



Calaveras County

California

PUBLIC WORKS DEPARTMENT

NOTICE TO BIDDERS AND SPECIAL PROVISIONS

FOR CONSTRUCTION OF THE
RED HILL LANDFILL CELL A FINAL COVER REPAIR PROJECT
IN CALAVERAS COUNTY, CALIFORNIA

Bid Book dated January 16, 2015

Standard Specifications dated 2010

Project Plans dated December 19, 2014

Standard Plans dated 2010

Advertising Date: February 10, 2015

Bids Open: March 6, 2015, at 11:00 a.m.

SPECIAL NOTICES

- This project has a special bid opening date and time. See the *Notice to Bidders* for details.
- Attention is directed to the following supplemental project information available for inspection and download at the County of Calaveras website:
www.co.calaveras.ca.us/cc/Departments/PublicWorks.aspx:
 - **Calaveras County Grading, Drainage, and Erosion Control Design Manual** updated December 2012

The special provisions contained herein have been prepared by or under the direction of the following Registered Person:

CIVIL ENGINEER, RCE #82568
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Date

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A. Techniacal Specifications

NOTICE TO BIDDERS

The COUNTY OF CALAVERAS invites separate sealed bids for construction of the Red Hill Landfill Cell A Final Cover Repair project. The project is to repair the Cell A final cover at the Red Hill Landfill in Calaveras County. The work includes earthwork, installation of a high performance turf reinforcement mat (HPTRM), re-seeding, and others as found in the plans. Advertisement of the project begins on February 10, 2015. Bids will be received at the Calaveras County Administrative Office, 891 Mountain Ranch Road, San Andreas, CA 95249, on **March 6, 2015, until 11:00 a.m.** local time and then opened publicly and read aloud.

Complete Base Bid work within **30 working days**.

The estimated cost of the project is **\$240,640** (for bonding purposes).

A non-mandatory pre-bid meeting is scheduled for this project on February 20, 2015 at 3:00 p.m. at the Calaveras County Main Library in San Andreas.

The work shall be done in accordance with the Standard Plans 2010 and Standard Specifications 2010 (as modified by the 04-19-13 published revisions), of the California Department of Transportation and in accordance with the special provisions.

The Bid Book, Notice to Bidders and Special Provisions, and project plans may be viewed at the County of Calaveras, Public Works Department, 891 Mountain Ranch Road, San Andreas, CA 95249 or online at www.co.calaveras.ca.us/cc/Departments/PublicWorks.aspx.

Copies of the Bid Book, Notice to Bidders and Special Provisions, and project plans may be obtained at the County of Calaveras Public Works Department upon payment of \$80.00 for each set (non-refundable).

INSTRUCTIONS TO BIDDERS

A. BID FORMAT

Each Bid must be submitted in a sealed envelope plainly marked on the outside as BID FOR RED HILL LANDFILL CELL A FINAL COVER REPAIR PROJECT and the envelope should bear on the outside the name of the Bidder and his address.

All Bids shall be made on the required Bid form. All blank spaces for Bid prices shall be filled in, in ink or typewritten, and the Bid form shall be fully completed and executed when submitted. Any corrections to entries made on Bid forms shall be initialed by the person signing the Bid. Only one copy of the Bid form is required unless otherwise specified. The Bid Item List, Subcontractor List, Equal Employment Opportunity Certification, Nonlobbying Certification, Noncollusion Affidavit, Debarment and Suspension Certification, and Bid Bond shall be included to constitute a complete Bid. Other Contract Documents do not need to be included with the Bid unless otherwise specified.

Bids are to be submitted for the entire work. Bids must be on a unit price basis.

Submit your bid with a BID BOND equal to at least 10 percent of the bid amount.

B. ADDENDA AND EXPLANATIONS TO BIDDERS

Any explanation regarding the meaning or interpretation of Plans, Specifications, or other Contract Documents must be requested in writing, with sufficient allowance of time for receipt of reply before the time set for opening of Bids. Any such explanations or interpretations shall be made in the form of

Addenda to the bid documents and shall be furnished to all Bidders, who shall acknowledge receipt of all Addenda in their Bid. Oral explanations and interpretations shall not be binding.

Bidder questions shall be submitted to Nathan Tumminello, Contract Manager, Calaveras County Public Works, by either e-mail or FAX to:

Email: ntumminello@co.calaveras.ca.us

Fax: (209) 754-6664

Answers to bidder questions will be posted to the County's website:

www.co.calaveras.ca.us/cc/Departments/PublicWorks.aspx

C. LICENSING REQUIREMENTS FOR BIDDERS/CONTRACTORS

Attention is directed to Section 3-1.06, the Contractor must have a Class "A" license or other appropriate license classification or a combination of license classifications that constitute a majority of the work. Bidder may satisfy required contractor license classifications through subcontracting that portion of the work that will be performed under the required contractor license classification. Any entity that regularly transacts business in Calaveras County shall obtain a Calaveras County business license prior to the start of work.

D. TAXES AND OTHER FEES

The prices submitted in the Bid shall include all sales taxes, other taxes, and applicable fees.

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COUNTY of CALAVERAS
DEPARTMENT OF PUBLIC WORKS
SPECIAL PROVISIONS

RED HILL LANDFILL CELL A FINAL COVER REPAIR PROJECT

The work embraced herein shall be done in accordance with the Standard Specifications dated May 2010 and the Standard Plans dated May 2010 of the California Department of Transportation insofar as the same may apply, and these special provisions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

DIVISION I GENERAL PROVISIONS

1 GENERAL

Add to section 1-1.01:

Wherever, in the special provisions and standard specifications, the words State of California, or State are used, they shall be understood to mean – The County of Calaveras, located in Calaveras County, California; also sometimes referred to as “County”. Any reference therein to the State of California or a State agency, office or officer shall be interpreted to refer to the County or its corresponding agency, office or officer acting under this contract.

Wherever, in the special provisions and standard specifications, the words requirements, conditions, provisions and laws that are applicable to the State of California rather than the County of Calaveras – Said references shall be construed as references to any corresponding requirements, conditions, provisions and laws which are applicable to the County of Calaveras.

Replace the 6th paragraph in section 1-1.05 with:

A Department not specified as a federal or California department is a County department.

Add to section 1-1.07B:

Advertisement: The published notice inviting sealed bids for the construction of the project.

Board of Supervisors: The Board of Supervisors of the County of Calaveras, California.

Caltrans: The State of California, Department of Transportation.

County: The County of Calaveras, located in Calaveras County, California.

Replace the following definitions in section 1-1.07B with:

Department: Department of Public Works, County of Calaveras.

Labor Surcharge and Equipment Rental Rates: Caltrans publication that lists labor surcharge and equipment rental rates.

State: The County of Calaveras, located in California.

APPENDIX A

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

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SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Title.
- B. Hours of Operation.
- C. Permits and Licenses.
- D. Construction water.
- E. CONTRACTOR's use of site.
- F. Description of work.
- G. CONTRACTOR's Work Scope.

1.2 PROJECT TITLE

- A. The Project is entitled RED HILL LANDFILL SLIDE REPAIR and includes all the of the Contract Documents.
- B. In case of conflict between the Special Provisions and other provisions specified for the project, the Special Provisions shall take precedence over and in lieu of such conflicting portions.

1.3 HOURS OF OPERATION

- A. The CONTRACTOR is allowed to work from 8:00 a.m. to 4:30 p.m. for work that requires County oversight. Other work is allowed from 7 a.m. to 7 p.m. All work can occur Monday through Friday, except for County holidays.

1.4 PERMITS AND LICENSES

- A. The CONTRACTOR and all his subcontractors must have all the licenses required by federal and State law in possession before performing any work. Compensation for complying with this specification is considered as included in the various bid items and no additional compensation will be allowed.

1.5 CONSTRUCTION WATER

- A. Construction water is not available onsite.
- B. The CONTRACTOR shall be responsible for providing and transporting all required construction water from an offsite location.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.6 CONTRACTOR'S USE OF SITE

- A. The CONTRACTOR cannot interfere with ongoing landfill operations, including the allowance of sufficient water supply for dust control and operational measures.
- B. The CONTRACTOR should limit activities to the project area, as shown on the Construction Drawings, stockpiles, staging area, and haul road as identified by the OWNER.

1.7 DESCRIPTION OF WORK

- A. The work to be performed for this contract includes, but is not necessarily limited to, the repair of the Cell A final cover at the Red Hill Landfill in Calaveras County, California. The construction area of Cell A is approximately 0.30 acres.

- B. The Cell A work, consists of the following constructed layers:

- Removal of the vegetative cover material;
- Reworking of the clay cover soil;
- Replacing the vegetative cover soil on top of the clay cover;
- Installing a high performance turf reinforcement mat (HPTRM);
- Reseeding the area per the HPTRM manufacturer; and
- Installing surface water drainage structures.

All work must be carried out and maintained per the Construction Drawings and Specifications subject to the approval of the Design Engineer and Quality Assurance/Quality Control consultant.

1.8 CONTRACTOR'S WORK SCOPE

- A. CONTRACTOR shall furnish all labor, materials, tools, equipment, supervision, transportation, and installation services required for the following tasks as summarized below, and outlined in the Construction Drawings and Specifications:
1. Excavating, stockpiling, and preparing the existing vegetative cover soil subgrade within the project area to the lines and grades shown on the Construction Drawings, including dust control, proof-rolling, surveying, and stockpile development.
 2. Repairing the existing clay cover to the lines and grades shown on the Construction Drawings, including moisture conditioning, compaction, dust control, and surveying.
 3. Preparing and maintaining the low permeability soil for the placement of vegetative cover soil, including fine grading, watering, etc.
 4. Placing the vegetative cover soil to the lines and grades shown on the Construction Drawings, including moisture conditioning, compaction, dust control, and surveying.
 5. Placing and anchoring the HPTRM over the vegetative cover soil as shown on the construction drawings.
 6. Seeding of the HTRM per the manufacturer's recommendations..
 7. Relocating the drainage pipes and other structures per the construction drawings.
 8. Provide all necessary construction staking to lay out the work and other surveying to compute quantities and prepare as-built drawings. Prepare all required Record Drawings and surveys necessary to document as-built quantities/conditions. Submit all required Record Drawings to OWNER.
 9. Provide warranties, performance and payment bonds, and insurance as specified in the Contract Documents.
 10. Generate and submit Project Schedules and Schedules of Values for ENGINEER'S review.
 11. Satisfy the substantive requirements of permits required from appropriate federal, state, and local authorities such as storm water discharge, erosion and sedimentation.

