimum qualification experience listed herein. The Contractor/Subcontractor performing the sheet pile installation shall have ten (10) years' experience installing sheet piling using the Press-In Method. Field Superintendent and Foreman shall have experience on a minimum of five (5) projects and five (5) years' experience in subsurface conditions similar to those expected at the project site.

32.3 Ground Anchor Installation - The Contractor performing the work described in Section 33 of these Detailed Specifications shall have installed permanent ground anchors for a minimum of ten (10) years.

The Contractor shall assign an engineer to supervise the work with at least three (3) years' of experience in the design and construction of permanent anchored structures. The Contractor may not use consultant's or manufacturer's representatives in order to meet the requirements of this section. Drill operators and onsite supervisors shall have a minimum of five (5) years' experience installing permanent ground anchors with the Contractor's organization.

32.4 Submittals - The Contractor shall submit a list containing at least five (5) projects completed within the last ten (10) years using the Press-In Method of sheet pile installation. The list shall also include at least five (5) projects completed in the last five (5) years that involved the installation of permanent ground anchors. For each project, the Contractor shall include with this submittal, at a minimum: 1) name of client contact, address, and telephone number; 2) location of project; 3) contract value; and 4) completion date for the project.

Resumes of the Contractor's staff shall be submitted to the District for review as part of the Contractor's bid. Only those individuals designated as meeting the qualification requirements shall be used for the project. The Contractor shall not substitute any of these individuals without written approval by Engineer. Engineer shall approve or reject the Contractor's qualifications and staff within fifteen (15) working days after receipt of the submission.

The Engineer may suspend the work if the Contractor substitutes unqualified personnel for approved personnel during construction. If work is suspended due to the substitution of unqualified personnel, the Contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustment in contract time resulting from the suspension of work will be allowed.

SECTION 33 - GROUND ANCHORS

33.1 Description - This section covers the contract item Ground Anchors Furnished, Installed, and Tested.

Ground Anchors shall be manufactured by DSI or approved manufacturer, consisting of Class 1 Double Corrosion Protected Anchors in accordance with Post Tensioning Institute (PTI), Soil and Rock Anchors, and the following:

The Contractor shall furnish all labor, materials, tools, supervision, transportation, installation equipment, and incidentals necessary to complete the work specified herein and shown on the drawings. The work shall include but not be limited to drilling, inserting, grouting, stressing, load testing, and lock-off of ground anchors including wedge plate and waler at the appropriate locations.

Unless otherwise directed, the Contractor shall select the drilling method, grouting method, grouting pressures, and, subject to the minimum values in the contract documents, determine the bond length, free-stressing (unbonded) length, and anchor diameter. The Contractor shall be responsible for installing ground anchors that will develop the load-carrying capacity indicated on the drawings in accordance with the testing subsection of these Detailed Specifications.

The anchor tendon and anchorage assembly shall be protected from corrosion as shown on the drawings and in accordance with the requirements of these Detailed Specifications.

33.2 Definitions -

Admixture - Substance added to the grout to either control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.

Alignment Load (AL) - A nominal minimum load applied to an anchor during testing to keep the testing equipment correctly positioned.

Anchor - A system, used to transfer tensile loads to the ground (soil or rock), which includes the prestressing steel, anchorage, corrosion protection, sheathings, spacers, centralizers, and grout.

Anchor Grout - See Primary Grout.

Anchor Head - The means by which the prestressing force is permanently transmitted from the prestressing steel to the bearing plate. The anchor head includes wedges and a wedge plate for strand tendons or an anchor nut for bar tendons.

Anchor Nut - The threaded device that transfers the prestressing force in a bar to a bearing plate.

Anchorage - The combined system of anchor head, bearing plate, trumpet, and corrosion protection that is capable of transmitting the prestressing force from the prestressing steel to the surface of the ground or the supported structure.

Anchorage Cover - A cover to protect the anchorage from corrosion and physical damage.

Apparent Free Tendon Length - The length of tendon which is apparently not bonded to the surrounding grout or ground, as calculated from the elastic load extension data during testing.

Bearing Plate - A steel plate under the anchor head that distributes the prestressing force to the anchored structure.

Bond Length - The length of the tendon that is bonded to the primary grout and capable of transmitting the applied tensile load to the surrounding soil or rock.

Bondbreaker - A sleeve placed over the anchor tendon in the free stressing length to ensure unobstructed elongation of the tendon during stressing.

Centralizer - A device to support and position the tendon in the drill hole so that a minimum grout cover is provided.

Coarse-Grained Soils - Soils with more than 50 percent, by weight, of the material larger than the No. 200 sieve size.

Cohesive Soils - Soils that exhibit plasticity. Atterberg limits are commonly used to determine plasticity and better define a soil as cohesive or non-cohesive.

Consolidation Grout - Portland cement grout that is injected into the hole prior to inserting the tendon to either reduce the permeability of the rock surrounding the hole or improve the ground conditions.

Construction Quality Assurance (CQA) Inspector - The person/firm responsible for construction quality assurance (CQA) testing, monitoring, and other duties related to assuring the quality of construction and adherence to the drawings and Specifications.

Corrosion Inhibiting Compound - Material used to protect against corrosion and/or lubricate the prestressing steel.

Coupler - The means by which the prestressing force can be transmitted from one partial-length of a prestressing tendon to another (mainly for bars).

Creep Movement - The movement that occurs during the creep test of an anchor under a constant load.

Creep Test - A test to determine the movement of the ground anchor at a constant load.

Design Load (DL) - Anticipated final maximum effective load in the anchor after allowance for time-dependent losses or gains. The design load includes appropriate load factors to ensure that the overall structure has adequate capacity for its intended use.

Elastic Movement - The recoverable movement measured during an anchor test.

Encapsulation - A corrugated or deformed tube protecting the prestressing steel against corrosion in the tendon bond length.

Fine-Grained Soils - Soils with at least 50 percent, by weight, of the material smaller than the No. 200 sieve size.

F_{PU} - Specified minimum tensile strength of the tendon as defined in the pertinent ASTM Specification.

Free Stressing (Unbonded) Length - The designed length of the tendon that is not bonded to the surrounding ground or grout during stressing.

Fully Bonded Anchor - Anchor in which the free stressing length without bondbreaker is grouted after stressing and so bonded to the surrounding structure or ground.

Lift-Off - The load (lift-off load) in the tendon which can be checked at any specified time with the use of a hydraulic jack, by lifting the anchor head off the bearing plate.

Lock-Off Load - The prestressing force in an anchor immediately after transferring the load from the jack to the stressing anchorage.

Non-Cohesive Soils - Material that is generally nonplastic.

Permanent Anchor - Any prestressed ground anchor that is intended to remain and function as part of a permanent structure. A permanent anchor has to fulfill its function for an extended period of time and thus requires special design, corrosion protection, and supervision during installation.

Performance Test - Incremental cyclic test loading of a prestressed anchor in which the total movement of the anchor is recorded at each increment.

Primary Grout - Portland cement grout that is injected into the anchor hole prior to or after the installation of the anchor tendon to provide for the force transfer to the surrounding ground along the bond length of the tendon. Primary grout is also known as anchor grout.

Proof Test - Incremental loading of a prestressed anchor recording the total movement of the anchor at each increment.

Pulling Head - Temporary anchoring device behind the hydraulic jack during stressing.

Relaxation - The decrease of stress or load with time while the tendon is held under constant strain.

Residual Movement - The non-elastic (i.e., non-recoverable) movement of an anchor measured during load testing.

Safety Factor - The ratio of the ultimate capacity to the working load used for the design of any component or interface.

Sheath - A smooth or corrugated pipe or tube protecting the prestressing steel in the free stressing length against corrosion.

Shop Drawings - All drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared for or by the Contractor or any subcontractor, manufacturer, supplier or distributor, and which illustrate the equipment, material or any other matter relating to the work.

Spacer - A device to separate elements of a multiple-element tendon to ensure full bond development of each prestressing steel element.

Stressing Anchorage - See Anchorage.

Supplier - Any person/firm who supplies materials or equipment for the work, including that fabricated to a special design, and may also be a Subcontractor.

Tendon - The complete anchor assembly (excluding grout) consisting of prestressing steel, corrosion protection, sheathings, and coating when required, as well as spacers and centralizers.

Test Load (TL) - The maximum load to which the anchor is subjected during testing.

Trumpet - Device to provide corrosion protection in the transition length from the anchorage to the free stressing length.

Unbonded Anchor - Anchor in which the free stressing length remains permanently unbonded.

Working Load - Equivalent term for Design Load.

33.3 Submittals - The Contractor shall prepare and submit to the Engineer, for review and approval, working drawings and a design submission describing the ground anchor system or systems intended for use. The working drawings and design submission shall be submitted within 28 days of the contract award date. The submission shall be prepared and stamped by a registered Professional Engineer in the State of California meeting the qualification requirements described under Section 32 of these Detailed Specifications. The Professional Engineer shall be available at any time during the life of the contract to discuss the design with the District. The working drawings and design submission shall include the following:

33.3.1 Ground Anchor Schedule - A ground anchor schedule giving:

- a. Ground anchor number;

- b. Ground anchor design load;
- c. Ground anchor lock-off load;
- d. Type and size of tendon;
- e. Minimum total anchor length;
- f. Minimum bond length;
- g. Minimum tendon bond length; and
- h. Minimum unbonded length.

33.3.2 Drawing - A drawing of the ground anchor tendon and the corrosion protection system including details for the following:

- a. Spacers and their location;
- b. Centralizers and their location;
- c. Unbonded length corrosion protection system;
- d. Bond length corrosion protection system;
- e. Anchorage and trumpet;
- f. Anchorage corrosion protection system; and
- g. The relationship of the ground anchors to right-of-way, easement limits, and the SARI line.

33.3.3 Stress Testing Methodology - Explicit confirmation or suggested modifications to:

- a. The stressing equipment called for in Sections 33.11 and 33.12; and
- b. The schedule/sequence of stressing shown in Sections 33.13 and 33.14 of these Detailed Specifications.

33.3.4 Certificates of Compliance - Certificates of Compliance for the following materials, if used. The certificate shall state that the material or assemblies to be provided will fully comply with the requirements of the contract.

- a. Prestressing steel, strand or bar;
- b. Portland cement;
- c. Grout admixtures;
- d. Prestressing hardware;
- e. Bearing plates; and
- f. Corrosion protection system.

33.3.5 Working Drawings - The Engineer shall approve or reject the Contractor's working drawings and design submission within thirty (30) working days after receipt of the submission. Approval of the design submittal does not relieve the Contractor of his responsibility for the successful completion of the work.

33.3.6 Mill Test Reports Submittal - The Contractor shall submit to the Engineer for review and approval or rejection, mill test reports for the prestressing steel and the bearing plate steel. The Engineer may require the Contractor to provide samples of any ground anchor material intended for use on the project. The Engineer shall approve or

reject the prestressing steel and bearing plate steel within five (5) working days after receipt of the test reports. The prestressing steel and bearing plates shall not be incorporated in the work without the Engineer's approval.

33.3.7 Calibration Data Submittal - The Contractor shall submit to the Engineer for review and approval or rejection, calibration data for each test jack, load cell, primary pressure gauge and reference pressure gauge to be used. The Engineer shall approve or reject the calibration data within five (5) working days after receipt of the data. Testing cannot commence until the Engineer has approved the jack, load cell, primary pressure gauge and reference pressure gauge calibrations.

33.3.8 Post Installation Report - The Contractor shall submit to the Engineer within twenty (20) calendar days after completion of the ground anchor work a report containing:

- a. Prestressing steel manufacturer's mill test reports for the tendons incorporated in the installation;
- b. Grouting records indicating the cement type, quantity injected and the grout pressures;
- c. Ground anchor test results and graphs; and
- d. As-built drawings showing the location and orientation of each ground anchor, anchor capacity, tendon type, total anchor length, bond length, unbonded length, and tendon bond length as installed and locations of all instruments installed.

33.4 References - Contract drawings, entitled Santa Ana Canyon - Below Prado, Inland Empire Brine Line Protection Project.

Geotechnical Engineering Circular No. 4 "Ground Anchors and Anchored Systems" Publication No. FHWA-IF-99-015, Office of Bridge Technology, Federal Highway Administration, June 1999.

Ground Anchor Inspector's Manual, from "In-Situ Soil Improvement Techniques", American Association of State Highway and Transportation Officials - Associated General Contractors of America - American Road and Transportation Builders Association (AASHTO-AGC-ARTBA), Task Force 27 Report, 1990.

Latest version of American Society for Testing and Materials (ASTM) standards:

1. ASTM A 53 Standard Specification for Steel Pipe
2. ASTM A 500 Standard Specification for Cold-formed Welded and Seamless Steel Structural Tubing in Rounds and Shapes
3. ASTM A 536 Standard Specification for Ductile Iron Castings
4. ASTM A 775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars
5. ASTM A 779 Standard Specification for Steel Strand, Seven Wire, Uncoated, Compacted, Stress-relieved for Prestressed Concrete
6. ASTM A 882 Standard Specification for Epoxy-Coated Seven-Wire

- Steel Strand
7. ASTM A 981 Standard Test Method for Evaluating Bond Strength for 15.2 mm (0.6 in.) Diameter Prestressing Steel Strand, Grade 270, Prestressed Ground Anchors
 8. ASTM C 109 Standard Test Method for Compressive Strength of Hydraulic Mortars (using 2 inch or 50 mm Cube Specimens)
 9. ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete
 10. ASTM D 1248 Standard Specification for Polyethylene Plastic Molding and Materials
 11. ASTM D 1784 Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC)
 12. ASTM D 1785 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Schedule 40, 80 and 120
 13. ASTM D 2241 Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Pipe (SDR Series)
 14. ASTM D 4101 Standard Specification for Propylene Plastic Injection and Materials
 15. ASTM G 57 Standard Method for Field Measurements of Soil Resistivity Wenner Four Electrode Method

Latest version of PTI standards:

- PTI, "Post Tensioning Manual"
- PTI, "Specification for Unbonded Single Strand Tendons"
- PTI, "Recommendations for Prestressed Rock and Soil Anchors"

33.5 Existing Conditions - The Contractor is responsible for contacting a utility location service to verify the location of underground utilities before starting the work.