12. The CONTRACTOR shall prepare a site specific Health and Safety Plan and Emergency Response and Contingency Plan (subject to approval by OWNER), furnish health and safety equipment and decontamination materials as specified in the Health and Safety Plan, and implement provisions of the Emergency Response and Contingency Plan as necessary.
13. Mobilization and demobilization of equipment and systems at the site.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Measurement and payment methods for contract bid items.

1.2 BID ITEM REQUIREMENTS

- A. The bid items are presented to indicate major categories of the work for purposes of comparative bid analysis and payment breakdown for monthly progress payments. Bid items are not intended to be exclusive descriptions of work categories, and the CONTRACTOR shall determine and include in its pricing all material, labor and equipment necessary to complete the entire project as shown and specified. The CONTRACTOR shall, prior to bidding, become familiar with the site conditions and consider site specifics in preparing the bid.

1.3 PAY ITEMS

- 1. Mobilization/Demobilization **(Bid Item 1)**
 - a. Measurement by lump sum (LS), based on mobilizing equipment and labor to perform work and demobilizing from and cleaning the site after all work and testing has been performed and accepted by the OWNER.
 - b. Payment as follows: 50 percent of lump sum amount upon completion of 10 percent of the work, and 50 percent for demobilization and site cleanup; Payment includes all costs for mobilizing and demobilizing equipment, living expenses, bonds, insurance, office and field overhead, geosynthetic installer management, and any other administrative costs necessary to complete the work. Includes work described in Section 01200, 01300, 01310, 01400, 01500, 01560, 01600, 01630, and 01700; as well as all sitework. Payment will be limited to 5 percent of the total contract price.
- 2. Layout of Work and Surveys **(Bid Item 2)**
 - a. Measured by Lump Sum (LS).
 - b. Payment includes all costs to perform construction control and slope staking, surveys to complete quantities, surveys to document as-built

conditions of the Cell A construction area, and the preparation of Record Drawings as described in the Specifications. CONTRACTOR shall provide an estimate of labor hours and expenses with this bid to support the lump sum price.

3. Temporary Controls **(Bid Item 3)**
 - a. Measure by the Lump Sum (LS)
 - b. Payment includes all costs for the temporary controls at the site including but not necessarily limited to dust control, pollution and erosion control, and traffic and safety controls as described in Section 01560.

4. Clearing and Stripping **(Bid Item 4)**
 - a. Measured by the square foot (SF). Measurement based on perimeter survey of the stripped borrow area; sloped areas will be equated based on actual slope adjusted area, not plan area.
 - b. Payment includes all costs to strip and dispose of material in the vegetative cover soil stockpile area for future use in the cover as described in the Specifications and as shown on the Construction Drawings.

5. Removal of Existing Vegetative Cover **(Bid Item 5)**
 - a. Measurement by the in-place cubic yard (CY). Measurement will be made by comparing the pre-construction survey of the area requiring vegetative cover removal with the post-excavation survey. Pre-construction survey will be established by field survey of existing grades. Survey will establish existing grades at a maximum 50-foot grid and establish major grade breaks. Post-excavation survey will be established by similar survey at a maximum 50-foot grid and also establish major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval. Pre-construction and post-excavation surveys shall be performed by the CONTRACTOR.
 - b. Payment will be by the cubic yard (CY). Payment includes all costs to furnish equipment and labor to excavate, haul, and place in an on-site stockpile as shown on the Construction Drawings and as described in the Specifications.

6. Existing Clay Cap Preparation **(Bid Item 6)**

- a. Measured by the square foot (SF). Measurement based on perimeter survey of the clay cap area; sloped areas will be equated based on actual slope adjusted area, not plan area.
 - b. Payment includes all costs to complete and maintain the compacted clay cap prior to placement of the vegetative cover soil as described in the Specifications.
7. Replacement of Vegetative Cover Layer **(Bid Item 7)**
- a. Measurement by the in-place cubic yard (CY). Measurement will be based on the surveyed area multiplied by the neat line thickness shown on the Construction Drawings. CONTRACTOR will be responsible for verifying specified thickness by survey methods. No adjustments will be made in the area for uneven contours.
 - b. Payment will be by the cubic yard (CY) in-place. Payment includes all costs to furnish equipment and labor to haul and place on-site supplied material as shown on the Construction Drawings and as described in the Specifications.
8. Anchor Trench Terminations **(Bid Item 8)**
- a. Measurement by the lineal foot (LF). Measurement shall be based on actual length installed and work required to prepare and shape the anchor trench.
 - b. Payment will be by lineal foot (LF). Payment includes all costs to locate, excavate, and backfill the anchor trench as shown on the Construction Drawings and described in the Specifications.
9. High Performance Turf Reinforcement Mat (HPTRM) **(Bid Item 9)**
- a. Measurement by the square foot (SF) of area installed. Measurement based on a perimeter survey of the completed installation. No adjustment will be made for uneven contours or for overlap at seams or wastage. No measurement will be made for high performance turf reinforcement mat (HPTRM) lost due to damage resulting from either the fault or the negligence of the CONTRACTOR. The measured area includes HPTRM placed in the anchor trenches in accordance with the Specifications and to the neat line dimensions shown on the Construction Drawings.

- b. Payment will be by the square foot (SF). Includes all costs to furnish and install HPTRM and all anchorages (pins, nails, etc.) as shown on the Construction Drawings and described in the Specifications.

10. Seeding **(Bid Item 10)**

- c. Measured by the square foot (SF). Measurement based on perimeter survey of the seeding area; sloped areas will be equated based on actual slope adjusted area, not plan area.
- d. Payment includes all costs to complete and maintain the seeding as described in the Specifications.

11. Drainage Improvements **(Bid Item 11)**

- a. Measured by Lump Sum (LS).
- b. Payment includes all costs to install/improve the drainage structures and construct the diversion berm as shown on the Construction Drawings and as described in the Specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements for survey work to be performed by CONTRACTOR to layout Work under this Contract.
- B. Before commencing any surveys, CONTRACTOR will give OWNER two working days advance notice so that OWNER may witness such work.

1.2 RELATED SECTIONS

- A. Section 01025 - Measurement and Payment.

1.3 DESCRIPTION

- A. Reference points: Reference points to be provided by OWNER pursuant to the General Conditions will include referenced monuments and elevation benchmarks in the vicinity of the Project. If displaced by CONTRACTOR, replacement of these reference points will be at the expense of CONTRACTOR.
- B. CONTRACTOR will furnish all necessary detail surveys including all lines, grades, and elevation appropriate to control construction. At a minimum, construction surveys are required for top of subgrade and top of drainage layer.
- C. Use by OWNER: OWNER may at any time use line and grade points and markers established by CONTRACTOR. CONTRACTOR's surveys are a part of the Work and may be checked by OWNER at any time. CONTRACTOR is responsible for any lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and for any resultant defects in the Work. CONTRACTOR will be required to conduct re-surveys or check surveys to correct errors indicated by review of the field notebooks or otherwise detected.

1.4 SURVEYS FOR MEASUREMENT FOR PAYMENT

- A. When the Specifications or OWNER require Bid Schedule items of work to be measured by surveying methods, CONTRACTOR shall perform the surveys. All such surveys, including control surveys for establishing the measurement reference lines, shall be performed by a duly qualified and licensed surveyor in the presence of CONTRACTOR who will provide notice so OWNER may witness the surveying operation. OWNER may independently check calculations of final

quantities for payment purposes. A duplicate of the note reductions and calculations will be given to the OWNER. All calculated quantities shall be certified by a licensed surveyor as to accuracy.

- B. Full compensation for complying with this provision shall be considered as included in the lump sum price for layout of work and surveys and no additional compensation will be allowed.

1.5 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

- A. Perform control traverse field surveys and computations to an accuracy of at least 1:10,000.
- B. The tolerances applicable in setting survey stakes are as set forth below. Such tolerances cannot supersede stricter tolerances required by the Construction Drawings or Specifications, and cannot otherwise relieve the CONTRACTOR of responsibility for measurements in compliance therewith.

<u>Type of Mark</u>	<u>Horizontal Position</u>	<u>Elevation</u>
Permanent reference points	1 in 10,000	±0.01 ft.
General excavation and earthwork	1 in 2,000	±0.10 ft.

- C. Tolerances for designed thickness shown on the Construction Drawings and for elevations shown on the Construction Drawings are ±0.10 foot unless otherwise specified.
- D. Surveyor must be licensed in the State of California.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01052

LAYOUT OF WORK AND SURVEYS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes requirements for survey work to be provided by the CONTRACTOR for the following:
 - 1. Setting offset stakes, slope stakes, and grade stakes for field layout of features for performance of the Work.
 - 2. Surveys for measurement of quantities for payment.
 - 3. Record Drawings.

1.2 DESCRIPTION

- A. **Reference Points.** The reference points provided by the OWNER include monuments and elevation bench marks in the vicinity of the Project. If displaced during the project, replacement of these reference points will be at the expense of the CONTRACTOR.
- B. The OWNER reserves the right to perform any desired checking and correction of the CONTRACTOR's layout work relative to OWNER's surveys but this does not relieve the CONTRACTOR of the responsibility for adequate performance of their Work.
- C. **Equipment and Personnel.** Provide instruments and other survey equipment that are accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Perform surveys under the direct supervision of a licensed surveyor.
- D. **Field Notes and Records.** Record surveys in field notebooks.
- E. **Use by the OWNER.** The OWNER may at any time use line and grade points and markers established by the OWNER or CONTRACTOR. The CONTRACTOR's surveys are a part of the Work and may be checked by the OWNER or representatives of the OWNER at any time.