As directed in Section 6.11 of the Special Provisions, the Contractor shall inspect the condition of the adjoining Brine Line and make records and photographs/video of any evidence of settlement, misalignment or cracking. The Contractor's report of this reconnaissance shall be delivered to the Engineer before work begins.

33.6 Construction Quality Assurance - The Construction Quality Assurance (CQA) Inspector will monitor all aspects of anchored wall construction. The CQA Inspector will perform material conformance testing as required. The Contractor shall be aware of the activities required by the CQA Inspector and shall account for these activities in the construction schedule. The Contractor shall correct all deficiencies and nonconformities identified by the CQA Inspector at no additional cost to the District.

33.7 Materials - The Contractor shall not deliver materials to the site until the Engineer has approved the submittals outlined in Section 33.3 of these Detailed Specifications.

The designated storage location or locations shall be protected by the Contractor from theft, vandalism, passage of vehicles, and other potential sources of damage to materials delivered to the site.

The Contractor shall protect the materials from the elements by appropriate means. Prestressing steel strands and bars shall be stored and handled in accordance with the manufacturer's recommendations and in such a manner that no damage to the component parts occurs. All steel components shall be protected from the elements at all times. Cement and additives for grout shall be stored under cover and protected against moisture.

33.7.1 Admixtures - Admixtures which control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to the approval of the Engineer. Admixtures, if used, shall be compatible with the prestressing steels and mixed in accordance with the manufacturer's recommendations. Expansive admixtures may only be added to the grout used for filling sealed encapsulations, trumpets, and anchorage covers. Accelerators shall not be permitted.

33.7.2 Ground Anchor and Anchor Head Accessories - Anchor head and tendon shall be manufactured by DSI or approved alternate, consisting of Class 1 Double Corrosion Protected Anchors in accordance with PTI recommendations for Soil and Rock (current edition).

The bearing plate shall be fabricated from steel conforming to AASHTO M 183 or M 222 specifications, or equivalent, or may be a ductile iron casting conforming to ASTM A 536.

The trumpet shall be fabricated from a steel pipe or tube or from PVC pipe. Steel pipe or tube shall conform to the requirements of ASTM A 53 for pipe or ASTM A 500 for tubing. Steel trumpets shall have a minimum wall thickness of 3 mm for diameters up to 100 mm and 5 mm for larger diameters. PVC pipe shall conform to ASTM A 1785, Schedule 40 minimum. PVC trumpets shall be positively sealed against the bearing plate and aligned with the tendon to prevent cracking during stressing.

Anchorage covers shall be fabricated from steel or plastic with a minimum thickness of 0.1 inch. The joint between the cover and the bearing plate shall be watertight.

Wedges shall be designed to preclude premature failure of the prestressing steel due to notch or pinching effects under static and dynamic strength requirements of Section 3.1.6 (1), Section 3.1.8 (1), and Section 3.1.8 (2) of the PTI "Post Tensioning Manual". Wedges shall not be reused.

Wedges for epoxy coated strand shall be designed to be capable of biting through the epoxy coating and into the strand. Removal of the epoxy coating from the strand to allow the use of standard wedges shall not be permitted. Anchor nuts and other threadable hardware for epoxy coated bars shall be designed to thread over the epoxy coated bar and still comply with the requirements for carrying capacity.

33.7.3 Bondbreaker - The bondbreaker shall be fabricated from a smooth plastic tube or pipe having the following properties:

- a. Resistant to chemical attack from aggressive environments, grout, or corrosion inhibiting compound;
- b. Resistant to aging by ultra-violet light;
- c. Fabricated from material nondetrimental to the tendon;
- d. Capable of withstanding abrasion, impact, and bending during handling and installation;
- e. Enable the tendon to elongate during testing and stressing; and
- f. Allow the tendon to remain unbonded after lock-off.

33.7.4 Cement Grout - Type I, II, III, or V Portland cement conforming to AASHTO M 85 shall be used for grout. The grout shall be a pumpable neat mixture of cement and water and shall be stable (bleed less than two (2) percent), fluid, and provide a minimum 28-day compressive strength of at least 21 MPa measured in accordance with ASTM C 109 at time of stressing.

33.7.5 Centralizers - Centralizers shall be fabricated from plastic, steel or material, which is nondetrimental to the prestressing steel. Wood shall not be used. The centralizer shall be able to support the tendon in the drill hole and position the tendon so a minimum of 1.0 inch of grout cover is provided and shall permit grout to freely flow around the tendon and up the drill hole.

Centralizers are not required on pressure injected anchors installed in coarse grained soils when the grouting pressure exceeds 150 psi, nor on hollow stem-augered anchors when they are grouted through the auger with grout having a slump of nine inches or less.

33.7.6 Corrosion Inhibiting Compound - The corrosion inhibiting compound placed in either the free length or the trumpet area shall be an organic compound (i.e., grease or wax) with appropriate polar moisture displacing, corrosion inhibiting additives and self-healing properties. The compound shall permanently stay viscous and be chemically stable and nonreactive with the prestressing steel, the sheathing material, and the anchor grout.

33.7.7 Grout Tubes - Grout tubes shall have an adequate inside diameter to enable the grout to be pumped to the bottom of the drill hole. Grout tubes shall be strong enough to withstand a minimum grouting pressure of 150 psi. Postgrout tubes shall be strong enough to withstand postgrouting pressures.

33.7.8 Heat Shrinkable Sleeves - Heat shrinkable sleeves shall be fabricated from a radiation crosslinked polyolefin tube internally coated with an adhesive sealant. Prior to shrinking, the tube shall have a nominal wall thickness of 0.6 mm. The adhesive sealant inside the heat shrinkable tube shall have a nominal thickness of 0.5 mm.

33.7.9 Prestressing Steel - Ground anchor tendons shall be fabricated from single or multiple elements of one of the following prestressing steels:

- a. Steel bars conforming to AASHTO M 275.
- b. Seven-wire, low-relaxation strands conforming to AASHTO M 203.
- c. "Compact" seven-wire, low-relaxation strands conforming to ASTM A 779.
- d. Epoxy coated strand conforming to ASTM A 882.
- e. Epoxy coated reinforcing steel bars conforming to ASTM A 775.

Centralizers shall be provided at maximum intervals of 10 feet with the deepest centralizer located 1 foot from the end of the anchor and the upper centralizer for the bond zone located no more than 5 feet from the top of the tendon bond length. Spacers shall be used to separate the steel strands of strand tendons. Spacers shall be provided at maximum intervals of 10 feet and may be combined with centralizers.

33.7.10 Prestressing Steel Couplers - Prestressing steel bar couplers shall be capable of developing 100 percent of the minimum specified ultimate tensile strength of the prestressing steel bar. Steel strands used for a soil or rock anchor shall be continuous with no splices, unless approved by the Engineer.

33.7.11 Sheath - A sheath shall be used as part of the corrosion protection system for the unbonded length portion of the tendon. The sheath shall be fabricated from one of the following:

- a. A polyethylene tube pulled or pushed over the prestressing steel. The polyethylene shall be Type II, III or IV as defined by ASTM D 1248 (or approved equal). The tubing shall have a minimum wall thickness of 1.5 mm.
- b. A hot-melt extruded polypropylene tube. The polypropylene shall be cell classification B55542-11 as defined by ASTM D 4101 (or approved equal). The tubing shall have a minimum wall thickness of 1.5 mm.
- c. A hot-melt extruded polyethylene tube. The polyethylene shall be high density Type III as defined by ASTM D 1248 (or approved equal). The tubing shall have a minimum wall thickness of 1.5 mm.
- d. Steel tubing conforming to ASTM A 500. The tubing shall have a minimum wall thickness of 5 mm.
- e. Steel pipe conforming to ASTM A 53. The pipe shall have a minimum wall thickness of 5 mm.
- f. Plastic pipe or tube of PVC conforming to ASTM D 1784 Class 13464-B. The pipe or tube shall be Schedule 40 at a minimum.
- g. A corrugated tube conforming to the requirement of the tendon bond length encapsulation (Section 33.7.13).

33.7.12 Spacers - Spacers shall be used to separate elements of a multi-element tendon and shall permit grout to freely flow around the tendon and up the drill hole. Spacers shall be fabricated from plastic, steel or material which is nondetrimental to the

prestressing steel. Wood shall not be used. A combination centralizer-spacer may be used.

33.7.13 Tendon Bond Length Encapsulations - When the drawings require the tendon bond length to be encapsulated to provide additional corrosion protection, the encapsulation shall be fabricated from one of the following:

- a. High density corrugated polyethylene tubing conforming to the requirements of AASHTO M 252 and having a minimum wall thickness of 1.5 mm except pregrouted tendons which may have a minimum wall thickness of 1.0 mm.
- b. Deformed steel tubing or pipes conforming to ASTM A 52 or A 500 with a minimum wall thickness of 5 mm.
- c. Corrugated, polyvinyl chloride tubes manufactured from rigid PVC compounds conforming to ASTM D 1784, Class 13464-B.
- d. Fusion-bonded epoxy conforming to the requirements of AASHTO M 284.

33.7.14 Water - Water for mixing grout shall be potable, clean, and free of injurious quantities of substances known to be harmful to Portland cement or prestressing steel.

33.8 Design Criteria - The tendon shall be sized so the design load does not exceed 60 percent of the specified minimum tensile strength (SMTS) of the prestressing steel. The lock-off load for the tendon shall be chosen based on anticipated time or activity-dependent load changes, but shall not exceed 70 percent of the SMTS of the prestressing steel. The prestressing steel shall be sized so the maximum test load does not exceed 80 percent of the SMTS of the prestressing steel.

The tieback anchorage force shown in the sheet pile wall design table on the drawings is the required horizontal load per lineal foot of steel sheet piling. The maximum tieback anchorage force shall be 200-kips/tieback. The drawings show suggested tieback anchorage and spacing, a minimum tieback angle of inclination and bonded and unbonded tendon lengths. The Contractor/Subcontractor shall determine the angle of inclination, length of bonded and unbonded steel bar or strand, tieback anchor spacing, and steel bar or strand materials specifications. This procedure, along with design calculations and details for steel bar or strand corrosion protection and sheathing and incorporating the "Anchor Head" detail and locking mechanism shown on the plans, shall be signed by an engineer who is licensed as a Civil Engineer in the State of California, and shall be a submittal to the District for approval.

Tiebacks shall maintain a minimum of one foot of clearance from the Brine Line. Due to right of way constraints the maximum horizontal length of the tiebacks shall not exceed 50 feet.

There are four wall designs shown on the drawings. The following table shows the four design details:

	Station 10+60 – Station 14+00	Station 14+00 – Station 22+00	Station 22+00 – Station 31+50	Aliso Station 10+64 – Station 11+80
Total Sheet Pile (ft.)	53	47	41	39
Tieback (ft. - down from top)	11	8	6	3
Tieback Design (K/ft. - wall)	18.0	11.0	11.0	7.0

The Contractor shall be responsible for determining the bond length necessary to develop the design load indicated on the approved working drawings. The minimum bonded length and free stressing length (unbonded length) shall be as shown on the drawings or the approved working drawings.

33.9 Corrosion Protection - Corrosion protection requirements shall be per approved submittals and in accordance with these Detailed Specifications.

33.9.1 Anchor Head Protection - All anchor rod, nut and threads for stressing anchorages shall be provided with a permanent weather cover per the corrosion protection plan shown on the approved working drawings. Stressing anchorages encased in concrete at least 2 inches thick do not require a cover.

The bearing plate and wedge plate assembly shall be protected against corrosion by coating with bitumastic or similar protective materials. Prior to coating, surfaces shall be cleaned and all rust and deleterious matter removed by sand blasting or acid pickling. The selected coating shall be compatible with the materials used for corrosion protection of the anchor head. Unless approved otherwise, the side of the bearing plate against the waler structure and other inaccessible parts shall be treated before installation.

The trumpet shall be sealed to the bearing plate and shall overlap the unbonded length corrosion protection by at least four inches. The trumpet shall be long enough to accommodate movements of the structure and the tendon during testing and stressing. On strand tendons, the trumpet shall be long enough to enable the tendon to make a transition from the diameter of the tendon along the unbonded length to the diameter of the tendon at the wedge plate without damaging the encapsulation.

The trumpet shall be completely filled with grout. Compounds may be placed any time during construction. Compound-filled trumpets shall have a permanent seal between the trumpet and the unbonded length corrosion protection. Grout must be placed after the ground anchor has been tested and stressed to the lock-off load. Trumpets filled with grout shall have either a temporary seal between the trumpet and the unbonded length corrosion protection or the trumpet shall fit tightly over the unbonded length corrosion protection for a minimum of four inches.

33.9.2 Unbonded Length Protection - Corrosion protection of the unbonded length shall be provided by a combination of sheaths, sheath filled with a corrosion inhibiting compound or grout, or a heat shrinkable tube internally coated with a mastic compound, depending on the tendon class. The corrosion inhibiting compound shall completely coat the tendon elements, fill the void between them and the sheath, and fill the interstices between the wires of 7-wire strands. Provisions shall be made to retain the compound within the sheath.

The corrosion protective sheath surrounding the unbonded length of the tendon shall be long enough to extend into the trumpet, but shall not come into contact with the stressing anchorage during testing. Any excessive protection length shall be trimmed off.

For pregrouted encapsulations and all Class I tendons, a separate bondbreaker or common sheath shall be provided for supplemental corrosion protection or to prevent the tendon from bonding to the grout surrounding the unbonded length.

33.9.3 Unbonded Length/Bond Length Transition - The transition between the corrosion protection for the bonded and unbonded lengths shall be designed and fabricated to ensure continuous protection from corrosive attack.

33.9.4 Tendon Bond Length Protection for Grout Protected Tendons (Class II) - Cement grout can be used to protect the tendon bond length in non-aggressive ground when the installation methods ensure that the grout will remain fully around the tendon. The grout shall overlap the sheathing of the unbonded length by at least one inch.

Centralizers or grouting techniques shall ensure a minimum of one-half inch of grout cover over the tendon bond length.

33.9.5 Tendon Bond Length Protection for Encapsulated Tendons (Class I) - A grout-filled, corrugated plastic encapsulation or a grout-filled, deformed steel tube shall be used.

The prestressing steel can be grouted inside the encapsulation prior to inserting the tendon into the drill hole or after the tendon has been placed.

Centralizers or grouting techniques shall ensure a minimum of one-half inch of grout cover over the encapsulation.

33.9.6 Epoxy (Class I) - Fusion-bonded epoxy may be used to provide a layer of protection for the steel tendon in addition to the cement grout.

33.9.7 Coupler Protection - On encapsulated bar tendons (Class I), the coupler and any adjacent exposed bar sections shall be covered with a corrosion-proof compound or wax-impregnated cloth tape. The coupler area shall be covered by a smooth plastic tube complying with the requirements set forth in Section 33.7.11 of these Detailed Specifications, overlapping the adjacent sheathed tendon by at least one inch. The two

joints shall be sealed each by a coated heat shrink sleeve of at least 6-inch length, or approved equal. The corrosion-proof compound shall completely fill the space inside the cover tube.

Corrosion protection details for strand couplers, if specifically permitted by the contract documents, shall be submitted for approval to the Engineer.

33.10 Construction -

33.10.1 Tendon Storage and Handling - Tendons shall be handled and stored in such a manner as to avoid damage or corrosion. Damage to the prestressing steel, the corrosion protection, and/or the epoxy coating as a result of abrasions, cuts, nicks, welds and weld splatter will be cause for rejection by the Engineer. The prestressing steel shall be protected if welding is to be performed in the vicinity. Grounding of welding leads to the prestressing steel is forbidden. Prestressing steel shall be protected from dirt, rust, or deleterious substances. A light coating of rust on the steel is acceptable. If heavy corrosion or pitting is noted, the Engineer shall reject the affected tendons.

The Contractor shall use care in handling and storing the tendons at the site. Prior to inserting a tendon in the drill hole, the Contractor and the CQA Inspector shall examine the tendon for damage to the encapsulation and the sheathing. If, in the opinion of the CQA Inspector, the encapsulation is damaged, the Contractor shall repair the encapsulation in accordance with the tendon supplier's recommendations. If, in the opinion of the CQA Inspector, the smooth sheathing has been damaged, the Contractor shall repair it with ultra-high molecular weight polyethylene tape. The tape should be spiral wound around the tendon to completely seal the damaged area. The pitch of the spiral shall ensure a double thickness at all points.

Banding for fabricated tendons shall be padded to avoid damage to the tendon corrosion protection. Upon delivery, the fabricated anchors or the prestressing steel for fabrication of the tendons onsite and all hardware shall be stored and handled in such a manner to avoid mechanical damage, corrosion, and contamination with dirt or deleterious substances.

Lifting of the pre-grouted tendons shall not cause excessive bending, which can debond the prestressing steel from the surrounding grout.

Pre-stressing steel shall not be exposed to excessive heat (i.e., more than 450° F).

33.10.2 Anchor Fabrication - Anchors shall be either shop or field fabricated from materials conforming the approved working drawings and schedules.

Prestressing steel shall be cut with an abrasive saw or, with the approval of the prestressing steel supplier, an oxyacetylene torch.

All of the tendon bond length, especially for strand, must be free of dirt, manufacturers' lubricants, corrosion-inhibitive coatings, or other deleterious substances that may significantly affect the grout-to-tendon bond or the service life of the tendon.

Pregrouting of encapsulated tendons shall be done on an inclined, rigid frame or bed by injecting the grout from the low end of the tendon.

33.10.3 Drilling - Drilling methods shall be left to the discretion of the Contractor, whenever possible. The Contractor shall be responsible for drilling a stable hole of a sufficient diameter to provide a one-inch annular space between the manufactured anchor and the drilled hole or as specified on the approved working drawings within the tolerances specified. Drilling methods may involve, amongst others, rotary, percussion, rotary/percussive or auger drilling; or percussive or vibratory driven casing.

Holes for anchors shall be drilled at the locations and to the length, inclination and diameter specified on the drawings or the approved working drawings. The drill bit or casing crown shall not be more than 0.1 inch smaller than the specified hole diameter. At the ground surface, the drill hole shall be located within 12 inches of the location shown on the drawings or the approved working drawings. The drill hole shall be located so the longitudinal axis of the drill hole and the longitudinal axis of the tendon are parallel. In particular, the ground anchor hole shall not be drilled in a location that requires the tendon to be bent in order to enable the bearing plate to be connected to the supported structure. At the point of entry, the ground anchor shall be installed within plus/minus three (3) degrees of the inclination from horizontal shown on the drawings or the approved working drawings. At the point of entry the horizontal angle made by the ground anchor and the structure shall be within plus/minus three (3) degrees of a line drawn perpendicular to the plane of the structure unless otherwise shown on the drawings or approved working drawings. The ground anchors shall not extend beyond the right-of-way or easement limits shown on the drawings.

33.10.4 Tendon Insertion - Tendons shall be placed in accordance with the drawings and details and the recommendations of the tendon manufacturer or specialist anchor contractor. The tendon shall be inserted into the drill hole to the desired depth without difficulty. When the tendon cannot be completely inserted, the Contractor shall remove the tendon from the drill hole and clean or redrill the hole to permit insertion. Partially inserted tendons shall not be driven or forced into the hole.

Each anchor tendon shall be inspected by field personnel during installation into the drill hole or casing. Damage to the corrosion protection system shall be repaired, or the tendon replaced if not repairable. Loose spacers or centralizers shall be reconnected to prevent shifting during insertion. Damaged fusion-bonded epoxy coatings shall be repaired in accordance with the manufacturer's recommendations. If the patch is not allowed to cure prior to inserting the tendon in the drill hole, the patched area shall be protected by tape or other suitable means.

The rate of placement of the tendon into the hole shall be controlled such that the sheathing, coating, and grout tubes are not damaged during installation of the tendon.

Anchor tendons shall not be subjected to sharp bends. The bottom end of the tendon may be fitted with a cap or bullnose to aid its insertion into the hole, casing, or sheathing.

33.10.5 Grouting - The Contractor shall use a neat cement grout or a sand-cement grout. The cement shall not contain lumps or other indications of hydration. Admixtures, if used, shall be mixed in accordance with the manufacturer's recommendations.

The grouting equipment shall produce a grout free of lumps and undispersed cement. A positive displacement grout pump shall be used. The pump shall be equipped with a pressure gauge to monitor grout pressures. The pressure gauge shall be capable of measuring pressures of at least 150 psi or twice the actual grout pressures used by the Contractor, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The mixer should be capable of continuously agitating the grout.

The grout shall be injected from the lowest point of the drill hole. The grout may be pumped through grout tubes, casing, hollow-stem-augers, or drill rods. The grout can be placed before or after insertion of the tendon. The quantity of the grout and the grout pressures shall be recorded. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing.

After the tendon is installed, the drill hole may be filled in one continuous grouting operation except that pressure grouting shall not be used in the free length zone. The grout at the top of the drill hole shall not contact the back of the structure or the bottom of the trumpet.

If the ground anchor is installed in a fine-grained soil using drill holes larger than six inches in diameter, then the grout above the top of the bond length shall be placed after the ground anchor has been tested and stressed. The Engineer will allow the Contractor to grout the entire drill hole at the same time if the Contractor can demonstrate that his particular ground anchor system does not derive a significant portion of its load-carrying capacity from the soil above the bond length portion of the ground anchor.

If grout protected tendons are used for ground anchors anchored in rock, then pressure grouting techniques shall be utilized. Pressure grouting requires that the drill hole be sealed and that the grout be injected until a minimum 50 psi grout pressure (measured at the top of the drill hole) can be maintained on the grout for at least five (5) minutes.

The grout tube may remain in the hole on completion of grouting if the tube is filled with grout.

After grouting, the tendon shall not be loaded for a minimum of three (3) days.

33.10.6 Anchorage Installation - The anchor bearing plate and the anchor head or nut shall be installed perpendicular to the tendon, within plus/minus three (3) degrees and

centered on the bearing plate, without bending or kinking of the prestressing steel elements. Wedge holes and wedges shall be free of rust, grout, and dirt.

The stressing tail shall be cleaned and protected from damage until final testing and lock-off. After the anchor has been accepted by the Engineer, the stress tail shall be cut to its final length according to the tendon manufacturer's recommendations.

The corrosion protection surrounding the unbonded length of the tendon shall extend up beyond the bottom seal of the trumpet or four inches into the trumpet if no trumpet seal is provided. If the protection does not extend beyond the seal or sufficiently far enough into the trumpet, the Contractor shall extend the corrosion protection or lengthen the trumpet.

The corrosion protection surrounding the unbonded length of the tendon shall not contact the bearing plate or the anchor head during testing and stressing. If the protection is too long, the Contractor shall trim the corrosion protection to prevent contact.

33.10.7 Welding - All structural welding of steel at the wedge and bearing plate assembly shall be performed by certified welders qualified to perform the type of welding shown on the shop drawings.

33.11 Stressing, Load Testing and Acceptance - Each ground anchor shall be tested. Five percent of all anchors shall be performance tested. The remainder shall be proof tested to 133% of the submitted tieback design force. No load greater than ten (10) percent of the design load can be applied to the ground anchor prior to testing. The maximum test load shall be no less than 1.33 times the design load and shall not exceed 80 percent of the specified minimum ultimate tensile strength (SMTS) of the prestressing steel of the tendon. The test load shall be simultaneously applied to the entire tendon. Stressing of single elements of multi-element tendons shall not be permitted.

33.11.1 Stressing Equipment - The testing equipment shall consist of:

A dial gauge or Vernier scale capable of measuring to the nearest 0.001 inch shall be used to measure the ground anchor movement. The movement-measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and it shall have adequate travel so the ground anchor movement can be measured without resetting the device at an interim point.

A hydraulic jack and pump shall be used to apply the test load. The jack and a calibrated primary pressure gauge shall be used to measure the applied load. The jack and primary pressure gauge shall be calibrated by an independent firm as a unit. The calibration shall have been performed within forty-five (45) working days of the date when the calibration submittals are provided to the Engineer. Testing cannot commence until the Engineer has approved the calibration. The primary pressure gauge shall be graduated in 100 psi increments or less. The ram travel shall be at least six inches and

preferably not be less than the theoretical elongation of the tendon at the maximum test load. If elongations greater than six inches are required, restroking can be allowed.

A calibrated reference pressure gauge shall also be kept at the site to periodically check the production (i.e., primary pressure) gauge. The reference gauge shall be calibrated with the test jack and primary pressure gauge. The reference pressure gauge shall be stored indoors and not subjected to rough treatment.

33.11.2 Stressing Procedures -

The stressing equipment shall be placed over the ground anchor tendon in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

The stressing equipment, the sequence of stressing and the procedure to be used for each stressing operation shall be addressed in the submittals outlined in Section 33.3 of these Detailed Specifications. The equipment shall be used strictly in accordance with the manufacturer's operating instructions.

Stressing equipment shall preferably be capable of stressing the whole tendon in one stroke to the specified test load and the equipment shall be capable of stressing the tendon to the maximum specified test load within 75 percent of the rated capacity. The pump shall be capable of applying each load increment in less than 60 seconds.

The equipment shall permit the tendon to be stressed in increments so that the load in the tendon can be raised or lowered in accordance with the test specifications, and allow the anchor to be lift-off tested to confirm the lock-off load.

Stressing equipment shall be recently calibrated within an accuracy of plus or minus two (2) percent prior to use. The calibration certificate and graph shall be available on site at all times. The calibration shall be traceable to the National Institute of Standards and Technology (NIST).

33.12 Load Testing Setup - Dial gauges shall bear on the pulling head of the jack and their stems shall be coaxial with the tendon direction. The gauges shall be supported on an independent, fixed frame, such as a tripod, which will not move as a result of stressing or other construction activities during the operation.

Prior to setting the dial gauges, the Alignment Load (AL) shall be accurately placed on the tendon. The magnitude of AL depends on the type and length of the tendon.

Regripping of strands, which would cause overlapping wedge bites, or wedge bites on the tendon below the anchor head, shall be avoided.

Stressing and testing of multiple element tendons with single element jacks is not permitted.

Stressing shall not begin before the grout has reached adequate strength.

33.13 Performance Tests - Five (5) percent of the ground anchors shall be performance tested in accordance with the procedures described below. The Engineer shall select the ground anchors to be performance tested. All remaining ground anchors shall be tested in accordance with the proof test procedures (see Section 33.14).

The performance test shall be made by incrementally loading and unloading the ground anchor in accordance with the schedule provided. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement shall be measured and recorded to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. The load shall be monitored with the primary pressure gauge. The reference pressure gauge shall be placed in series with the primary pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the primary pressure gauge differ by more than ten (10) percent, the jack, primary pressure gauge and reference pressure gauge shall be recalibrated at no expense to the District. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

The maximum test load in a performance test shall be held for ten (10) minutes. A load cell shall be used to monitor small changes in load during constant load-hold periods.

STEPS FOR THE PERFORMANCE TEST.