1.3 RELATED SECTIONS

- A. Section 01025 - Measurement and Payment

B. Section 01050 – Field Engineering

1.4 SURVEYS FOR LAYOUT AND PERFORMANCE OF WORK

- A. CONTRACTOR will perform all surveys for layout of the Work, reduce the field notes, make necessary calculations, and prepare drawings necessary to carry out such work. CONTRACTOR's layout work will include the following:
1. Slope staking for cell grading at 50-foot grid, and grade breaks.
 2. Blue top for landfill subgrade and engineered fill at 50-foot grid and grade breaks.
 3. Control staking for LCRS piping, low permeability soil liner, and operations layer thickness at 50-foot grid, and grade breaks.
 4. All as-built surveys specified in this section.
 5. Surveys to measure completed units of work specified in this section.
- B. CONTRACTOR must perform all additional slope staking, off-setting and other control staking necessary to perform the Work.
- C. Full compensation for complying with this provision shall be considered as included in the lump sum price for layout of work and surveys and no additional compensation will be allowed.

1.5 SURVEYS FOR RECORD DRAWINGS AND MEASUREMENT FOR PAYMENT

- A. Provide the OWNER with Record Drawings that show the following items:
1. Topography that depicts the construction area after clay preparation.
 2. Topography that depicts the top of vegetative cover.
 3. Anchor trench location with survey points and at alignment breaks, such as corners.
 4. Limit of HPTRM surface area.
 5. Location of drainage structures.
- B. Submit survey information for items listed above to the OWNER before the items are covered.

1. Provide surveys to measure the following items:
 - a. Measure the area of the clay preparation area.
 - b. Volume of vegetative cover.
 - c. Actual area (corrected for slope) of the HPTRM and seeding.
- C. The OWNER may perform independent checks.
- D. Provide Record Drawings on 22" x 34" size drawings, and on computer disk in an approved version of AutoCAD. Use the coordinate system shown on the Construction Drawings. The Record Drawings shall show all relevant features of the phase, including access roads, contours (2-ft. interval), aerial survey control points, hinge lines, and coordinates of all riser pipes, and other permanent design related structures.
- E. Full compensation for complying with this provision shall be considered as included in the lump sum price for layout of work and surveys and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Representatives of CONTRACTOR, subcontractors, and suppliers attending meetings must be authorized to act on behalf of organizations they represent.

1.2 PRE-CONSTRUCTION MEETING

- A. Meeting will be held at a location selected by OWNER.
- B. Attendance:
 - 1. CONTRACTOR's Office Representative.
 - 2. CONTRACTOR's On-Site Field Superintendent.
 - 3. Any Subcontractors or Supplier's representatives whom CONTRACTOR may desire to invite or OWNER may request.
 - 4. ENGINEER and CQA FIRM.
 - 5. OWNER.
- C. A suggested format would include, but not be limited to, the following subjects:
 - 1. Presentation of a proposed construction progress schedule and submittals as required by the Contract Documents.
 - 2. Required bonds and insurance certifications prior to Notice to Proceed.
 - 3. Liquidated Damages.
 - 4. Procedures for handling submittals.
 - 5. Direction of correspondence, and coordinating responsibility between CONTRACTOR and OWNER.
 - 6. Request or scheduling of a weekly job meeting for all involved.
 - 7. Laboratory testing of construction materials.

8. Applications for payment, and progress payment procedures.
 9. Change Order procedures.
 10. OWNER's site regulations.
- D. The meeting will be documented by the OWNER or person designated by the OWNER. Copies of the minutes and relevant documents will be provided to all parties.
- E. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.3 WEEKLY PROGRESS MEETINGS

- A. OWNER's Representative will schedule and administer progress meetings at a minimum of once per week and such additional meetings as required, or as requested by OWNER.
- B. Attendance:
1. OWNER'S Representative.
 2. ENGINEER, if requested by OWNER'S Representative.
 3. CQA Officer
 4. CONTRACTOR's superintendent.
 5. Subcontractors as appropriate to agenda.
 6. Suppliers as appropriate to agenda.
- C. Meeting requirements:
1. OWNER's Representative will administer the following general requirements for progress meetings:
 - a. Prepare agenda for meetings.
 - b. Make physical arrangements for meetings.
 - c. Preside at meetings.

2. CONTRACTOR will administer the following general requirements for progress meetings:
 - a. Record significant proceedings and decisions of meeting.
 - b. Reproduce and distribute copies of meeting record within seven days after each meeting to participants in meeting and to parties affected by decisions made at meeting. Furnish one copy of minutes to participants. Revise and distribute revisions to meeting minutes as necessary.

D. Suggested Agenda:

1. Review and approval of record of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, and conflicts.
4. Problems which impede Work Schedule.
5. Review of off-site delivery schedules.
6. Corrective measures and procedures to regain projected schedule if a review of the schedule deems it necessary.
7. Revisions to Construction Progress Schedule.
8. Coordination of schedules between contractors.
9. Review submittal schedules; expedite as required.
10. Maintenance of quality and safety standards.
11. Pending changes and substitutions.
12. Review proposed changes for effect on construction schedule and completion date, and on other contracts of projects.
13. Review of drawings and specifications that govern the next two weeks of work.
14. Review of bid item quantities relative to original estimates.
15. Review and update of as-built drawings.

16. Other business.

- E. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.4 DAILY PROGRESS MEETINGS

- A. An informal progress meeting will be held daily before the start of work. At a minimum, this meeting will be attended by the CONTRACTOR's Project Manager, Job Foreman and other CONTRACTOR staff. It may also be attended by the OWNER's Representative or CQA Monitor. The purpose of this meeting is to:
1. Review safety topics.
 2. Review scheduled work activities.
 3. Discuss problems and resolutions.
 4. Review test data.
 5. Discuss the CONTRACTOR's personnel and equipment assignments for the day.
 6. Review the previous day's activities and accomplishments.
- B. This meeting will be documented by the CONTRACTOR.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal Procedures.
- B. Construction Progress Schedules.
- C. Proposed Products List.
- D. Shop Drawings.
- E. Product Data.
- F. Samples.
- G. Manufacturer's Installation Instructions.
- H. Manufacturers' Certificates.

1.2 RELATED SECTIONS

- A. Section 01310 - Construction Schedule.
- B. Section 01400 - Quality Control.
- C. Section 01700 - Contract Closeout.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a transmittal form. Provide a minimum of five copies of each submittal. OWNER will retain three copies of each submittal.
- B. Sequentially number the transmittal form. For revised submittals add an alphabetic suffix to the original number.
- C. Identify Project, CONTRACTOR, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply CONTRACTOR's stamp, signed or initialed certifying review, verifying that the products required, field dimensions, adjacent construction work, and

coordination of information, is in accordance with the requirements of the Work and Contract Documents.

- E. Schedule submittals to expedite review by the OWNER and delivery in the time frame specified. Coordinate submission of related items.
- F. Allow 7 calendar days of review time for each submittal excluding delivery time to and from the CONTRACTOR.
- G. Identify variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.
- H. Provide space for CONTRACTOR, OWNER and/or OWNER's Representative review stamps.
- I. If revisions and re-submittals are required, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- K. Submittals not requested will not be recognized or processed.
- L. The CONTRACTOR shall prepare a list of all required submittals with the status of review at the pre-construction meeting. This list shall be updated and submitted to the OWNER at the weekly progress meetings.
- M. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 5 days after date of Agreement.
- B. Revise and resubmit as required but no less than every 7 days. The revised schedule must show the original target schedule.
- C. Submit revised schedules during weekly progress meetings. If revisions to the schedule affect work by others, the OWNER must be notified two weeks prior to the change. No changes may be initiated without the written approval of the OWNER.
- D. Submit a computer-generated schedule with a separate line for each item of Work or operation identifying the first work day of each week.

- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the critical path, start, and finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates and review periods required for shop drawings, product data, samples, and product delivery dates, including those furnished by OWNER.
- H. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.5 PROPOSED PRODUCTS LIST

- A. Within 5 days after date of OWNER-CONTRACTOR Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.6 SHOP DRAWINGS

- A. Submit the number of opaque reproductions, which CONTRACTOR requires, plus 3 copies which will be retained by OWNER.
- B. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Contract Closeout.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.7 PRODUCT DATA

- A. Submit the number of copies, which the CONTRACTOR requires, plus 3 copies that will be retained by the OWNER.

- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- C. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - Contract Closeout.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.8 SAMPLES

- A. Submit a sample of the LCRS gravel, bentonite, and any other imported soil material that represents the specified products. Coordinate sample submittals for interfacing work.
- B. For the soil samples, submit each sample in an air-tight sealed bucket and provide at least 50 pounds, unless otherwise stated in the individual specification sections.
- C. Include identification on each sample including source identification and full project information.
- D. Submit the number of samples specified in individual specification sections. The OWNER may retain all or a portion of each sample as a record of the submittal.
- E. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.9 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. When specified in individual specification sections, submit three copies of printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to the OWNER.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.10 MANUFACTURER CERTIFICATES

- A. When specified in individual specification sections, submit manufacturer's certificates in specified quantities.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting data, affidavits, certifications, and quality control testing.
- C. Certificates must be specific to the material or product delivered to the site.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 DESCRIPTION

- A. Prepare and submit with Bid, a preliminary construction schedule in compliance with Section 01300.
- B. The following sequencing of the construction is mandatory and shall be conducted by the CONTRACTOR:
 - 1. Remove vegetative cover soil
 - 2. Prepare existing clay cap
 - 3. Replace vegetative cover soil
 - 4. Excavate anchor trench
 - 5. Place High Performance Turf Reinforcement Matt (HPTRM)
 - 6. Backfill anchor trench
 - 7. Seeding
 - 8. Drainage improvements
- C. OWNER will review the preliminary construction schedule and incorporate it into their overall project schedule.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.2 DELAYS AND RECOVERY

- A. If, at any time during Project, CONTRACTOR fails to complete an activity by its latest scheduled completion date, CONTRACTOR must submit within two working days a written statement as to how and when CONTRACTOR will reorganize its work force to return to the current construction schedule.

- B. Whenever it becomes apparent from the progress evaluation and updated schedule data that milestone completion dates and/or contract completion dates will not be met, some or all of the following actions must be taken:
 - 1. Increase construction staffing in such quantities and crafts to substantially eliminate backlog of work.
 - 2. Increase number of working hours per shift, shifts per work day, work days per week, or amount of construction equipment, or combination of foregoing to substantially eliminate backlog of work.
 - 3. Reschedule work items to achieve concurrence of accomplishment.
- C. Under no circumstances will the addition of equipment or construction forces, increased working hours, or any other method, manner or procedure to return to current the Construction Progress Schedule be considered justification for contract modification or treated as an acceleration.