Step	Loading	Applied Load	Record and Plot Total Movement (δ_{ti})	Record and Plot Residual Movement (δ_{ri})	Calculate Elastic Movement (δ_{ei})
1	Apply alignment load (AL)				
2	Cycle 1	0.25DL	δ_{t1}		$\delta_{t1} - \delta_{r1} = \delta_{e1}$
		AL		δ_{r1}	
3	Cycle 2	0.25DL	δ_{t2}		$\delta_{t2} - \delta_{r2} = \delta_{e2}$
		0.50DL	δ_{t2}		
		AL		δ_{r2}	
4	Cycle 3	0.25DL	δ_{t3}		$\delta_{t3} - \delta_{r3} = \delta_{e3}$
		0.50DL	δ_{t3}		
		0.75DL	δ_{t3}		
		AL		δ_{r3}	
5	Cycle 4	0.25DL	δ_{t4}		$\delta_{t4} - \delta_{r4} = \delta_{e4}$
		0.50DL	δ_{t4}		
		0.75DL	δ_{t4}		
		1.00DL	δ_{t4}		
		AL		δ_{r4}	
6	Cycle 5	0.25DL	δ_{t5}		$\delta_{t5} - \delta_{r5} = \delta_{e5}$
		0.50DL	δ_{t5}		
		0.75DL	δ_{t5}		
		1.00DL	δ_{t5}		
		1.2DL	δ_{t5}		
		AL		δ_{r5}	
7	Cycle 6	0.25DL	δ_{t6}		
		0.50DL	δ_{t6}		
		0.75DL	δ_{t6}		
		1.00DL	δ_{t6}		
		1.2DL	δ_{t6}		
		1.33DL	δ_{t6} , zero reading for creep test		
8	Hold load for 10 minutes while recording movement at specified times. If the total movement measured during the load hold exceeds the specified maximum value then the load hold should be extended to a total of 60 minutes.				
9	Cycle 6 cont'd.	AL		δ_{r6}	Cycle 6: $\delta_{t6} - \delta_{r6} = \delta_{e6}$
Notes: AL = Alignment Load, DL = Design Load, δ_i = total movement at a load other than maximum for cycle, i = number identifying a specific load cycle.					

The jack shall be adjusted as necessary in order to maintain a constant load. The load-hold period shall start as soon as the maximum test load is applied and the ground anchor movement, with respect to a fixed reference, shall be measured and recorded at 1, 2, 3, 4, 5, 6 and 10 minutes. If the ground anchor movement between one (1) minute and ten (10) minutes exceeds 0.04 inch, the maximum test load shall be held for an additional 50 minutes. If the load-hold is extended, the ground anchor movement shall be recorded at 15, 20, 30, 40, 50 and 60 minutes.

33.14 Proof Tests - The proof test shall be performed by incrementally loading the ground anchor in accordance with the following schedule. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement shall be measured and recorded to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. The load shall be monitored with the primary pressure gauge. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

PROOF TEST SCHEDULE

Step	Load
1	AL
2	0.25DL
3	0.50DL
4	0.75DL
5	1.00DL
6	1.20DL
7	1.33DL
8	Reduce to lock-off load
9	AL (optional)
10	Adjust to lock-off load

The maximum test load in a proof test shall be held for ten (10) minutes. The jack shall be adjusted as necessary in order to maintain a constant load. The load-hold period shall start as soon as the maximum test load is applied and the ground anchor movement with respect to a fixed reference shall be measured and recorded at 1, 2, 3, 4, 5, 6 and 10 minutes. If the ground anchor movement between one (1) minute and ten (10) minutes exceeds 0.04 inch, the maximum test load shall be held for an additional 50 minutes. If the load-hold is extended, the ground anchor movements shall be recorded at 15, 20, 30, 40, 50 and 60 minutes.

33.15 Ground Anchor Acceptance Criteria - A performance-tested or proof-tested ground anchor with a ten (10) minute load-hold shall be acceptable if the: (1) ground anchor resists the maximum test load with less than 0.04 inch of movement between 1 minute and 10 minutes; and (2) total elastic movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

A performance-tested or proof-tested ground anchor with a 60 minute load-hold shall be acceptable if the: (1) ground anchor resists the maximum test load with a creep rate that does not

exceed 0.08 inch in the last log cycle of time; and (2) total elastic movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

33.16 Procedures for Anchors Failing Acceptance Criteria - Anchors that do not satisfy the minimum apparent free length criteria shall be either rejected and replaced at no additional cost to the District or locked off at not more than 50 percent of the maximum acceptable load attained. In this event, no further acceptance criteria are applied.

In the event that an anchor fails, the Contractor shall modify the design and/or construction procedures. These modifications may include, but are not limited to, installing additional anchors, modifying the installation methods, reducing the anchor design load by increasing the number of anchors, increasing the anchor length, or changing the anchor type. Any modification of design or construction procedures shall be at no change in the contract price. A description of any proposed modifications must be submitted to the Engineer in writing. Proposed modifications shall not be implemented until the Contractor receives written approval from the Engineer.

33.17 Anchor Lock-Off - After testing has been completed, the load in the tendon shall be such that after seating losses (i.e., wedge seating), the specified lock-off load has been applied to the anchor tendon.

The magnitude of the lock-off load shall be as specified in the submitted Ground Anchor Schedule (Section 33.3.1 of these Detailed Specifications), and shall not exceed 70% F_{pu} .

The wedges shall be seated at a minimum load of 50% F_{pu} . If the lock-off load is less than 50% F_{pu} , shims shall be used under the wedge plate and the wedges seated at 50% F_{pu} . The shims shall then be removed to reduce the load in the tendon to the desired lock-off load. Bar tendons may be locked off at any load less than 70% F_{pu} .

33.18 Anchor Lift-Off Test - After transferring the load to the anchorage, and prior to removing the jack, a lift-off test shall be conducted to confirm the magnitude of the load in the anchor tendon. This load is determined by reapplying load to the tendon to lift off the wedge plate (or anchor nut) without unseating the wedges (or turning the anchor nut). This moment represents zero time for any long time monitoring.

33.19 Measurement - The quantity to be paid for the contract item Ground Anchors Furnished, Installed, and Tested will be the number of each specified in the Proposal. No change in the number of ground anchors will be made as a result of any Contractor/Subcontractor alternative design submittal. The contract unit price for Ground Anchors Furnished, Installed, and Tested shall include all labor, materials, tools, equipment, and incidentals required for the complete installation of the tendons, walers and anchor heads. Also included in the unit cost is the compensation for anchorage testing and documentation in the form of the Post-Installation Report described in the submittals Section 33.3.8 of these Detailed Specifications. If the quantity of ground anchors proposed and installed is different than the number of Units specified in the Proposal, payment per Ground Anchors Furnished, Installed, and Tested will be prorated appropriately.

Payment per anchor will be further subdivided on a per unit basis as follows:

1. Seventy-five percent (75%) upon installation of tendon, grout, waler and anchor head; and
2. Twenty-five percent (25%) upon successful testing and acceptance.

33.20 Payment - The contract prices paid for Ground Anchors Furnished, Installed, and Tested shall include full compensation for all costs incurred under this section.

SECTION 34 - SHEET PILING, AZ 28-700

34.1 Description - This section covers the contract item Sheet Piling, AZ 28-700.

34.2 Related Section - Section 33 - Ground Anchors.

34.3 References - Latest version of American Society for Testing and Materials (ASTM) standards:

1. ASTM A 36 Standard Specification for A 36 Carbon Structural Steel
2. ASTM A 328 Standard Specification for A 328 Steel Sheet Piling
3. ASTM A 500 Standard Specification for Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
4. ASTM A 572 Standard Specification for A 572 High-Strength Low-Alloy Columbium-Vanadium Structural Steel
5. ASTM A 615 Standard Specification for A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
6. ASTM A 709 Standard Specification for A 709 Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, Bars and Quenched, and Tempered Alloy Structural Steel Plates for Bridges

34.4 Sheet Piling, AZ 28-700 - The contract item Sheet Piling, AZ 28-700 covers all the materials and installation of the sheet piling as shown on the drawings and in conformance with the requirements, and the following minimum specifications.

Difficult driving conditions are anticipated due to the presence of cobbles and boulders in the alluvial materials overlying bedrock. The Contractor shall refer to the information included in Appendix "C" for his interpretation. The Contractor shall anticipate the presence of cobbles and boulders are very likely to be found along project alignment. The cobbles and boulders must be penetrated in order to achieve design tip elevation into underlying bedrock. The Contractor should be prepared to use all available state of the art "Press-In Method" sheet pile installation technologies, including but not limited to auguring, to penetrate the cobbles and boulders and achieve design tip elevation. Before initiation of sheet pile installation, the Contractor should examine all existing documentation including but not limited to boring logs in and around the project location and past construction documentation. Groundwater is expected to be encountered throughout the project. Caving of soils during pre-drilling operations should be anticipated. The Contractor shall be prepared to deal with caving soils should they be encountered during any drilling operations.

34.5 Materials - Steel sheet piles shall be hot rolled, AZ 28-700 Grade 50 interlocking steel sheet, or approved equivalent, complying with ASTM A 572. The Contractor shall furnish a "Certificate of Compliance" signed by the manufacturer certifying that the sheet piles conform to the requirements of these Detailed Specifications. The Contractor shall not deliver materials to the site until the Engineer has approved the submittals.

All material shall be new and conform to the following specifications:

Shape	AZ 28-700
Required Elastic Section Modulus	51.4 in. ³ /ft.
Required Plastic Section Modulus	59.9 in. ³ /ft.
Required Moment of Inertia per Pile	466.5 in. ⁴ /ft.

Sheet piles shall be furnished in lengths measured from the plan tip elevation shown to the cutoff elevation. Installed sheet piles shall be continuously interlocked throughout the entire length. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than five (5) degrees when interlocked, and maintain continuous interlocking when installed. Splices in steel sheet piles shall not be permitted without prior authorization of the Engineer.

34.6 Construction - The steel sheet piling system shall utilize the "Press-in Method" as installed by the "Silent Piler" provided by the Giken Seisakusho Company, or equal. The piles shall be driven to the tip elevation as shown on the plans, unless otherwise permitted, in writing, by the Engineer. The piling shall be driven true and straight without damage to the piling or to the interlock between the piles.

The pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

Pilings shall be carefully located as directed. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Place the pile so the face will not be more than six inches from horizontal alignment at any point. Top of pile at elevation of cutoff shall be within 1/2 inch horizontally and two inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave.

Redrive all heaved piles to the required tip elevation.

The Contractor shall pull, as directed by the Engineer, selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged, to the extent that its usefulness in the structure is impaired, shall be removed and replaced at the Contractor's expense. Pilings pulled and found to be in satisfactory condition shall be redriven when directed by the Engineer.

The removal of sheet pilings shall consist of pulling, sorting, cleaning the interlocks, inventorying, and storing previously installed sheet pilings as shown and directed.

The method of pulling piling must be approved. Pulling holes shall be provided in pilings as required. Extractors shall be of suitable type and size. Care shall be exercised during pulling of pilings to avoid damaging piling interlocks and adjacent construction. If the Engineer determines that adjacent permanent construction has been damaged during pulling, the Contractor will be required to repair this construction at no cost to the District. Pilings shall be pulled one sheet at a time. Pilings fused together shall be separated prior to pulling unless the Contractor demonstrates, to the satisfaction of the Engineer, that the pilings cannot be separated. The Contractor will not be paid for the removal of pilings damaged beyond structural use due to proper care not being exercised during pulling.

Pulled pilings shall be sorted, cleaned, inventoried and stored by type into groups as:

1. Piling usable without reconditioning.
2. Piling requiring reconditioning.
3. Piling damaged beyond structural use.

34.7 Welding and Splicing - Splicing of sheet piles shall not be permitted, unless approved by the Engineer. All structural welding of steel and steel reinforcement shall be performed by certified welders qualified to perform the type of welding shown on the shop drawings. All sheet piles shall be cutoff to a true plane at the elevations shown on the drawings. All cutoff lengths shall remain the property of the Contractor and shall be properly disposed.

34.8 Measurement - Measurement for payment for the contract item Sheet Piling, AZ 28-700 will be the actual square footage acceptably installed, projected normal to the face of the wall, including embedment as shown on the plans and as directed by the Engineer.

34.9 Payment - The contract price paid for Sheet Piling, AZ 28-700 shall include full compensation for all costs incurred under this section.

SECTION 35 - FIRE PROTECTION REQUIREMENTS

35.1 Description - The contract item Fire Contingency Requirements shall include labor, materials and equipment necessary to ensure that fire hazards are minimized during construction of the project.

35.2 Background and Justification - Chino Hills State Park (CHSP) is in a high fire danger area of southern California that includes portions of San Bernardino, Riverside and Orange Counties and is adjacent to a portion of Los Angeles County. Wildfires that occur in or near the park pose significant threat to life and property. CHSP is near numerous developments, including residential, commercial and industrial, and contains significant segments of important regional utility infrastructure.

The wildfire history of the park and adjacent areas is well documented, indicating that over 98% of wildfires in over 100 years were human caused fires. As of February 2013, there have been only two wildfires at CHSP started by natural causes since the park was dedicated in 1984. Statistics gathered since the early 1940s by various agencies document human caused

wildfires in California have increased significantly as population increases and the amount of urban-wildland interface has increased at a rapid pace. Particularly alarming is the percentage of wildfires caused by various kinds of equipment operation. These include activities such as, but not limited to, using plastic line weed whips, mowing, driving over vegetation with vehicles and heavy equipment, as well as the use of grinding, welding and power cutting tools, including chain saws. Depending on which study or data is cited and which region each covers, the percentage of equipment caused wildfires in California ranges between 20% and 30%. Southern California has the highest percentage of equipment caused wildfires, partially attributable to its long, dry, hot seasonal climate conditions.

Climate change is also contributing to increased wildfires in many areas of the world, including California. Fire season in California is not just limited to late summer and fall. With generally warm, dry conditions and regular prolonged drought periods, CHSP has experienced wildfires every month of the year on a regular basis. Additionally, the increased frequency of wildfires is converting many natural areas to non-native annual grasslands, where fires start more easily and spread faster, especially during southern California's long, dry season. These light fuels contribute to increased fire danger along the urban-wildland interface.

In summary, equipment operation is one of the categories of fire causes that can be managed in ways that can lower the risk of human-caused fire starts. Therefore, actions need to be taken to require prudent methods and practices for all projects using equipment in order to minimize the risk of accidental equipment related fire starts.

35.3 Temporary Suspension of the Work - In accordance with Section 6.05 of the General Provisions, the Engineer shall have the authority to suspend the work wholly or in part due to unsuitable conditions. Equipment operation will not occur during high fire danger warnings or advisories as determined by the National Weather Service and other state, national or local agencies (e.g., High Fire Danger Advisory, High Fire Danger Warning, Red Flag Conditions Advisory, and Red Flag Conditions Warning). CHSP staff shall also have the authority to temporarily suspend the work wholly or in part due to high winds and temperatures and low relative humidity, even if no high fire danger warnings have been issued by other agencies.

35.4 Construction Equipment - All construction equipment shall have approved spark arrestors that comply with all federal, state and local safety requirements.

35.5 Equipment Use Limitations - Vehicles and equipment shall not drive off-road except through approved TCE right of way limits for clearing of access or staging areas. All vehicles must use existing cleared pull-outs for passing other vehicles, even if one vehicle must back into a pull-out. Vehicles shall not drive over natural vegetation, especially dry vegetation that could be ignited by hot vehicle parts. Any clearing of access and/or staging areas shall be performed in accordance with all fire contingency guidelines stated herein. For the purpose of minimizing a fire being sparked from equipment, all mowing activities shall be conducted before 10:00 a.m. unless otherwise authorized by Ryann Gill (951.789.1278). During the use of any equipment that has the potential of throwing sparks, the Engineer or CHSP staff may require the Contractor to wet nearby vegetation during dry or semi-dry conditions.

35.6 Fire Spotter - Except for normal site access by vehicles on well-maintained roads, all equipment operation shall require observation by a separate, appropriately equipped fire spotter(s) that has been trained in the proper use of the equipment determined to best suit the circumstances. The fire spotter(s) shall watch for small sparks or fire starts during all equipment operation and shall immediately extinguish sparks or fire starts. The fire spotter(s) shall be dedicated to fire watch and shall not perform additional work duties. If a spark or fire cannot be extinguished by the fire spotter(s) immediately, evacuation procedures as per the approved Emergency Action Plan shall be implemented and the fire shall be reported immediately by calling 911. All fires, no matter how small, shall be reported to CHSP staff within 24 hours.

35.7 Fire Extinguishing Equipment - In addition to the regulation fire extinguishers located with vehicles, the Contractor shall appropriately equip the fire spotter(s) with water type fire extinguishing equipment (e.g., water hogs or water trucks with hose and pumps and/or water backpack sprayers) that will be used solely for the purpose of preventing and extinguishing fires.

35.8 Construction Personnel - Smoking on the site shall not be permitted by any personnel.

35.9 Emergency Action Plan - The Contractor shall submit an Emergency Action Plan that shall include escape routes, evacuation procedures, Emergency Action Plan implementation procedures, emergency contact information and the name and training qualifications of the fire spotter(s). Prior to construction, safety trainings shall be conducted by the Contractor for all staff in order to review the Emergency Action Plan. If desired, Chino Hills State Park staff member Ryann Gill (951.789.1278) may be contacted to assist with the onsite tailgate training session. Contractor's safety meetings will be conducted regularly to review and communicate project changes and new safety concerns.

35.10 Payment - The contract lump sum price paid for Fire Contingency Requirements shall include full compensation for all direct and indirect costs incurred under this section, and for executing all the work involved in preventing and extinguishing sparks and fires. Payment will be made on a basis of the percentage of the work completed on the entire project.

APPENDIX "A"

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT

RULE 403

(Adopted May 7, 1976) (Amended November 6, 1992)
(Amended July 9, 1993) (Amended February 14, 1997)
(Amended December 11, 1998)(Amended April 2, 2004)
(Amended June 3, 2005)

RULE 403. FUGITIVE DUST

(a) Purpose

The purpose of this Rule is to reduce the amount of particulate matter entrained in the ambient air as a result of anthropogenic (man-made) fugitive dust sources by requiring actions to prevent, reduce or mitigate fugitive dust emissions.

(b) Applicability

The provisions of this Rule shall apply to any activity or man-made condition capable of generating fugitive dust.

(c) Definitions

- (1) ACTIVE OPERATIONS means any source capable of generating fugitive dust, including, but not limited to, earth-moving activities, construction/demolition activities, disturbed surface area, or heavy- and light-duty vehicular movement.
- (2) AGGREGATE-RELATED PLANTS are defined as facilities that produce and / or mix sand and gravel and crushed stone.
- (3) AGRICULTURAL HANDBOOK means the region-specific guidance document that has been approved by the Governing Board or hereafter approved by the Executive Officer and the U.S. EPA. For the South Coast Air Basin, the Board-approved region-specific guidance document is the Rule 403 Agricultural Handbook dated December 1998. For the Coachella Valley, the Board-approved region-specific guidance document is the Rule 403 Coachella Valley Agricultural Handbook dated April 2, 2004.
- (4) ANEMOMETERS are devices used to measure wind speed and direction in accordance with the performance standards, and maintenance and calibration criteria as contained in the most recent Rule 403 Implementation Handbook.
- (5) BEST AVAILABLE CONTROL MEASURES means fugitive dust control actions that are set forth in Table 1 of this Rule.

- (6) BULK MATERIAL is sand, gravel, soil, aggregate material less than two inches in length or diameter, and other organic or inorganic particulate matter.
- (7) CEMENT MANUFACTURING FACILITY is any facility that has a cement kiln at the facility.
- (8) CHEMICAL STABILIZERS are any non-toxic chemical dust suppressant which must not be used if prohibited for use by the Regional Water Quality Control Boards, the California Air Resources Board, the U.S. Environmental Protection Agency (U.S. EPA), or any applicable law, rule or regulation. The chemical stabilizers shall meet any specifications, criteria, or tests required by any federal, state, or local water agency. Unless otherwise indicated, the use of a non-toxic chemical stabilizer shall be of sufficient concentration and application frequency to maintain a stabilized surface.
- (9) COMMERCIAL POULTRY RANCH means any building, structure, enclosure, or premises where more than 100 fowl are kept or maintained for the primary purpose of producing eggs or meat for sale or other distribution.
- (10) CONFINED ANIMAL FACILITY means a source or group of sources of air pollution at an agricultural source for the raising of 3,360 or more fowl or 50 or more animals, including but not limited to, any structure, building, installation, farm, corral, coop, feed storage area, milking parlor, or system for the collection, storage, or distribution of solid and liquid manure; if domesticated animals, including horses, sheep, goats, swine, beef cattle, rabbits, chickens, turkeys, or ducks are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and feeding is by means other than grazing.
- (11) CONSTRUCTION/DEMOLITION ACTIVITIES means any on-site mechanical activities conducted in preparation of, or related to, the building, alteration, rehabilitation, demolition or improvement of property, including, but not limited to the following activities: grading, excavation, loading, crushing, cutting, planing, shaping or ground breaking.
- (12) CONTRACTOR means any person who has a contractual arrangement to conduct an active operation for another person.
- (13) DAIRY FARM is an operation on a property, or set of properties that are contiguous or separated only by a public right-of-way, that raises cows or

produces milk from cows for the purpose of making a profit or for a livelihood. Heifer and calf farms are dairy farms.

- (14) DISTURBED SURFACE AREA means a portion of the earth's surface which has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural soil condition, thereby increasing the potential for emission of fugitive dust. This definition excludes those areas which have:
- (A) been restored to a natural state, such that the vegetative ground cover and soil characteristics are similar to adjacent or nearby natural conditions;
 - (B) been paved or otherwise covered by a permanent structure; or
 - (C) sustained a vegetative ground cover of at least 70 percent of the native cover for a particular area for at least 30 days.
- (15) DUST SUPPRESSANTS are water, hygroscopic materials, or non-toxic chemical stabilizers used as a treatment material to reduce fugitive dust emissions.
- (16) EARTH-MOVING ACTIVITIES means the use of any equipment for any activity where soil is being moved or uncovered, and shall include, but not be limited to the following: grading, earth cutting and filling operations, loading or unloading of dirt or bulk materials, adding to or removing from open storage piles of bulk materials, landfill operations, weed abatement through disking, and soil mulching.
- (17) DUST CONTROL SUPERVISOR means a person with the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule 403 requirements at an active operation.
- (18) FUGITIVE DUST means any solid particulate matter that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of any person.
- (19) HIGH WIND CONDITIONS means that instantaneous wind speeds exceed 25 miles per hour.
- (20) INACTIVE DISTURBED SURFACE AREA means any disturbed surface area upon which active operations have not occurred or are not expected to occur for a period of 20 consecutive days.
- (21) LARGE OPERATIONS means any active operations on property which contains 50 or more acres of disturbed surface area; or any earth-moving operation with a daily earth-moving or throughput volume of 3,850 cubic

- meters (5,000 cubic yards) or more three times during the most recent 365-day period.
- (22) OPEN STORAGE PILE is any accumulation of bulk material, which is not fully enclosed, covered or chemically stabilized, and which attains a height of three feet or more and a total surface area of 150 or more square feet.
- (23) PARTICULATE MATTER means any material, except uncombined water, which exists in a finely divided form as a liquid or solid at standard conditions.
- (24) PAVED ROAD means a public or private improved street, highway, alley, public way, or easement that is covered by typical roadway materials, but excluding access roadways that connect a facility with a public paved roadway and are not open to through traffic. Public paved roads are those open to public access and that are owned by any federal, state, county, municipal or any other governmental or quasi-governmental agencies. Private paved roads are any paved roads not defined as public.
- (25) PM₁₀ means particulate matter with an aerodynamic diameter smaller than or equal to 10 microns as measured by the applicable State and Federal reference test methods.
- (26) PROPERTY LINE means the boundaries of an area in which either a person causing the emission or a person allowing the emission has the legal use or possession of the property. Where such property is divided into one or more sub-tenancies, the property line(s) shall refer to the boundaries dividing the areas of all sub-tenancies.
- (27) RULE 403 IMPLEMENTATION HANDBOOK means a guidance document that has been approved by the Governing Board on April 2, 2004 or hereafter approved by the Executive Officer and the U.S. EPA.
- (28) SERVICE ROADS are paved or unpaved roads that are used by one or more public agencies for inspection or maintenance of infrastructure and which are not typically used for construction-related activity.
- (29) SIMULTANEOUS SAMPLING means the operation of two PM₁₀ samplers in such a manner that one sampler is started within five minutes of the other, and each sampler is operated for a consecutive period which must be not less than 290 minutes and not more than 310 minutes.
- (30) SOUTH COAST AIR BASIN means the non-desert portions of Los Angeles, Riverside, and San Bernardino counties and all of Orange

County as defined in California Code of Regulations, Title 17, Section 60104. The area is bounded on the west by the Pacific Ocean, on the north and east by the San Gabriel, San Bernardino, and San Jacinto Mountains, and on the south by the San Diego county line.

- (31) STABILIZED SURFACE means any previously disturbed surface area or open storage pile which, through the application of dust suppressants, shows visual or other evidence of surface crusting and is resistant to wind-driven fugitive dust and is demonstrated to be stabilized. Stabilization can be demonstrated by one or more of the applicable test methods contained in the Rule 403 Implementation Handbook.
 - (32) TRACK-OUT means any bulk material that adheres to and agglomerates on the exterior surface of motor vehicles, haul trucks, and equipment (including tires) that have been released onto a paved road and can be removed by a vacuum sweeper or a broom sweeper under normal operating conditions.
 - (33) TYPICAL ROADWAY MATERIALS means concrete, asphaltic concrete, recycled asphalt, asphalt, or any other material of equivalent performance as determined by the Executive Officer, and the U.S. EPA.
 - (34) UNPAVED ROADS means any unsealed or unpaved roads, equipment paths, or travel ways that are not covered by typical roadway materials. Public unpaved roads are any unpaved roadway owned by federal, state, county, municipal or other governmental or quasi-governmental agencies. Private unpaved roads are all other unpaved roadways not defined as public.
 - (35) VISIBLE ROADWAY DUST means any sand, soil, dirt, or other solid particulate matter which is visible upon paved road surfaces and which can be removed by a vacuum sweeper or a broom sweeper under normal operating conditions.
 - (36) WIND-DRIVEN FUGITIVE DUST means visible emissions from any disturbed surface area which is generated by wind action alone.
 - (37) WIND GUST is the maximum instantaneous wind speed as measured by an anemometer.
- (d) Requirements
- (1) No person shall cause or allow the emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that:

- (A) the dust remains visible in the atmosphere beyond the property line of the emission source; or
 - (B) the dust emission exceeds 20 percent opacity (as determined by the appropriate test method included in the Rule 403 Implementation Handbook), if the dust emission is the result of movement of a motorized vehicle.
- (2) No person shall conduct active operations without utilizing the applicable best available control measures included in Table 1 of this Rule to minimize fugitive dust emissions from each fugitive dust source type within the active operation.
- (3) No person shall cause or allow PM₁₀ levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples collected on high-volume particulate matter samplers or other U.S. EPA-approved equivalent method for PM₁₀ monitoring. If sampling is conducted, samplers shall be:
- (A) Operated, maintained, and calibrated in accordance with 40 Code of Federal Regulations (CFR), Part 50, Appendix J, or appropriate U.S. EPA-published documents for U.S. EPA-approved equivalent method(s) for PM₁₀.
 - (B) Reasonably placed upwind and downwind of key activity areas and as close to the property line as feasible, such that other sources of fugitive dust between the sampler and the property line are minimized.
- (4) No person shall allow track-out to extend 25 feet or more in cumulative length from the point of origin from an active operation. Notwithstanding the preceding, all track-out from an active operation shall be removed at the conclusion of each workday or evening shift.
- (5) No person shall conduct an active operation with a disturbed surface area of five or more acres, or with a daily import or export of 100 cubic yards or more of bulk material without utilizing at least one of the measures listed in subparagraphs (d)(5)(A) through (d)(5)(E) at each vehicle egress from the site to a paved public road.
- (A) Install a pad consisting of washed gravel (minimum-size: one inch) maintained in a clean condition to a depth of at least six inches and extending at least 30 feet wide and at least 50 feet long.