1.3 PROJECT UPDATES

- A. Update schedule weekly, or as requested by the OWNER.
- B. Provide details for scheduled activities over the two weeks following the current day of the schedule. Changes affecting work by others shall be addressed per Section 01300, 1.4, C.
- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction facilities required for the construction of the permanent facilities specified under the Scope of Work of this Contract.
- B. Construction facilities include furnishing of all equipment, materials, tools, accessories, incidentals, labor, and performing all work for the installation of equipment and for construction of facilities, including their maintenance, operation, and removal, if required, at the completion of the Work under the Contract.

1.2 RELATED SECTIONS

- A. Section 01560 - Temporary Controls.

1.3 DEFINITION

- A. Construction facilities include, but are not be limited to, the following temporary offices, utilities, equipment, materials, facilities, areas, and services:
 - 1. Field Office (Optional)
 - 2. Parking Areas
 - 3. Temporary Roads
 - 4. Storage of Materials and Equipment
 - 5. Construction Equipment
 - 6. Temporary Sanitary Facilities
 - 7. Temporary Electric Power
 - 8. Temporary Water
 - 9. First Aid Facilities
 - 10. Security

1.4 REFERENCES

- A. Construct/install, maintain and operate construction facilities in accordance with the applicable federal, state, and local laws, rules, and regulations.

1.5 GENERAL REQUIREMENTS

- A. CONTRACTOR is responsible for furnishing, installing, constructing, operating, maintaining, removing and disposing of the construction related facilities, as specified in these Specifications, and as required by OWNER for the completion of the Work under the Contract.
- B. Locate and maintain construction facilities in a clean, safe, and sanitary condition at all times until completion of the Contract.
- C. The requirements specified herein are in addition to any requirements specified elsewhere in the Contract Documents. Construction facilities must meet the requirements for all-weather service.
- D. Minimize land disturbances related to the construction facilities to the greatest extent possible and restore land to the extent reasonable and practical, to its original contours by grading to provide positive drainage and by seeding the area to match with existing vegetation, or as specified elsewhere. All debris or other disturbances resulting from the CONTRACTOR's actions shall be removed by the CONTRACTOR to the satisfaction of the OWNER.
- E. Design and construct utilities to provide uninterrupted service.
- F. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization.

1.6 FIELD OFFICE

- A. CONTRACTOR may provide an office for his own staff.
- B. The location of the office must be approved by OWNER.
- C. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.7 PARKING AREAS

- A. OWNER will provide parking area for maintenance and delivery vehicles, the OWNER's, ENGINEER's, and CONTRACTOR's representatives, and other authorized visitors.
- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.8 TEMPORARY ROADS

- A. General.
 - 1. Temporary roads are existing roads that are improved, or new roads constructed by CONTRACTOR for convenience of CONTRACTOR in the performance of the Work under the Contract.
 - 2. Coordinate construction with OWNER.
 - 3. If applicable, coordinate all road construction activities with local utilities, fire and police departments.
 - 4. Keep erosion to a minimum and maintain suitable grade and radii of curves to facilitate ease of movement of vehicles and equipment.
 - 5. Furnish and install longitudinal and cross drainage facilities including, but not limited to, the ditches, structures, pipes and the like.
 - 6. Clean equipment so that mud or dirt is not carried onto public roads. Clean any mud or dirt transported by equipment onto paved roads both on site and off site.
- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.9 STORAGE OF MATERIALS AND EQUIPMENT

- A. Make arrangements for storage areas for materials and equipment. Locations and configurations of such facilities are subject to the acceptance of OWNER.
- B. Confine all operations, including storage of materials, to approved area. CONTRACTOR is liable for any and all damage caused during such use of property of the OWNER or others. Store materials in accordance with manufacturer's instructions when applicable.

- C. Store construction materials and equipment within boundaries of designated areas. Storage of gasoline or similar fuels must conform to state and local regulations and be limited to the areas approved for this purpose by the OWNER.
- D. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.10 CONSTRUCTION EQUIPMENT

- A. Erect, equip, and maintain all construction equipment in accordance with all applicable statutes, laws, ordinances, rules, and regulations of OWNER or other authority having jurisdiction.
- B. Provide and maintain scaffolding, staging, runways, hoists, barricades, and similar equipment required for performance of the Contract. Provide hoists or similar equipment with operators and signals, as required.
- C. Provide, maintain, and remove upon completion of the Work, all temporary rigging, scaffolding, hoisting equipment, debris boxes, barricades around openings and excavations, fences, ladders, and all other temporary work, as required for all work hereunder unless otherwise directed by OWNER.
- D. Construction equipment and temporary work must conform to all the requirements of state, county, local authorities, OSHA, and underwriters, which pertain to operation, safety, and fire hazard. Furnish and install all items necessary for conformity with such requirements, whether or not called for under separate sections of these Specifications.
- E. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.11 TEMPORARY SANITARY FACILITIES

- A. Provide temporary sanitary facilities for use by all employees and persons engaged in the work, including subcontractors, their employees and authorized visitors.
- B. Sanitary facilities include enclosed chemical toilets and washing facilities. These facilities must meet the requirements of local public health standards. Open pit or trench latrines are not permitted.

- C. Locate sanitary facilities as approved by OWNER, and maintain in a sanitary condition during the entire course of the work.
- D. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.12 TEMPORARY ELECTRIC POWER (Optional)

- A. Provide and maintain during the course and progress of the Work all electrical power and wiring requirements to facilitate the work of all trades and services associated with the work. Make arrangements with the applicable serving utility company or provide generators and pay all charges for providing and maintaining electrical service including usage costs at the site unless otherwise approved by the OWNER. Furnish all temporary wiring, feeders, and connections.
- B. Routing of temporary conductors, including welding leads, must not create a safety hazard nor interfere with operation and maintenance of existing facilities.
- C. Install all temporary wiring in accordance with the applicable requirements of the local electrical code.
- D. Provide power and lighting to field office, and for Work as required, at no extra cost to OWNER.
- E. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization.

1.13 TEMPORARY WATER

- A. Potable water is not available on-site. Refer to Section 01010.
- B. Make all arrangements for water needs from an off-site supplier for emergencies.
- C. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization.

1.14 FIRST AID FACILITIES

- A. Provide first aid equipment and supplies to serve all CONTRACTOR personnel at the site.

- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.15 SECURITY

- A. Make all necessary provisions and be responsible for the security of the Work and the site until final inspection and acceptance of the Work unless otherwise approved by the OWNER. In no case shall the OWNER be responsible for the security of the CONTRACTOR's supplies, property, or equipment.
- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.16 SHUT-DOWN TIME OF SERVICES

- A. Do not disconnect or shut down any part of existing utilities and services, except by express permission of OWNER.
- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.17 MAINTENANCE

- A. Maintain all construction facilities, utilities, temporary roads, services to office, and the like in good working condition as required by OWNER during the term of the Contract.
- B. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

1.18 STATUS AT COMPLETION

- A. Upon completion of the Work, or prior thereto, when so required by OWNER:
 - 1. Repair damage to roads caused by or resulting from the CONTRACTOR's work.
 - 2. Remove and dispose of all construction facilities including office trailers, and other facilities and utilities including all concrete foundations. Similarly, return all areas utilized for temporary facilities to substantially their near original, natural state, or as otherwise indicated or directed.

- B. Obliterate temporary roads built for CONTRACTOR's convenience and restore the area to near original conditions to the extent practicable unless otherwise approved by the OWNER.
- C. Full compensation for complying with this provision shall be considered as included in the bid item lump sum for mobilization/demobilization and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary controls required during the term of the Contract for the protection of the environment and the health and safety of workers and general public.
- B. Furnishing all equipment, materials, tools, accessories, incidentals, and labor, and performing all work for the installation of equipment and construction of facilities, including their maintenance and operation during the term of the Contract.
- C. Temporary controls include, but are not limited, to the following:
 - 1. Dust Control
 - 2. Pollution and Erosion Control
 - 3. Traffic and Safety Controls
- D. Perform work as specified in this Specification and as required by OWNER. Maintain equipment and accessories in clean, safe and sanitary condition at all times until completion of the Contract.

1.2 RELATED SECTIONS

- A. Section 01500 - Construction Facilities.

1.3 DUST CONTROL

- A. Provide dust control measures as specified in the Contract. The CONTRACTOR shall obtain a dust control permit from Calaveras County, if applicable.
- B. Dust control consists of transporting water, furnishing required equipment, additives, accessories and incidentals, carrying out proper and efficient measures wherever and as often as necessary to reduce dust nuisance, and to prevent dust originating from construction operations throughout the duration of the Contract, as required by OWNER.

- C. Apply water by means of pressure-type distributors or pipelines equipped with a spray system or hoses with nozzles that will insure a uniform application of water.
- D. Provide all equipment used for the application of water with a positive means of shut-off.
- E. Unless otherwise permitted by OWNER or unless all the water is applied by means of pipelines, provide at least one operations mobile unit with a minimum capacity of 3,500 gallons for applying water at the site during construction.
- F. Full compensation for complying with this provision shall be considered as included in the bid items lump sum for temporary controls and no additional compensation will be allowed.

1.4 POLLUTION AND EROSION CONTROL

- A. Erosion Control: CONTRACTOR shall control sediment transport on sloped surfaces. CONTRACTOR shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) which complies with all requirements of the applicable Industrial Activities Storm Water NPDES General Permit.
- B. Pollution of Waterways: Perform work using methods that prevent entrance or accidental spillage of solid or liquid matter, contaminants, debris and other objectionable pollutants and wastes into streams, watercourses, flowing or dry, and underground water sources. Such pollutants and wastes will include, but will not be restricted to refuse, earth and earth products, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, hazardous chemicals, oil and other petroleum products, aggregate processing tailings, and mineral salts. Dispose of pollutants and wastes in accordance with applicable permit provisions or in a manner acceptable to and approved by the OWNER.
- C. Storage and Disposal of Petroleum Products:
 - 1. Petroleum products covered by this section include gasoline, diesel fuel, lubricants, heating oils, and refined and used oil. During project construction, store all petroleum products in such a way as to prevent contamination of all ground and surface waters.
 - 2. Lubricating oil may be brought into the project area in steel drums or other means, as CONTRACTOR elects. Store used lubricating oil in steel drums, or other approved means, and return to the supplier for disposal. Do not burn or otherwise dispose of at the project area.