- (B) Pave the surface extending at least 100 feet and at least 20 feet wide.
 - (C) Utilize a wheel shaker/wheel spreading device consisting of raised dividers (rails, pipe, or grates) at least 24 feet long and 10 feet wide to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.
 - (D) Install and utilize a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.
 - (E) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the actions specified in subparagraphs (d)(5)(A) through (d)(5)(D).
- (6) Beginning January 1, 2006, any person who operates or authorizes the operation of a confined animal facility subject to this Rule shall implement the applicable conservation management practices specified in Table 4 of this Rule.
- (e) Additional Requirements for Large Operations
- (1) Any person who conducts or authorizes the conducting of a large operation subject to this Rule shall implement the applicable actions specified in Table 2 of this Rule at all times and shall implement the applicable actions specified in Table 3 of this Rule when the applicable performance standards can not be met through use of Table 2 actions; and shall:
 - (A) submit a fully executed Large Operation Notification (Form 403 N) to the Executive Officer within 7 days of qualifying as a large operation;
 - (B) include, as part of the notification, the name(s), address(es), and phone number(s) of the person(s) responsible for the submittal, and a description of the operation(s), including a map depicting the location of the site;
 - (C) maintain daily records to document the specific dust control actions taken, maintain such records for a period of not less than three years; and make such records available to the Executive Officer upon request;

- (D) install and maintain project signage with project contact signage that meets the minimum standards of the Rule 403 Implementation Handbook, prior to initiating any earthmoving activities;
 - (E) identify a dust control supervisor that:
 - (i) is employed by or contracted with the property owner or developer;
 - (ii) is on the site or available on-site within 30 minutes during working hours;
 - (iii) has the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule requirements;
 - (iv) has completed the AQMD Fugitive Dust Control Class and has been issued a valid Certificate of Completion for the class; and
 - (F) notify the Executive Officer in writing within 30 days after the site no longer qualifies as a large operation as defined by paragraph (c)(18).
- (2) Any Large Operation Notification submitted to the Executive Officer or AQMD-approved dust control plan shall be valid for a period of one year from the date of written acceptance by the Executive Officer. Any Large Operation Notification accepted pursuant to paragraph (e)(1), excluding those submitted by aggregate-related plants and cement manufacturing facilities must be resubmitted annually by the person who conducts or authorizes the conducting of a large operation, at least 30 days prior to the expiration date, or the submittal shall no longer be valid as of the expiration date. If all fugitive dust sources and corresponding control measures or special circumstances remain identical to those identified in the previously accepted submittal or in an AQMD-approved dust control plan, the resubmittal may be a simple statement of no-change (Form 403NC).
- (f) **Compliance Schedule**
The newly amended provisions of this Rule shall become effective upon adoption. Pursuant to subdivision (e), any existing site that qualifies as a large operation will have 60 days from the date of Rule adoption to comply with the notification and recordkeeping requirements for large operations. Any Large Operation

Notification or AQMD-approved dust control plan which has been accepted prior to the date of adoption of these amendments shall remain in effect and the Large Operation Notification or AQMD-approved dust control plan annual resubmittal date shall be one year from adoption of this Rule amendment.

(g) Exemptions

- (1) The provisions of this Rule shall not apply to:
 - (A) Dairy farms.
 - (B) Confined animal facilities provided that the combined disturbed surface area within one continuous property line is one acre or less.
 - (C) Agricultural vegetative crop operations provided that the combined disturbed surface area within one continuous property line and not separated by a paved public road is 10 acres or less.
 - (D) Agricultural vegetative crop operations within the South Coast Air Basin, whose combined disturbed surface area includes more than 10 acres provided that the person responsible for such operations:
 - (i) voluntarily implements the conservation management practices contained in the Rule 403 Agricultural Handbook;
 - (ii) completes and maintains the self-monitoring form documenting sufficient conservation management practices, as described in the Rule 403 Agricultural Handbook; and
 - (iii) makes the completed self-monitoring form available to the Executive Officer upon request.
 - (E) Agricultural vegetative crop operations outside the South Coast Air Basin whose combined disturbed surface area includes more than 10 acres provided that the person responsible for such operations:
 - (i) voluntarily implements the conservation management practices contained in the Rule 403 Coachella Valley Agricultural Handbook; and
 - (ii) completes and maintains the self-monitoring form documenting sufficient conservation management practices, as described in the Rule 403 Coachella Valley Agricultural Handbook; and
 - (iii) makes the completed self-monitoring form available to the Executive Officer upon request.

- (F) Active operations conducted during emergency life-threatening situations, or in conjunction with any officially declared disaster or state of emergency.
 - (G) Active operations conducted by essential service utilities to provide electricity, natural gas, telephone, water and sewer during periods of service outages and emergency disruptions.
 - (H) Any contractor subsequent to the time the contract ends, provided that such contractor implemented the required control measures during the contractual period.
 - (I) Any grading contractor, for a phase of active operations, subsequent to the contractual completion of that phase of earth-moving activities, provided that the required control measures have been implemented during the entire phase of earth-moving activities, through and including five days after the final grading inspection.
 - (J) Weed abatement operations ordered by a county agricultural commissioner or any state, county, or municipal fire department, provided that:
 - (i) mowing, cutting or other similar process is used which maintains weed stubble at least three inches above the soil; and
 - (ii) any discing or similar operation which cuts into and disturbs the soil, where watering is used prior to initiation of these activities, and a determination is made by the agency issuing the weed abatement order that, due to fire hazard conditions, rocks, or other physical obstructions, it is not practical to meet the conditions specified in clause (g)(1)(H)(i). The provisions this clause shall not exempt the owner of any property from stabilizing, in accordance with paragraph (d)(2), disturbed surface areas which have been created as a result of the weed abatement actions.
 - (K) sandblasting operations.
- (2) The provisions of paragraphs (d)(1) and (d)(3) shall not apply:
- (A) When wind gusts exceed 25 miles per hour, provided that:

- (i) The required Table 3 contingency measures in this Rule are implemented for each applicable fugitive dust source type, and;
 - (ii) records are maintained in accordance with subparagraph (e)(1)(C).
 - (B) To unpaved roads, provided such roads:
 - (i) are used solely for the maintenance of wind-generating equipment; or
 - (ii) are unpaved public alleys as defined in Rule 1186; or
 - (iii) are service roads that meet all of the following criteria:
 - (a) are less than 50 feet in width at all points along the road;
 - (b) are within 25 feet of the property line; and
 - (c) have a traffic volume less than 20 vehicle-trips per day.
 - (C) To any active operation, open storage pile, or disturbed surface area for which necessary fugitive dust preventive or mitigative actions are in conflict with the federal Endangered Species Act, as determined in writing by the State or federal agency responsible for making such determinations.
- (3) The provisions of (d)(2) shall not apply to any aggregate-related plant or cement manufacturing facility that implements the applicable actions specified in Table 2 of this Rule at all times and shall implement the applicable actions specified in Table 3 of this Rule when the applicable performance standards of paragraphs (d)(1) and (d)(3) can not be met through use of Table 2 actions.
 - (4) The provisions of paragraphs (d)(1), (d)(2), and (d)(3) shall not apply to:
 - (A) Blasting operations which have been permitted by the California Division of Industrial Safety; and
 - (B) Motion picture, television, and video production activities when dust emissions are required for visual effects. In order to obtain this exemption, the Executive Officer must receive notification in writing at least 72 hours in advance of any such activity and no nuisance results from such activity.
 - (5) The provisions of paragraph (d)(3) shall not apply if the dust control actions, as specified in Table 2, are implemented on a routine basis for

each applicable fugitive dust source type. To qualify for this exemption, a person must maintain records in accordance with subparagraph (e)(1)(C).

- (6) The provisions of paragraph (d)(4) shall not apply to earth coverings of public paved roadways where such coverings are approved by a local government agency for the protection of the roadway, and where such coverings are used as roadway crossings for haul vehicles provided that such roadway is closed to through traffic and visible roadway dust is removed within one day following the cessation of activities.
- (7) The provisions of subdivision (e) shall not apply to:
 - (A) officially-designated public parks and recreational areas, including national parks, national monuments, national forests, state parks, state recreational areas, and county regional parks.
 - (B) any large operation which is required to submit a dust control plan to any city or county government which has adopted a District-approved dust control ordinance.
 - (C) any large operation subject to Rule 1158, which has an approved dust control plan pursuant to Rule 1158, provided that all sources of fugitive dust are included in the Rule 1158 plan.
- (8) The provisions of subparagraph (e)(1)(A) through (e)(1)(C) shall not apply to any large operation with an AQMD-approved fugitive dust control plan provided that there is no change to the sources and controls as identified in the AQMD-approved fugitive dust control plan.

(h) Fees

Any person conducting active operations for which the Executive Officer conducts upwind/downwind monitoring for PM₁₀ pursuant to paragraph (d)(3) shall be assessed applicable Ambient Air Analysis Fees pursuant to Rule 304.1. Applicable fees shall be waived for any facility which is exempted from paragraph (d)(3) or meets the requirements of paragraph (d)(3).

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Backfilling	01-1 Stabilize backfill material when not actively handling; and 01-2 Stabilize backfill material during handling; and 01-3 Stabilize soil at completion of activity.	<ul style="list-style-type: none"> ✓ Mix backfill soil with water prior to moving ✓ Dedicate water truck or high capacity hose to backfilling equipment ✓ Empty loader bucket slowly so that no dust plumes are generated ✓ Minimize drop height from loader bucket
Clearing and grubbing	02-1 Maintain stability of soil through pre-watering of site prior to clearing and grubbing; and 02-2 Stabilize soil during clearing and grubbing activities; and 02-3 Stabilize soil immediately after clearing and grubbing activities.	<ul style="list-style-type: none"> ✓ Maintain live perennial vegetation where possible ✓ Apply water in sufficient quantity to prevent generation of dust plumes
Clearing forms	03-1 Use water spray to clear forms; or 03-2 Use sweeping and water spray to clear forms; or 03-3 Use vacuum system to clear forms.	<ul style="list-style-type: none"> ✓ Use of high pressure air to clear forms may cause exceedance of Rule requirements
Crushing	04-1 Stabilize surface soils prior to operation of support equipment; and 04-2 Stabilize material after crushing.	<ul style="list-style-type: none"> ✓ Follow permit conditions for crushing equipment ✓ Pre-water material prior to loading into crusher ✓ Monitor crusher emissions opacity ✓ Apply water to crushed material to prevent dust plumes

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Cut and fill	05-1 Pre-water soils prior to cut and fill activities; and 05-2 Stabilize soil during and after cut and fill activities.	✓ For large sites, pre-water with sprinklers or water trucks and allow time for penetration ✓ Use water trucks/pulls to water soils to depth of cut prior to subsequent cuts
Demolition – mechanical/manual	06-1 Stabilize wind erodible surfaces to reduce dust; and 06-2 Stabilize surface soil where support equipment and vehicles will operate; and 06-3 Stabilize loose soil and demolition debris; and 06-4 Comply with AQMD Rule 1403.	✓ Apply water in sufficient quantities to prevent the generation of visible dust plumes
Disturbed soil	07-1 Stabilize disturbed soil throughout the construction site; and 07-2 Stabilize disturbed soil between structures	✓ Limit vehicular traffic and disturbances on soils where possible ✓ If interior block walls are planned, install as early as possible ✓ Apply water or a stabilizing agent in sufficient quantities to prevent the generation of visible dust plumes
Earth-moving activities	08-1 Pre-apply water to depth of proposed cuts; and 08-2 Re-apply water as necessary to maintain soils in a damp condition and to ensure that visible emissions do not exceed 100 feet in any direction; and 08-3 Stabilize soils once earth-moving activities are complete.	✓ Grade each project phase separately, timed to coincide with construction phase ✓ Upwind fencing can prevent material movement on site ✓ Apply water or a stabilizing agent in sufficient quantities to prevent the generation of visible dust plumes

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Importing/exporting of bulk materials	09-1 Stabilize material while loading to reduce fugitive dust emissions; and 09-2 Maintain at least six inches of freeboard on haul vehicles; and 09-3 Stabilize material while transporting to reduce fugitive dust emissions; and 09-4 Stabilize material while unloading to reduce fugitive dust emissions; and 09-5 Comply with Vehicle Code Section 23114.	<ul style="list-style-type: none"> ✓ Use tarps or other suitable enclosures on haul trucks ✓ Check belly-dump truck seals regularly and remove any trapped rocks to prevent spillage ✓ Comply with track-out prevention/mitigation requirements ✓ Provide water while loading and unloading to reduce visible dust plumes
Landscaping	10-1 Stabilize soils, materials, slopes	<ul style="list-style-type: none"> ✓ Apply water to materials to stabilize ✓ Maintain materials in a crusted condition ✓ Maintain effective cover over materials ✓ Stabilize sloping surfaces using soil binders until vegetation or ground cover can effectively stabilize the slopes ✓ Hydroseed prior to rain season
Road shoulder maintenance	11-1 Apply water to unpaved shoulders prior to clearing; and 11-2 Apply chemical dust suppressants and/or washed gravel to maintain a stabilized surface after completing road shoulder maintenance.	<ul style="list-style-type: none"> ✓ Installation of curbing and/or paving of road shoulders can reduce recurring maintenance costs ✓ Use of chemical dust suppressants can inhibit vegetation growth and reduce future road shoulder maintenance costs

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Screening	12-1 Pre-water material prior to screening; and 12-2 Limit fugitive dust emissions to opacity and plume length standards; and 12-3 Stabilize material immediately after screening.	<ul style="list-style-type: none"> ✓ Dedicate water truck or high capacity hose to screening operation ✓ Drop material through the screen slowly and minimize drop height ✓ Install wind barrier with a porosity of no more than 50% upwind of screen to the height of the drop point
Staging areas	13-1 Stabilize staging areas during use; and 13-2 Stabilize staging area soils at project completion.	<ul style="list-style-type: none"> ✓ Limit size of staging area ✓ Limit vehicle speeds to 15 miles per hour ✓ Limit number and size of staging area entrances/exists
Stockpiles/ Bulk Material Handling	14-1 Stabilize stockpiled materials. 14-2 Stockpiles within 100 yards of off-site occupied buildings must not be greater than eight feet in height; or must have a road bladed to the top to allow water truck access or must have an operational water irrigation system that is capable of complete stockpile coverage.	<ul style="list-style-type: none"> ✓ Add or remove material from the downwind portion of the storage pile ✓ Maintain storage piles to avoid steep sides or faces

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Traffic areas for construction activities	15-1 Stabilize all off-road traffic and parking areas; and 15-2 Stabilize all haul routes; and 15-3 Direct construction traffic over established haul routes.	✓ Apply gravel/paving to all haul routes as soon as possible to all future roadway areas ✓ Barriers can be used to ensure vehicles are only used on established parking areas/haul routes
Trenching	16-1 Stabilize surface soils where trencher or excavator and support equipment will operate; and 16-2 Stabilize soils at the completion of trenching activities.	✓ Pre-watering of soils prior to trenching is an effective preventive measure. For deep trenching activities, pre-trench to 18 inches soak soils via the pre-trench and resuming trenching ✓ Washing mud and soils from equipment at the conclusion of trenching activities can prevent crusting and drying of soil on equipment
Truck loading	17-1 Pre-water material prior to loading; and 17-2 Ensure that freeboard exceeds six inches (CVC 23114)	✓ Empty loader bucket such that no visible dust plumes are created ✓ Ensure that the loader bucket is close to the truck to minimize drop height while loading
Turf Overseeding	18-1 Apply sufficient water immediately prior to conducting turf vacuuming activities to meet opacity and plume length standards; and 18-2 Cover haul vehicles prior to exiting the site.	✓ Haul waste material immediately off-site

TABLE 1
BEST AVAILABLE CONTROL MEASURES
(Applicable to All Construction Activity Sources)

Source Category	Control Measure	Guidance
Unpaved roads/parking lots	19-1 Stabilize soils to meet the applicable performance standards; and 19-2 Limit vehicular travel to established unpaved roads (haul routes) and unpaved parking lots.	✓ Restricting vehicular access to established unpaved travel paths and parking lots can reduce stabilization requirements
Vacant land	20-1 In instances where vacant lots are 0.10 acre or larger and have a cumulative area of 500 square feet or more that are driven over and/or used by motor vehicles and/or off-road vehicles, prevent motor vehicle and/or off-road vehicle trespassing, parking and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures.	

Table 2
DUST CONTROL MEASURES FOR LARGE OPERATIONS

FUGITIVE DUST SOURCE CATEGORY	CONTROL ACTIONS
Earth-moving (except construction cutting and filling areas, and mining operations)	<p>(1a) Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations each subsequent four-hour period of active operations; OR</p> <p>(1a-1) For any earth-moving which is more than 100 feet from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 feet in length in any direction.</p>
Earth-moving: Construction fill areas:	<p>(1b) Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. For areas which have an optimum moisture content for compaction of less than 12 percent, as determined by ASTM Method 1557 or other equivalent method approved by the Executive Officer and the California Air Resources Board and the U.S. EPA, complete the compaction process as expeditiously as possible after achieving at least 70 percent of the optimum soil moisture content. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations during each subsequent four-hour period of active operations.</p>

Table 2 (Continued)

FUGITIVE DUST SOURCE CATEGORY	CONTROL ACTIONS
Earth-moving: Construction cut areas and mining operations:	(1c) Conduct watering as necessary to prevent visible emissions from extending more than 100 feet beyond the active cut or mining area unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.
Disturbed surface areas (except completed grading areas)	(2a/b) Apply dust suppression in sufficient quantity and frequency to maintain a stabilized surface. Any areas which cannot be stabilized, as evidenced by wind driven fugitive dust must have an application of water at least twice per day to at least 80 percent of the unstabilized area.
Disturbed surface areas: Completed grading areas	(2c) Apply chemical stabilizers within five working days of grading completion; OR (2d) Take actions (3a) or (3c) specified for inactive disturbed surface areas.
Inactive disturbed surface areas	(3a) Apply water to at least 80 percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible to watering vehicles due to excessive slope or other safety conditions; OR (3b) Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR (3c) Establish a vegetative ground cover within 21 days after active operations have ceased. Ground cover must be of sufficient density to expose less than 30 percent of unstabilized ground within 90 days of planting, and at all times thereafter; OR (3d) Utilize any combination of control actions (3a), (3b), and (3c) such that, in total, these actions apply to all inactive disturbed surface areas.

Table 2 (Continued)

FUGITIVE DUST SOURCE CATEGORY	CONTROL ACTIONS
Unpaved Roads	<p>(4a) Water all roads used for any vehicular traffic at least once per every two hours of active operations [3 times per normal 8 hour work day]; OR</p> <p>(4b) Water all roads used for any vehicular traffic once daily and restrict vehicle speeds to 15 miles per hour; OR</p> <p>(4c) Apply a chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface.</p>
Open storage piles	<p>(5a) Apply chemical stabilizers; OR</p> <p>(5b) Apply water to at least 80 percent of the surface area of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust; OR</p> <p>(5c) Install temporary coverings; OR</p> <p>(5d) Install a three-sided enclosure with walls with no more than 50 percent porosity which extend, at a minimum, to the top of the pile. This option may only be used at aggregate-related plants or at cement manufacturing facilities.</p>
All Categories	<p>(6a) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 2 may be used.</p>

TABLE 3
CONTINGENCY CONTROL MEASURES FOR LARGE OPERATIONS

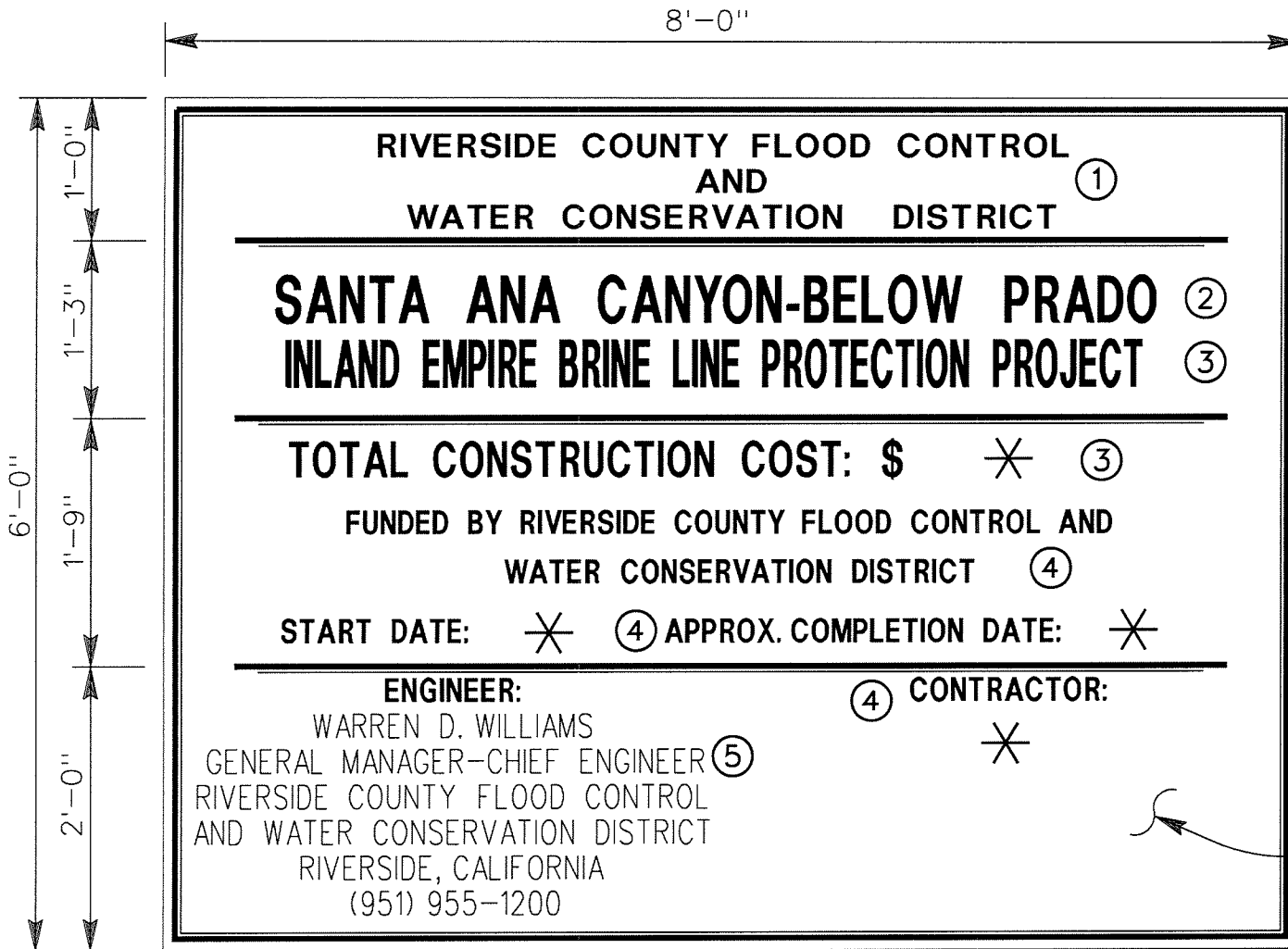
FUGITIVE DUST SOURCE CATEGORY	CONTROL MEASURES
Earth-moving	(1A) Cease all active operations; OR (2A) Apply water to soil not more than 15 minutes prior to moving such soil.
Disturbed surface areas	(0B) On the last day of active operations prior to a weekend, holiday, or any other period when active operations will not occur for not more than four consecutive days: apply water with a mixture of chemical stabilizer diluted to not less than 1/20 of the concentration required to maintain a stabilized surface for a period of six months; OR (1B) Apply chemical stabilizers prior to wind event; OR (2B) Apply water to all unstabilized disturbed areas 3 times per day. If there is any evidence of wind driven fugitive dust, watering frequency is increased to a minimum of four times per day; OR (3B) Take the actions specified in Table 2, Item (3c); OR (4B) Utilize any combination of control actions (1B), (2B), and (3B) such that, in total, these actions apply to all disturbed surface areas.
Unpaved roads	(1C) Apply chemical stabilizers prior to wind event; OR (2C) Apply water twice per hour during active operation; OR (3C) Stop all vehicular traffic.
Open storage piles	(1D) Apply water twice per hour; OR (2D) Install temporary coverings.
Paved road track-out	(1E) Cover all haul vehicles; OR (2E) Comply with the vehicle freeboard requirements of Section 23114 of the California Vehicle Code for both public and private roads.
All Categories	(1F) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 3 may be used.

Table 4
(Conservation Management Practices for Confined Animal Facilities)

SOURCE CATEGORY	CONSERVATION MANAGEMENT PRACTICES
Manure Handling (Only applicable to Commercial Poultry Ranches)	(1a) Cover manure prior to removing material off-site; AND (1b) Spread the manure before 11:00 AM and when wind conditions are less than 25 miles per hour; AND (1c) Utilize coning and drying manure management by removing manure at laying hen houses at least twice per year and maintain a base of no less than 6 inches of dry manure after clean out; or in lieu of complying with conservation management practice (1c), comply with conservation management practice (1d). (1d) Utilize frequent manure removal by removing the manure from laying hen houses at least every seven days and immediately thin bed dry the material.
Feedstock Handling	(2a) Utilize a sock or boot on the feed truck auger when filling feed storage bins.
Disturbed Surfaces	(3a) Maintain at least 70 percent vegetative cover on vacant portions of the facility; OR (3b) Utilize conservation tillage practices to manage the amount, orientation and distribution of crop and other plant residues on the soil surface year-round, while growing crops (if applicable) in narrow slots or tilled strips; OR (3c) Apply dust suppressants in sufficient concentrations and frequencies to maintain a stabilized surface.
Unpaved Roads	(4a) Restrict access to private unpaved roads either through signage or physical access restrictions and control vehicular speeds to no more than 15 miles per hour through worker notifications, signage, or any other necessary means; OR (4b) Cover frequently traveled unpaved roads with low silt content material (i.e., asphalt, concrete, recycled road base, or gravel to a minimum depth of four inches); OR (4c) Treat unpaved roads with water, mulch, chemical dust suppressants or other cover to maintain a stabilized surface.
Equipment Parking Areas	(5a) Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR (5b) Apply material with low silt content (i.e., asphalt, concrete, recycled road base, or gravel to a depth of four inches).

APPENDIX "B"

PROJECT SIGNS



RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ①

SANTA ANA CANYON-BELOW PRADO ②
 INLAND EMPIRE BRINE LINE PROTECTION PROJECT ③

TOTAL CONSTRUCTION COST: \$ * ③

FUNDED BY RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ④

START DATE: * ④ APPROX. COMPLETION DATE: *

ENGINEER: WARREN D. WILLIAMS
 GENERAL MANAGER-CHIEF ENGINEER ⑤
 RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
 RIVERSIDE, CALIFORNIA
 (951) 955-1200

CONTRACTOR: * ④

LETTER SCHEDULE

	<u>SIZE</u>	<u>COLOR</u>
①	2"	BLACK
②	4"	ROYAL
③	3"	ROYAL
④	2"	ROYAL
⑤	2"	BLACK

3/4" CDX GRADE PLYWOOD



6x6 POSTS SHALL BE BURIED 3' MINIMUM WITH 5' FROM GROUND TO BOTTOM OF SIGN

NOTES:

1. MINIMUM SPACING BETWEEN LINES 1".
2. * -INFO. FURNISHED BY ENGINEER
3. ALL LETTERS FILLED AND CENTERED
4. THE STRIPES ARE GOLD AND BLACK ON WHITE BACKGROUND.

APPENDIX "B" PROJECT SIGN

APPENDIX "C"

GEO TECHNICAL REPORT

NOTICE: The geotechnical report is included herein for informational purposes only. This report was not prepared for purposes of bid development. It was produced to assist the design engineer regarding overall project feasibility and to make recommendations regarding some design parameters. Contractors are encouraged to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer.