3. If the total capacity volume of stored petroleum products is greater than 1,320 gallons in total and/or 660 gallons in any single container and these products are stored above ground, CONTRACTOR shall prepare and adhere to a Spill Prevention Control and Countermeasure Plan (SPCC Plan) in accordance with applicable EPA and other state regulations.
- D. All chemicals stored on-site must be appropriately labeled as to its content and hazard rating.
- E. Full compensation for complying with this provision shall be considered as included in the bid items lump sum for temporary controls and no additional compensation will be allowed.

1.5 TRAFFIC AND SAFETY CONTROLS

- A. Post construction areas and roads with traffic control signs or devices used for protection of workmen, the public and equipment. The signs or devices must conform to the American National Standards Institute, Manual on Uniform Traffic Control Devices for Streets and Highways.
- B. Remove signs or traffic control devices as soon as they have served their purpose. It is particularly important to remove any markings on road surfaces, which under conditions of poor visibility could cause a driver to turn off the road or into traffic moving in the opposite direction.
- C. Barricades for protection of employees must conform to the portions of the American National Standards Institute, Manual on Uniform Traffic Control Devices for Streets and Highways, relating to barricades.
- D. Material Haul on Public Roads: Follow all requirements stated in the permits for using public roads for hauling materials to the site.
- E. Provide flag persons, properly equipped with International Orange protective clothing and flags, as necessary, to direct or divert pedestrian or vehicular traffic.
- F. Construct and maintain fences, planking, barricades, lights, shoring, and warning signs as required by local authorities, federal and state safety ordinances, and as required to protect OWNER's property from injury or loss, and as necessary for the protection of the public, and provide walks around any obstructions made in a public place for carrying on the Work covered in this Contract. Leave all such protection in place and maintained until removal is authorized.
- G. Guard and protect all workers, pedestrians, and the public from excavations, blasting operations, construction equipment, all obstructions, and other

dangerous items or areas by means of adequate railings, guard rails, temporary walks, barricades, warning signs, sirens, directional signs, overhead protection, planking, decking, danger lights, etc.

- H. Full compensation for complying with this provision shall be considered as included in the bid items lump sum for temporary controls and no additional compensation will be allowed.

1.6 MAINTENANCE

- A. Maintain all temporary controls in good working conditions during the term of the Contract for the safe and efficient transport of equipment and supplies, and for construction of permanent works, as required by the OWNER.
- B. Full compensation for complying with this provision shall be considered as included in the bid items lump sum for temporary controls and no additional compensation will be allowed.

1.7 STATUS AT COMPLETION

- A. Upon completion of the Work, or prior thereto, when so required by the OWNER, remove all temporary controls and restore disturbed areas as required by OWNER.
- B. Full compensation for complying with this provision shall be considered as included in the bid items lump sum for temporary controls and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.

1.2 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.3 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, and/or damage.
- D. Any damaged materials, whether as originally shipped or as a result of handling, shall be replaced at no additional cost to the OWNER and with no extension of contract time.

- E. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.4 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place aboveground on sloped supports, if in accord with manufacturer's handling instructions.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- H. Any products that become damaged during storage shall be replaced at no additional cost to the OWNER and with no extension of contract time.
- I. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation, maintenance, completion, and submission of all project Record Drawings, specifications and related documents.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01560 - Temporary Controls.

1.3 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintain at the job site one copy of the following Project or Contract Documents for record purposes:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and Work Change Directives.
 - 5. Field Orders.
 - 6. Reviewed Shop Drawings.
 - 7. Clarifications or Explanatory Drawings and Specifications.
 - 8. Inspection Reports.
 - 9. Laboratory Test Records.
 - 10. Field Test Records.
- B. Store documents used for record purposes in the field office or other approved location, apart from documents used for construction.
- C. File documents in accordance with the Construction Specification sections.

- D. Maintain documents in clean, dry, legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by the OWNER and his authorized representatives.
- G. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.4 RECORD DRAWINGS

A. Project Drawings:

- 1. Maintain record drawings of all work and subcontracts continuously as the job progresses. Keep a separate set of prints, for this purpose only and at the job site at all times.
- 2. Keep these drawings up-to-date.
- 3. During the course of construction, identify on the Construction Drawings the actual locations for all runs of mechanical and electrical work, including all site utilities and services installed underground or otherwise concealed. Show deviations from the Construction Drawings in detail. Locate all main runs, whether piping or drain lines, by dimension and elevation.
- 4. During the course of the construction record as-built information outlined in Section 01052.
- 5. Deliver the final and record set of "as-built" drawings to the OWNER prior to the OWNER's acceptance of the Project.

B. Addenda and Change Orders:

- 1. Incorporate changes to the Construction Drawings affected by Addenda, Change Orders, or Field Orders. Identify change by Addendum, Change Order, or Field Order number and effective date.
- 2. When revised Construction Drawings are issued as the basis of or along with addenda or change order, incorporate these revised Construction Drawings into the record set with appropriate annotation.

C. Shop Drawings:

1. Collect and maintain one complete set of reviewed shop drawings, including manufacturer's printed catalog cuts and data, for record purposes.
 2. Shop drawings must be filed and maintained separate from project Construction Drawings. Shop drawings must be filed in 9-inch by 12-inch file folders to the greatest extent possible and be indexed in accordance with the format as herein specified.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.5 RECORD SPECIFICATIONS

A. Project Specifications:

1. Information, changes, and notes must be recorded in the specifications in blank areas, such as page margins or the backs of opposite pages, or on separate sheets inserted in the binder. All such information, changes, and notes must be recorded with red pen or red typewriter ribbon.
2. In each section, in an appropriate location, record the manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
3. The record specifications book must be complete and include all documents and forms listed under Bidding Requirements, Contract Forms, Contract Conditions, and Specifications.

B. Addenda, Change Orders, Work Change Directives, and Field Orders

1. All Addenda, Change Orders, Work Change Directives, and Field Orders must be incorporated into the front of the specifications book in reverse chronological order. Use appropriate page dividers to identify addenda, change orders, and to separate addenda from the specifications.
2. In addition, the changes to the specifications effected by Addenda, Change Order, Work Change Directives, or Field Order must be annotated on the affected page or pages of the specifications, or adjacent thereto.

- C. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

1.6 SUBMISSION OF DOCUMENTS

- A. At completion of the project, and before submitting an invoice for final payment, deliver the record documents to the OWNER.
- B. Record documents must be delivered neatly and efficiently packaged.
- C. Submission of record documents must be accompanied with a transmittal letter, in triplicate, containing the following information:
 - 1. Date of submission.
 - 2. Project title and number.
 - 3. CONTRACTOR's name and address.
 - 4. Title and number of each record document. (Shop drawings may be grouped in basic categories or divisions of work.)
 - 5. Certification that each document as submitted is complete and accurate.
 - 6. Signature of CONTRACTOR or his authorized representative.
- D. Full compensation for complying with this provision shall be considered as included in the various bid items and no additional compensation will be allowed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION 01700

TECHNICAL SPECIFICATIONS

DIVISION 2 – SITEWORK

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SECTION 02110

CLEARING AND STRIPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Clearing and stripping grass and other organic material from the necessary borrow area(s) as required.
- B. Stockpiling stripped organic material.
- C. Disposal of stripped materials and debris.

1.2 RELATED SECTIONS

- A. Section 02221 – Excavating and Stockpiling
- B. Section 02222 - Anchor Trench Backfill
- C. Section 02223 – Clay Cap Preparation
- D. Section 02224 – Vegetative Cover Layer

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Set required lines, levels, contours, and datum by construction staking.
- B. Locate, identify, and protect existing closure areas and associated vegetation.
- C. Notify utility company to locate utilities, if applicable.
- D. Provide for dust control.
- E. Protect benchmarks, existing structures, and fences from excavation equipment and vehicular traffic.
- F. Provide for dewatering as necessary for the work.

- G. CONTRACTOR shall note that topography shown on the Construction Drawings may differ from topography at time of construction. The CONTRACTOR shall perform a pre-commencement survey to document site conditions prior to starting work.

3.2 STRIPPING

- A. Strip grass, roots, organic soils, plastics and other deleterious materials prior to excavating or fill placement.
- B. Strip to a maximum depth of 3 inches below existing ground surface.
- C. Transport and place all organic materials in the designated stockpile location as directed by the OWNER, and in accordance with Section 02221.
- D. Dispose of all plastic materials and debris in an approved disposal facility.
- E. Full compensation for complying with the provisions shall be considered as included in the square foot price for clearing and stripping and no additional compensation will be allowed.

END OF SECTION

SECTION 02221

EXCAVATING AND STOCKPILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating to remove the layer of vegetative cover entirely from the slide area.
- B. Stockpiling the excavated vegetative cover soil for re-application.
- C. Excavating from approved borrow area(s) to obtain supplemental soil for vegetative cover construction, as required.
- D. Excavating to construct anchor trenches and stormwater conveyance improvements.

1.2 RELATED SECTIONS

- A. Section 02110 – Clearing and Stripping
- B. Section 02222 – Anchor Trench Backfill
- C. Section 02223 – Clay Cap Preparation
- D. Section 02224 – Vegetative Cover Layer
- E. Section 02270 – Erosion and Sediment Control

1.3 FIELD MEASUREMENTS

- A. Verify that survey bench marks and intended elevations for the work are as designed.
- B. Prepare a final survey for an as-built record drawing based on a 50-foot grid spacing and at critical grade breaks in order to verify the design and for future design measurement of the low-permeability clay layer and other overlying components.

PART 2 PRODUCTS

2.1 VEGETATIVE COVER LAYER

- A. Soil meeting requirements of Section 02224, Part 2.1.

2.2 ANCHOR TRENCH BACKFILL

- A. Soil meeting requirements of Section 02222, Part 2.1.

PART 3 EXECUTION

3.1 PREPARATION

- A. Set required lines, levels, contours, and datum by construction staking.
- B. Locate, identify, and protect existing landfill areas.
- C. Notify utility company to locate utilities, if applicable.
- D. Provide for dust control.
- E. Protect benchmarks, existing structures, and fences from excavation equipment and vehicular traffic.
- F. Implement erosion and sediment control plan before beginning excavations.
- G. Provide for dewatering as necessary of any potential sources of surface or near-surface water within the construction zones for finish excavation and fill placement.
- H. CONTRACTOR shall note that topography shown on the Construction Drawings may differ from topography at time of construction. The CONTRACTOR shall perform a pre-commencement survey to document site conditions prior to starting work.
- I. Prior to excavating soil on site, contractor shall clear and strip excavation area in accordance with Section 02110 of these Specifications.

3.2 EXCAVATION

- A. Vegetative Cover Layer
 - 1. Excavate soil as required to the lines, grades, and elevations as shown on the Drawings.
 - 2. Excavate the existing vegetative cover material that slid from the entire slide area. Care shall be taken to ensure that the underlying clay cap is not damaged.

3. Grade top perimeter of excavations to prevent surface water from draining into excavation.
 4. Machine grade completed slopes to design grades.
 5. Notify OWNER of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
 6. Correct over-excavated areas by placing clay per Section 02223, or vegetative cover per 02224, as applicable, and as approved by the OWNER.
 7. Stockpile excavated materials in designated stockpile area(s) approved by the OWNER.
 8. Haul unsuitable material to location designated by OWNER.
 9. Excavate supplemental vegetative cover material, as required, from a borrow area that is approved by the OWNER and that meets the requirements of Section 02224.
 10. Full compensation for complying with the provisions shall be considered as included in the cubic yard price for removal of vegetative cover and no additional compensation will be allowed.
- B. Anchor Trench
1. Excavate anchor trenches to the lines and grades shown on the Drawings.
 2. Full compensation for complying with the provisions shall be considered as included in the linear foot price for anchor trench termination and no additional compensation will be allowed.
- C. Water Drainage Structures
1. Excavate water drainage structures to the lines and grades shown on the Drawings.
 2. Full compensation for complying with the provisions shall be considered as included in the lump sum price for drainage improvements and no additional compensation will be allowed.

3.3 FIELD QUALITY CONTROL

- A. Provide for visual inspection of surfaces.

- B. Perform as-built surveys as required to document excavation limits, to measure backfill quantities for payment, and to verify proper construction of overlying materials.
- C. Unless otherwise noted, tolerances are:
 - 1. Line \pm 0.5 foot
 - 2. Grade \pm 0.1 foot

END OF SECTION

SECTION 02222

ENGINEERD FILL AND ANCHOR TRENCH BACKFILL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Engineered Fill Placement.
- B. Anchor Trench Backfill Placement.

1.2 RELATED SECTIONS

- A. Section 02221 – Excavating and Stockpiling
- B. Section 02224 – Vegetative Cover Layer
- C. Section 02771 – High Performance Turf Reinforcement Mat (HPTRM)

1.3 REFERENCES

- A. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- B. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- C. ASTM D2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

PART 2 PRODUCTS

2.1 ENGINEERED FILL

- A. Soil obtained from a designated borrow area on site or imported soil, as approved by the OWNER and ENGINEER.
- B. Free of organic material.
- C. Free of frozen material, ice, snow, or excessive moisture.
- D. Maximum particle size of 6 inches.

2.2 ANCHOR TRENCH BACKFILL

- A. Soil obtained from a designated borrow area on site or imported soil, as approved by the OWNER and ENGINEER.
- B. Free of organic material.
- C. Free of frozen material, ice, snow, or excessive moisture.
- D. Maximum particle size of 3 inches.

PART 3 EXECUTION

3.1 ENGINEERED FILL PREPARATION

- A. Clear and strip all areas to receive engineered fill prior to diversion berm construction in accordance with Section 02110.
- B. Scarify subgrade soils to a depth of 6 inches, moisture condition, and recompact prior to soil placement. Any areas observed to be excessively soft for saturated during proof rolling should be over excavated to a minimum depth of 12 inches and replaced with suitable materials. The top 6 inches shall be compacted under the engineered fill compaction criteria.
- C. Prior to placement of engineered fill, verify that no substantial thickness of loose or uncompacted soil is present in the fill area.
- D. Begin engineered fill placement only when ENGINEER has accepted the underlying subgrade soils.

3.2 ENGINEERED FILL PLACEMENT

- A. Place engineered fill to lines and grades shown on the Drawings.
- B. Place in loose lift thickness not exceeding 8 inches.
- C. Compact each lift to a minimum of 90 percent relative compaction at a moisture content of $\pm 4\%$ of optimum as determined by ASTM D1557. Completed lifts of engineered fill cannot yield under equipment loads.

3.3 ANCHOR TRENCH BACKFILL PREPARATION

- A. Begin only when geosynthetic HPTRM installations have been completed in accordance with Section 02771.
- B. Begin anchor trench backfill only when the ENGINEER has accepted the underlying subgrade.

3.4 ANCHOR TRENCH BACKFILL PLACEMENT

- A. Place backfill to the lines and grades shown on the Drawings.
- B. Place in loose lift thickness not exceeding 12 inches.
- C. Compact each lift to a minimum of 85 percent relative compaction as determined by ASTM D1557. Completed lifts of fill cannot excessively yield under equipment loads.
- D. Do not damage geosynthetic installation.
- E. Full compensation for complying with the provisions shall be considered as included in the linear foot price for anchor trench termination and no additional compensation will be allowed.

3.3 CONSTRUCTION QUALITY ASSURANCE

- A. Construction Quality Assurance (CQA) will be performed in accordance with the CQA Plan.
- B. The CQA ENGINEER will determine optimum moisture content and maximum density for all engineered fills in accordance with ASTM D1557.
- C. The CQA ENGINEER will determine in-place density and moisture content by one or more of the following methods or approved equal: ASTM D2216 and ASTM D6938.
- D. The OWNER may perform additional testing to determine the conformance of the materials with these Specifications and the Drawings.
- E. The CONTRACTOR shall cooperate fully with the OWNER in performance of sampling and testing. Include costs for assistance in unit or lump sum prices.

END OF SECTION

SECTION 02223
CLAY CAP PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Inspection and preparation of the existing low permeability clay cap.

1.2 RELATED SECTIONS

- A. Section 02110 — Clearing and Stripping
- B. Section 02221 — Excavating and Stockpiling
- C. Section 02224 — Vegetative Cover Layer

1.3 REFERENCES

- A. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- B. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- C. ASTM D2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

PART 2 PRODUCTS

2.1 COMPACTED LOW PERMEABILITY CLAY CAP MATERIAL

- A. The low permeability clay cap material shall be free of any exposed loose or saturated materials, desiccation cracking, organic debris, or any other foreign or deleterious objects.
- B. The low permeability clay cap material shall have a minimum relative compaction of 90% and +2 to +5% of the optimum moisture content as determined by ASTM D1557.
- C. The thickness of the low permeability clay cap should be maintained at a minimum of 1 foot thick.

PART 3 EXECUTION

3.1 CLAY CAP PREPARATION

- A. Prior to clay cap preparation and placement of vegetative cover layer, the existing clay cap surface grade shall be cleared and stripped in accordance with Sections 02110 and 02221.
- B. The existing clay cap shall be fully inspected to be in accordance with Part 2.1 of this Specification.
- C. If any portions of the clay cap are found to be not in compliance with Part 2.1 of this Specification, the clay cap shall be repaired such that the finished grade is in compliance with Part 2.1 of this Specification.
- D. Any loose or saturated materials exposed in the cap shall be removed, moisture conditioned, replaced and compacted in accordance with Part 2.1 of this Specification.
- E. Any areas showing signs of desiccation cracking should be scarified (ripped), moisture conditioned, and re-compacted in accordance with Part 2.1 of this Specification.
- F. Care should be taken to avoid damaging the existing clay cap, and any damage to existing systems should be promptly repaired at no additional cost to the OWNER.
- G. Verify that the clay cap finished grade is complete and in compliance with slopes and dimensions shown on the Drawings.
- H. Verify clay cap surface is free of ponded water before the vegetative cover layer is placed.
- I. Full compensation for complying with the provisions shall be considered as included in the square foot price for existing clay cap preparation and no additional compensation will be allowed.

3.2 CONSTRUCTION QUALITY ASSURANCE

- A. Construction quality assurance (CQA) will be performed in accordance with the CQA plan.
- B. The OWNER may perform additional testing to determine the conformance of the materials with these Construction Specifications and the Drawings.

3.3 ACCEPTANCE

- A. Contractor retains all ownership and responsibility for the low permeability clay cap until acceptance by the OWNER for placement of overlying vegetative cover layer.

- B. The OWNER's representative will accept the low permeability clay cap when the work is complete, all final as-built surveys have been performed, all required field and laboratory testing is complete, and all other necessary documentation from the OWNER's representative demonstrates compliance with these specifications.

END OF SECTION

SECTION 02224

VEGETATIVE COVER LAYER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vegetative Cover Layer Placement.

1.2 RELATED SECTIONS

- A. Section 02110 – Clearing and Stripping
- B. Section 02221 – Excavating and Stockpiling
- C. Section 02223 – Clay Cap Preparation
- D. Section 02271 – Re-Seeding
- E. Section 02771 – High Performance Turf Reinforcement Mat

1.3 REFERENCES

- A. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- B. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- C. ASTM D2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

PART 2 PRODUCTS

2.1 VEGETATIVE COVER LAYER

- A. Soil material obtained from the previously excavated vegetative cover layer, from a designated borrow area on site or imported soil, as approved by the OWNER and ENGINEER.
- B. Free of frozen material, ice, snow, or excessive moisture.

- C. Maximum particle size of 3 inches.
- D. Containing no sharp rocks, sticks, or other material that may damage the overlying geosynthetics.
- E. The vegetative cover material shall have a minimum relative compaction of 85% and +1 to +3% of the optimum moisture content as determined by ASTM D1557.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to placement of vegetative cover layer, verify that the clay cap has been prepared in accordance with Section 02223 of these Specifications.
- B. Begin vegetative cover layer placement only when the OWNER has accepted the underlying subgrade.
- C. Establish lines and grades by field survey for placement of the vegetative cover layer in accordance with the Drawings and this Specification.