**GEOTECHNICAL INVESTIGATION
PROPOSED SAWPA BRINE LINE
SHEET PILE PROTECTION
SANTA ANA RIVER
RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
PREPARED FOR
ALBERT A. WEBB ASSOCIATES
JOB NO. 13025-3**



CHJ Consultants

1355 E. Cooley Drive, Suite C, Colton, CA 92324 ♦ Phone (909) 824-7311 ♦ Fax (909) 503-1136
15345 Anacapa Road, Suite D, Victorville, CA 92392 ♦ Phone (760) 243-0506 ♦ Fax (760) 243-1225
77-564A Country Club Drive, Suite 122, Palm Desert, CA 92211 ♦ Phone (760) 772-8234 ♦ Fax (909) 503-1136

November 21, 2013

Albert A. Webb Associates
3788 McCray Street
Riverside, California 92506
Attention: Mr. Joseph Caldwell

Job No. 13025-3

Dear Mr. Caldwell:

Attached herewith is the Geotechnical Investigation report prepared for the proposed SAWPA Brine Line Sheet Pile Protection project, Santa Ana River, in Riverside County, California.

This report was based upon a scope of services generally outlined in our proposal, dated March 29, 2013, and other written and verbal communications.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact this firm at your convenience.

Respectfully submitted,

CHJ CONSULTANTS

Fred Yi, Ph.D., G.E.
Chief Engineer

FY:lb



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GEOTECHNICAL INVESTIGATION
PROPOSED SAWPA BRINE LINE
SHEET PILE PROTECTION
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INTRODUCTION

During November of 2013, a geotechnical investigation was prepared by this firm for the proposed SAWPA Brine Line Sheet Pile Protection project, Santa Ana River, in Riverside County, California. The purposes of this investigation were to explore and evaluate the geotechnical engineering conditions at the Aliso Creek Crossing (western reach, hereafter) and to explore and confirm the geotechnical engineering conditions below a depth of 40 feet along the Alternative RC3 area (eastern reach, hereafter) for design and construction of proposed sheet piles.

To orient our investigation, a set of 95 percent submittal plans, various scales, dated May 17, 2013, prepared by Albert A. Webb Associates, and a Memorandum of Record by Jeff Devine of USACE, dated August 12, 2008, were furnished for our use. The Memorandum includes boring logs from a previous investigation. Google Earth aerial imagery was also utilized. The approximate location of the project alignment is shown on the attached Index Map (Appendix "A").

The results of our investigation, and our conclusions and recommendations, are presented in this report.

SCOPE OF SERVICES

The scope of services provided during this geotechnical investigation included the following:

- Review of published and unpublished geologic literature and maps pertaining to the project alignment
- Field reconnaissance of the alignment and surrounding area



- Marking of exploration locations, notification of underground service alert and coordination with Riverside County Flood Control District personnel
- Drilling, logging and sampling of six exploratory borings within the sheet pile alignment
- Evaluation of groundwater levels along the alignment
- Confirmation of soil conditions along the alignment especially below a depth of 40 feet
- Evaluation of earth pressures

PROJECT CONSIDERATIONS

We understand that the project includes installation of sheet pile walls along two reaches of the Santa Ana River for protection of an existing approximately 60-inch-diameter brine line pipe. The 95 percent submittal plans indicate that planned sheet pile depths vary from 40 feet to 52 feet along the eastern reach and 36 feet at the western reach area. Explorations were previously completed to depths of 40 to 41-1/2 feet in the eastern reach area during a prior study by others. No prior explorations are available for the western reach. The proposed sheet pile wall alignments are generally within unpaved, graded roadways along the existing brine line alignment. Based on the conditions documented in the available Memorandum and prior boring logs, gravelly layers or zones were encountered in the subsurface that required additional exploration regarding advancement of sheet piles using conventional methods. This investigation focused on depths and thicknesses of gravelly zones, as well as other pertinent geotechnical conditions.

SITE DESCRIPTION

The project consists of two separate alignment areas located adjacent to or near the Santa Ana River north of Green River Golf Course and west of State Route 71 in Riverside County, California. The project includes a western reach at Aliso Creek Wash (120 feet) and an eastern reach (2,090 feet) along an unpaved road (former BNSF railroad grade). At the time of our investigation the project



areas were generally undeveloped and covered with annual grasses and weeds. The eastern reach is relatively flat and planar. Buried utilities were indicated along the north side of the eastern reach. The western reach is situated at a road cut formed at a road crossing of Aliso Creek. Evidence of a buried sewer (brine) line was observed along the north side of the western reach. The Green River Golf Course is located south and east of the alignment areas.

No other surface features pertinent to this investigation were noted.

FIELD INVESTIGATION

The soil conditions underlying selected areas of the project were explored by means of six exploratory borings, four within the eastern reach and two within the western reach, drilled to a maximum depth of 53-1/2 feet below the existing ground surface (bgs) with a truck-mounted CME 75 drill rig equipped for soil sampling. The approximate locations of our exploratory borings are indicated on the attached Site Plan (Enclosure "A-2").

Continuous logs of the subsurface conditions, as encountered within the exploratory borings, were recorded at the time of drilling by a staff geologist from this firm. Both a standard penetration test (SPT) sampler (2-inch outer diameter and 1-3/8-inch inner diameter) and a modified California sampler (3-1/4-inch outer diameter and 2-3/8-inch inner diameter) were utilized in our investigation. Relatively undisturbed samples were obtained by driving the modified California sampler (a split-spoon ring sampler) ahead of the borings at selected levels. The penetration resistance was recorded on the boring logs as the number of hammer blows used to advance the sampler in 6-inch increments (or less if noted). Samplers are driven with an automatic hammer that drops a 140-pound weight 30 inches for each blow. After the required seating, samplers are advanced up to 18 inches, providing up to three sets of blowcounts at each sampling interval. The recorded blows are raw numbers without any corrections, such as hammer type (automatic vs. manual cathead) or sampler size (California sampler vs. standard penetration test sampler). Relatively undisturbed as well as bulk



samples of typical soil types obtained were returned to the laboratory in sealed containers for testing and evaluation.

Our exploratory boring logs, including recorded blowcounts per 6-inch increment, are presented in Appendix "B". The stratification lines presented on the boring logs represent approximate boundaries between soil types, which may include gradual transitions.

LABORATORY INVESTIGATION

Included in our laboratory testing program were moisture content tests (ASTM D2216) on all samples returned to the laboratory and dry density tests on all recovered ring samples. The results are included on the boring logs. Direct shear tests (ASTM D3080) were performed on selected relatively undisturbed samples in order to provide shear strength parameters. Sieve analyses (ASTM D422) were conducted on representative samples for classification purposes.

Selected samples of alignment soils were delivered to our corrosion consultant, HDR|Schiff, for corrosion analyses.

The laboratory test results are presented in Appendix "C".

SITE GEOLOGY AND SUBSURFACE SOIL CONDITIONS

The project is located where the Santa Ana River enters the Santa Ana Canyon near the junction of the Chino Hills, Santa Ana Mountains and Chino Plain. Bedrock units in the nearby hills consist of Tertiary-age marine and non-marine sedimentary units. The Santa Ana River floodplain includes locally and regionally derived sediments.

The project area is underlain by young axial-channel and alluvial-fan deposits (Morton and Miller, 2006). Sandstone bedrock of the Puente Formation underlies the alluvial deposits.



EASTERN REACH:

Boring Nos. 1, 2, 3 and 4 were completed to depths of 50, 52, 28 and 58-1/2 feet bgs, respectively.

Fill was encountered in Boring Nos. 1 and 4 to a depth of 4 feet bgs. The fill consists of silty sand with gravel. Fill was not encountered in the remaining borings.

The soil profile generally consists of silty sand (SM), sand (SP-SM, SP) and silty sandy gravel (GM) to the maximum depths attained. The soils range from loose to dense.

Groundwater was encountered between 18 feet and 26 feet bgs along the eastern reach. These depths correspond to groundwater elevations between 425 feet and 430 feet above mean sea level (amsl) and mimic elevations of the Santa Ana River channel.

Boring No. 3, located adjacent to a bedrock cut, encountered sandstone bedrock at a depth of 7 feet bgs. The drill auger penetrated 21 feet of bedrock material prior to drilling refusal. Bedrock was not encountered in Boring Nos. 1, 2 or 4, which were located east of Boring No. 3.

Refusal to advancement of the drilling augers due to flowing sands in groundwater was experienced in Boring Nos. 1 and 2 at depths of 50 and 52 feet, respectively.

WESTERN REACH:

Boring Nos. 5 and 6 were completed to depths of 25-1/2 and 47 feet bgs, respectively.

Fill was not encountered within the western reach.

The soil profile generally consists of silty sand (SM) and silty sandy gravel (GM). The soils range from loose to dense.



Boring Nos. 5 and 6 encountered sandstone bedrock at depths of 19 and 17 feet bgs, respectively, corresponding to a bedrock surface elevation of about 419 feet amsl. The drill augers penetrated 30 feet of bedrock material prior to drilling refusal in Boring No. 6.

Groundwater was encountered at a depth of 41 feet bgs in Boring No. 6. This depth corresponds to a groundwater elevation of 396 feet amsl.

SUBSURFACE MATERIALS CONSIDERATIONS:

The presence of gravel lenses or beds was recorded during drilling based on auger returns, recovered samples or drill chatter. These intervals are summarized in the following table.

Boring No.	Intervals (feet bgs)	Notes
1	16 (thin lens), 24-25, 32-33	
2	10-16 (thin lenses), 24-26, 29-31	
3	Not encountered	Bedrock at 7 feet
4	15-16, 18-20, 43-46 and 55-57	
5	4-19	lag deposits of Aliso Creek
6	5-17	lag deposits of Aliso Creek

Because of the depositional setting of Santa Ana River sediments, additional gravel lenses may occur between exploration locations at other depths with the project alignments.

The materials encountered during this investigation are generally granular and considered to be non-critically expansive. Slight caving above groundwater was observed upon removal of the drill augers. Flowing sands were observed below groundwater level within the eastern reach.



A more detailed description of the subsurface soil conditions encountered within our exploratory borings is presented on the attached boring logs.

CONCLUSIONS AND RECOMMENDATIONS

Data from our exploratory borings indicate that the soil profile typically consists of silty sand (SM), sand (SP-SM, SP) and silty sandy gravel (GM) units overlying sandstone bedrock at varying depths. The soils encountered generally ranged from loose to dense.

Bedrock was encountered in Exploratory Boring Nos. 3, 5 and 6 at depths of 7, 19 and 17 feet bgs, respectively. Refusal was experienced in some borings.

Fill was encountered in Exploratory Boring Nos. 1 and 4 to a depth of 4 feet bgs.

Groundwater was encountered between 18 and 26 feet bgs along the eastern reach and 41-1/2 feet bgs along the western reach.

Sandy silty gravel layers and lenses (intervals) were encountered locally within the borings. These are summarized in Table 1.

Our exploratory borings exhibited slight caving above groundwater upon removal of the drill augers. Flowing sands were observed below groundwater level within the eastern reach.



SHORING DESIGN PARAMETERS:

For design of cantilevered shoring or sheet piles, a triangular distribution of lateral earth pressure may be used. It may be assumed that the retained soils with a level surface behind the cantilevered shoring or sheet piles will exert a lateral pressure equal to that developed by a fluid with a density of 43 pounds per cubic foot (pcf).

For the design of tied-back or braced shoring, we recommend the use of a rectangularly distributed apparent earth pressure for calculating the total load. For the case where the grade is level behind the shoring, the recommended pressure distribution is rectangular, with the maximum pressure equal to $30H$ in pounds per square foot (psf) where H is the height of the shoring in feet. The design engineer should refer to FHWA-IF-99-015 or the latest Caltrans Trenching and Shoring Manual for the recommended apparent earth pressure diagram.

The upper 10 feet of shoring or sheet piles adjacent to streets or other vehicular traffic areas should be designed to resist a uniform construction surcharge load of 72 psf or an alternative traffic surcharge load of 100 psf, in addition to the recommended earth pressures. If traffic is kept back at least 10 feet from the shoring or sheet piles, the traffic surcharge may be neglected.

SOIL CORROSIVITY:

Selected samples of material were delivered to our consultant, HDR|Schiff, for soil corrosivity testing. Laboratory testing consists of pH, resistivity and major soluble salts commonly found in soils. The results are included in Enclosure "C-7". These tests have been performed in order to screen the alignment for potentially corrosive soils.

Values from the soil tested indicate that the soils are "moderately corrosive" and "corrosive" to ferrous metals at as-received and saturated conditions, respectively. Specific corrosion control measures, such as coating of pipe with non-corrosive material or alternative non-metallic pipe material, are considered to be needed.



Results of the soluble sulfate testing indicate a "not applicable" (Class S0) anticipated exposure to sulfate attack, as indicated in Appendix "C". Based upon the criteria from Table 4.2.1. of the American Concrete Institute Manual of Concrete Practice (2011), no special measures, such as specific cement types or water-cement ratios, will be needed for this "not applicable" exposure to sulfate attack.

Soluble chloride content of soil was not at levels high enough to be of concern with respect to corrosion of ferrous materials. It was, however, at levels high enough to be of concern with respect to corrosion of reinforcing steel. The results should be considered in combination with the soluble chloride content of the hardened concrete in determining the effect of chloride on the corrosion of reinforcing steel.

Ammonium contents did not indicate a concern with respect to corrosion of buried copper, while nitrate contents did.

CHJ Consultants does not practice corrosion engineering. If further information concerning the corrosion characteristics or if interpretation of the results submitted herein is required, then a competent corrosion engineer should be consulted.

CONSTRUCTION OBSERVATION:

If conditions inconsistent with the findings of this investigation are encountered during construction, the geotechnical engineer should be notified so that an evaluation of potential effects to the proposed improvements can be made.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express



or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions that appear different from those described herein be encountered in the field by the client or any firm performing services for the client or the client's assign, this firm should be contacted immediately in order that we might evaluate their effect.

If this report or portions thereof are provided to contractors or included in specifications, it should be understood by all parties that they are provided for information only and should be used as such.

The report and its contents resulting from this investigation are not intended or represented to be suitable for reuse on extensions or modifications of the project, or for use on any other project.




CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.



Respectfully submitted,
CHJ CONSULTANTS


John S. McKeown, E.G. 2396
Project Geologist




Fred Yi, Ph.D., G.E. 2967
Chief Engineer




Robert J. Johnson, G.E. 443
President

JMc/FY/RJJ:lb