3.2 VEGETATIVE COVER LAYER PLACEMENT

- A. Excavate from the borrow area, import site or approved stockpile, screen or otherwise process the vegetative cover material to meet the requirements of this Specification.
- B. Place vegetative cover layer to the lines and grades shown on the Drawings.
- C. Spread and place in two compacted lifts meeting the minimum depth shown on the Drawings.
- D. Spread and place materials using a dozer or alternative equipment approved by the OWNER's representative.
- E. The final surface of the vegetative cover layer shall be uniform and smooth.
- F. Grade final surface to a vertical tolerance of 0.0 foot to 0.1 foot.
- G. Full compensation for complying with the provisions shall be considered as included in the cubic yard price for replacement of vegetative cover layer and no additional compensation will be allowed.

3.3 FIELD QUALITY CONTROL

- A. Perform as-built surveys to demonstrate and document the vegetative cover layer thickness and limits. Survey is to be performed on the same grid as the clay cap layer survey to allow for point on point verification of the layer thickness.
- B. At the completion of construction, the Contractor shall provide an as-built survey drawing in digital form to the OWNER that includes the survey point data and the contoured topography of the finished surface.

3.4 CONSTRUCTION QUALITY ASSURANCE

- A. Construction Quality Assurance (CQA) will be performed in accordance with the CQA Plan.
- B. The OWNER may perform additional testing to determine the conformance of the materials with these Specifications and the Drawings.
- C. The CONTRACTOR shall cooperate fully with the OWNER in performance of sampling and testing. Include costs for assistance in unit or lump sum prices.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. For permanent and temporary structures, the work shall include the following:
 - 1. Silt Fences (temporary as needed).
 - 2. Straw Bale Barriers (temporary as needed).
 - 3. Erosion Mats (permanent and temporary as needed).
- B. Install erosion and sediment controls (such as temporary silt fences, silt traps, and straw bale barriers) in accordance with the Contractor's Erosion Control Plan (ECP).

1.2 RELATED SECTIONS

- A. Section 02110 – Clearing and Stripping
- B. Section 02221 – Excavating and Stockpiling
- C. Section 02222 – Anchor Trench Backfill
- D. Section 02223 – Clay Cap Preparation
- E. Section 02224 – Vegetative Cover Layer
- F. Section 02271 – Re-Seeding
- G. Section 02771 – High Performance Turf Reinforcement Mat

1.3 REQUIREMENTS

- A. Contractor shall prepare and submit, at least 14 days prior to the start of work, an Erosion Control Plan (ECP) to be implemented during the Work. The ECP shall meet local, State, and federal regulatory requirements, for construction of this project.
- B. Implement erosion control practices and procedures. If the erosion control measures are inadequately maintained, or are found to be inadequate in the field, install additional measures to prevent sediment laden runoff from leaving the site.
- C. Full compensation for complying with the provisions shall be considered as included

in the lump sum price for temporary controls and no additional compensation will be allowed.

1.4 SEQUENCING AND SCHEDULING

- A. All erosion control features must be approved by the OWNER's Representative before beginning site earthwork.
- B. Route runoff from cleared or disturbed areas. Route through temporary sediment traps, straw bale barriers, or silt fences. Place erosion control facilities prior to any earthwork, clearing, and grubbing. It is preferable for construction to progress in an upstream direction starting with downstream erosion control facilities as the first items of construction.
- C. Hydroseed areas between September 15 and November 30, 2014 unless otherwise directed by the OWNER's Representative.
- D. Notify the OWNER's Representative of any soils showing signs of erosion.
- E. Ensure that all waters from any dewatering operations reaching existing water courses meet or exceed the existing quality of the water course.

1.5 REMOVAL OF EROSION CONTROL FACILITIES

- A. Remove all temporary control facilities, 30 days after final completion of work or upon approval by OWNER's Representative. Dispose of used silt fence and supports, straw bales, and sediment traps. Costs for removal of erosion control features are incidental, and shall be included in lump sum or unit costs. Final payment will not be released until this work is completed.

PART 2 PRODUCTS

2.1 GENERAL

- A. Product specifications described below pertain to erosion control facilities shown on the Drawings, if any.

2.2 SILT FENCE

- A. Woven geotextile supplied in minimum 3.5 foot widths and meeting the requirements of Table 02270-1.

TABLE 02270-1
WOVEN GEOTEXTILE PROPERTIES

TEST	TEST DESIGNATION	UNIT	REQUIREMENT
Grab Tensile Elongation	D4632	%	15 min.
Grab Tensile Strength	D4632	lbs	100 min.
Puncture Resistance	D4833	lbs	60 min.
Permittivity	D4491	Sec ⁻¹	0.1 - 0.5
Apparent Opening Size	D4751	mm	0.5 - 0.85
Burst Strength	D3786	psi	190 min.

- B. Support Fence: 2-inch by 2-inch by 14-gage wire mesh fencing in 3-foot-wide rolls.
- C. Posts: 1.5-inch by 1.5-inch by 4-foot-long standard (or better) wooden posts, or 4-foot-long steel fence posts.
- D. Fasteners: Heavy duty wire staples at least 1-inch-long, tie wires, or hog rings.
- E. Gravel Backfill: Drainage gravel material consistent with Caltrans Class 1, Type A.

2.3 STRAW BALE BARRIER

- A. Bales: Straw bales, minimum size 15-inch x 15-inch x 36 inch.
- B. Straw wattles: Straw wrapped in tubular plastic netting to a density of 2.75 pcf, 8-10" diameter.
- C. Posts: Per 2.2.C.

2.4 EROSION CONTROL MAT

- A. Pyramat HP TRM or equivalent high velocity turf reinforcement mat.

PART 3 EXECUTION

3.1 PREPARATION

- A. Contractor shall notify the OWNER's Representative at least 7 days prior to installation of each of the erosion control structures or materials.
- B. Contractor will prepare all soil surfaces in accordance with the Supplier's recommendations and these Specifications.

3.2 SILT FENCE INSTALLATION

- A. Install parallel to slope contours.
- B. Space posts at 6-foot maximum spacing. Drive posts a minimum of 18 inches below the soil surface elevation (outside of final cover system).
- C. Excavate a 12-inch x 6-inch wide trench on the upslope side of the post alignment.
- D. Staple filter fabric to wooden posts using heavy duty 1-inch wire staples or tie the filter fabric to metal posts using wire rings. Space staples or wire rings 8-inches along post.
- E. Extend filter fabric 12-inches into trench, leaving 24 inches of fencing and fabric above ground level.
- F. Backfill trench with Caltrans Class 1, Type A drainage material.
- G. Where joints are necessary, splice filter fabric together only at posts with a minimum 6-inch overlap and both ends securely fastened to the post.
- H. Full compensation for complying with the provisions shall be considered as included in the lump sum price for temporary controls and no additional compensation will be allowed.

3.3 STRAW BALE BARRIER CONSTRUCTION

- A. Excavate a one bale wide strip of soil 4-inches-deep, perpendicular to the flow direction in the channel. Remove all grass and other materials that may allow underflow.
- B. Install straw bales end-to-end, with the bindings oriented horizontally around the sides of the bales. Anchor each bale into trench. Push bales together as firmly as possible.
- C. Chink the gaps between bales with straw to prevent water from escaping between bales. This must be done carefully to avoid separating the bales. Place and compact excavated soils against the upstream side of the straw bale barrier to a height of 4 inches to prevent piping under bales.
- D. Full compensation for complying with the provisions shall be considered as included in the lump sum price for temporary controls and no additional compensation will be allowed.

3.4 EROSION CONTROL MAT

- A. Install erosion control mat at locations, widths, and dimensions shown on the Drawings.
- B. Install, overlap, and anchor erosion control mat in accordance with the Manufacturer's and Supplier's guidelines. Anchoring shall include stapling, nailing, initial anchor trenches, check anchor trenches, longitudinal anchor trenches, and terminal anchor trenches as recommended by the Manufacturer or Supplier.
- C. Full compensation for complying with the provisions shall be considered as included in the lump sum price for temporary controls and no additional compensation will be allowed.

3.5 MAINTENANCE

- A. General Requirements: Observe the facilities during the first storm following construction to ensure that the facilities are properly located, constructed, and operating as designed. Maintain and repair facilities as needed to ensure that they continue to work as designed.
- B. Silt Fence: Check for sagging fences, torn fabric, and signs of erosion and/or sedimentation down slope of the fence. Make repairs as necessary. If the silt fence fails due to storm water runoff inundating the fence, construct additional erosion and sediment control measures to remove sediment from and convey the runoff to downstream drainage facilities. Remove accumulated sediment behind silt fences whenever it reaches approximately one-third the height of the fence.
- C. Temporary Ditches: Remove sediment before it reaches the outlet. The ditch bottom may be over-excavated to provide additional sediment storage.
- D. Straw Bale Barrier: Check for undercutting, damaged bales, evidence of erosion or sedimentation between bales, and "end run" erosion at the ends of the barrier. Make repairs, replace bales, and remove sediment before it reaches approximately one-half the height of the barrier.
- E. Erosion Control Mat: Check for damage, displacement, or unanchored portions of the erosion control mat. Repair, replace, or re-anchor materials as needed.
- F. Full compensation for complying with the provisions shall be considered as included in the lump sum price for temporary controls and no additional compensation will be allowed.

END OF SECTION

SECTION 02271

RE-SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Seeding of final cover surface, disturbed ground, and borrow areas as required by the OWNER. Seeding materials include seed mix, fertilizer, mulch, and tackifier.
- B. 50% of recommended seed mix shall be applied to soil surface prior to HPTRM installation, and 50% of recommended seed mix shall be applied to the surface of the HPTRM after installation.

1.2 RELATED SECTIONS

- A. Section 02110 – Clearing and Stripping
- B. Section 02221 – Excavating and Stockpiling
- C. Section 02224 – Vegetative Cover Layer
- D. Section 02270 – Erosion and Sediment Control
- E. Section 02771 – High Performance Turf Reinforcement Mat (HPTRM)

1.3 DEFINITIONS

- A. Hydraulic Growth Medium (HGM): A hydraulically-applied matrix containing at least 20% by volume of prepackaged decomposed/composted organic fibers accepted as growth mediums, such as compost or peat moss that may or may not contain other materials and tackifiers. An HGM is used to provide a growth medium for seed germination, plant growth/establishment and soil-building characteristics in conditions of marginal or extremely poor soils and where erosion control is required.

1.4 SUBMITTALS

- A. Submit the following 14 days prior to seeding operations.
 - 1. Proposed seed mix.
 - 2. Product data sheet of seed mix.

3. Product data sheet of fertilizer.
4. Product data sheet of mulch.
5. Product data sheet of tackifier.
6. Certifications that seed mix are free of noxious weed seed.
7. Application rates guide, installation and mixing instructions, and product specifications for the HGM.

1.5 DELIVERY, STORAGE & HANDLING

- A. HGM shall be delivered in ultraviolet and weather resistant factory labeled packages and shall be stored in a cool dry place away from open flames ensuring strict adherence to manufacturer recommendations.

1.6 SEEDING WINDOW

- A. Perform seeding operation only during periods when successful results can be obtained (i.e., not during drought or excessive precipitation periods).
- B. Do not conduct seeding operations when soil is frozen or when snow is present.
- C. Do not conduct seedbed preparation, seeding, or mulch application when wind conditions cause the seed/mulch to blow from the intended target.

PART 2 PRODUCTS

2.1 SEED MIX

- A. Native seed varieties from the local Sierra Nevada Foothills Ecoregion stocks, meeting the requirements of Calaveras County shall be used.
- B. Certified free of noxious seed.
- C. The rooting depth of the seed mixture shall not exceed the depth of the 1.0 foot thick vegetative cover layer.
- D. All seed that is required to be labeled under the California Food and Agricultural Code shall be labeled by the vendors supplying the seed. Such labels shall not be removed from seed bags until just prior to their use, and shall be readily accessible for inspection by the OWNER's Representative.
- E. Before seeding, the Contractor shall furnish written evidence (seed label or

letter) to the OWNER's Representative that seed not required to be labeled under the California Food and Agricultural Code conforms to the purity and germination requirements in these specifications.

- F. The purity and germination percentage shall be a minimum of 95%. The percentage of seed germination shall include the germination percentage of any hard seed.
- G. Seed with less than the specified purity or germination may be used under the following conditions:
 - 1. The application rate for such seed shall be increased to compensate for the less than specified purity or germination.
 - 2. Prior to using such seed, the Contractor shall submit the purity and germination percentages to the OWNER's Representative, and the proposed increased application rate for such seed.
 - 3. No such seed shall be used before the OWNER's Representative has approved, in writing, the use of such seed and the increased application rate.
 - 4. The additional seed required because of the increased application rate shall be furnished and supplied at the Contractor's expense.
- H. Seed specified shall be labeled to include the name, date (month and year) collected, and the name and address of the seed supplier. Said seed, at the time of sowing, shall be from the previous or current year's harvest.
- I. All shipments of seed not accompanied by a valid California Nursery Stock Certificate shall be reported to the OWNER's Representative at the point of destination for inspection and shall be held until released by the OWNER's Representative.
- J. Seed treated with mercury compounds shall not be used.
- K. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts, or a seed technologist Certified by Society of Commercial Seed Technologists.
- L. Seed shall have been tested for purity and germination not more than one year prior to application of seed or seed shall be retested at the Contractor's expense.
- M. Results from testing or retesting seed for purity and germination shall be

furnished to the OWNER's Representative prior to applying seed.

2.2 HYDRAULIC GROWTH MEDIUM (HGM)

- A. The HGM shall be 70% by volume of thermally and mechanically processed straw, flexible flax fibers and 30% by volume of sphagnum peat moss or compost. The soil stabilizer and tackifier added to the HGM on the job site shall contain both long chain and cross-linking molecules in conjunction with a hydrocolloid vegetable gum based tackifier to provide effective soil structure stabilization, water infiltration, and most importantly to adhere mulch to the soil surface.
- B. All components of the HGM shall be pre-packaged by the Manufacturer to assure material performance and in compliance with the following values. At no time will field mixing of fibers be allowed.
- C. Laboratory Analysis:

Test Property	Value
Sphagnum Peat Moss, Compost Content	30% Minimum by volume
Thermally and mechanically Processed Straw/Flax Fibers	70% Minimum by volume
Total Organic Matter Content	93% Minimum
Carbon : Nitrogen Ratio	80:1 Maximum
pH	5-8

- D. Tackifier
 - 1. Derived natural organic plant sources containing no growth or germination inhibiting material.
 - 2. Hydrate in water and readily blend with other slurry materials.
- E. Fertilizer
 - 1. Fertilizer as recommended by the seed mix supplier.
- F. Water
 - 1. Obtain from water filling station or pond as approved by OWNER.

2.3 HYDROSEEDING EQUIPMENT

- A. Hydroseeder that utilizes water as carrying agent and maintains continuous agitation of seed mix.
- B. Hydroseeder with operating capacity sufficient to agitate, suspend, and mix specified products into a homogeneous slurry.
- C. Spray nozzles which provide a uniform distribution of slurry.
- D. Hydroseeder tank should be completely free of seed and other products from previous applications prior to use if the current application is different from the immediately previous application.
- E. Alternative application methods other than hydroseeding method described herein may be proposed.

PART 3 EXECUTION

3.1 PREPARATION AND EXAMINATION

- A. Notify OWNER 2 days prior to seeding operations.
- B. Verify areas to receive seed are complete and in accordance with the Drawings and Specifications.
- C. Prepare seedbed by loosening 50 to 75 mm (2 to 3 in) of soil above final grade. This may be accomplished with a rotary tiller on slopes 3H:1V or flatter.
- D. Protect finished graded and prepared areas from damage by vehicular or pedestrian traffic or erosion.
- E. Repair and correct damaged areas prior to seeding at no additional cost to the OWNER.

3.2 APPLICATION RATES

- A. 50% of the total recommended seed mixture shall be applied to the soil surface prior to HPTRM installation. Seed mixture applied to the soil surface may be hydroseed, broadcast or other method approved by the OWNER.
- B. 50% of the total recommended seed mixture shall be applied to the surface of the HPTRM after HPTRM installation using the HGM/hydroseeding application methods.
- C. Seed Mix, mulch, fertilizer, and tackifier application rates as recommended by the seed supplier.

3.3 HYDROSEED APPLICATION

- A. Seeding will only be performed during the times and under the conditions provided in Part 1.6, Seeding Window.
- B. Strictly comply with manufacturer's installation instructions and recommendations.
- C. HGM Mixing:
 - 1. Fill hydroseeder tank with water to a level where the paddles are $\frac{1}{4}$ covered and may be activated.
 - 2. Activate the mechanical agitation system.
 - 3. Prime pump and any discharge hoses before adding any HGMs.
 - 4. Add the appropriate amount and type of soil stabilizer and tackifier as recommended for the site specific application. Allow soil stabilizer and tackifier and water to mix for 5 minutes prior to adding HGMs. Please see manufacturer application rate chart for amounts of specific Soil Stabilizer & Tackifier and HGMs.
 - 5. Continue filling tank with water to approximately $\frac{3}{4}$ full and begin adding bags of HGM.
 - 6. All quantity of HGM should be added before the water level reaches 85% of the tanks capacity.
 - 7. Add seed and/or other amendments to slurry as required.
 - 8. Completely fill tank with water and allow slurry to mix for a minimum of 5 minutes or until all HGM are mixed into a consistent slurry.
- D. HGM Application:
 - 1. Prior to application and mixing of the mulch it is recommended that the site be measured and marked to known areas to ensure appropriate seed, amendment, and HGM application rates.
 - 2. Bring hydroseeder to appropriate operating speed and agitator speed for slurry application.
 - 3. Apply the HGM in a consistent and even manner across soil and/or HPTRM surface at an application rate of 3,933 kg/ha (3,500 lb/ac).
 - 4. Apply the HGM from opposite directions to ensure the highest level of coverage, effectiveness, and performance.

5. Achieve uniform visible coat distributed over entire hydromulch-seeding areas in specified proportions.
 6. If you need to stop spraying at anytime, close the spray nozzle at the end of the hose to avoid water draining from the hose. If you are using a tower applicator, stop normally and upon restart remove the spray tip, discharge a small amount of HGM, replace the tip and return to applying the product.
- E. Do not drive seeding equipment on completed areas.
 - F. Once the top layer has been applied, temporary surficial protection of the HGM should be accomplished. For slope applications, where no concentrated runoff or hydraulic flow is anticipated, the HGM can be protected with a hydraulically applied Bonded Fiber Matrix (BFM) and/or Flexible Growth Medium (FGM). For applications where concentrated runoff or hydraulic flow is expected, then surficial protection should be accomplished using an Erosion Control Blanket (ECB).
 - G. Do not place excessive soil above material.
 - H. Irrigate as necessary to establish and maintain vegetation until 75% of vegetation has established and has reached a height of 2 inches. Frequent, light irrigation will need to be applied to seeded areas if natural rain events have not occurred within two weeks of seeding. When watering seeded areas, use a fine spray to prevent erosion of seeds or soil. Do not over irrigate. Alternate installation methods must be approved by Engineer prior to execution.
 - I. Full compensation for complying with the provisions shall be considered as included in the square foot price for seeding and no additional compensation will be allowed.

3.4 CLEANING AND REPAIR

- A. Remove excess material and waste from site.
- B. Reseed and mulch eroded, damaged, or barren areas prior to completion of the project at no additional cost to OWNER.
- C. Full compensation for complying with the provisions shall be considered as included in the square foot price for seeding and no additional compensation will be allowed.

3.5 QUALITY ASSURANCE

- A. The Construction Quality Assurance (CQA) Engineer shall review the proposed seed mix prior to application.
- B. The CQA Engineer shall inspect seed labels/certifications upon delivery of seed to worksite to ensure compliance with these specifications.
- C. Completed areas will be inspected after seeding operations to ensure that the seeding is uniform and in general compliance with these specifications.

3.6 WARRANTY AND ACCEPTANCE

- A. Completed areas will be inspected after seeding operations by the OWNER. Completed areas will conditionally accepted based on compliance with specified materials, application rates, execution, and maintenance.
- B. All completed areas must be guaranteed for one year from the date of conditional acceptance to be in healthy, stable, and flourishing conditions.
- C. At the end of the one-year warranty period, OWNER and CONTRACTOR will perform additional inspection of completed areas. Repair and/or replace defective areas noted.

END OF SECTION

SECTION 02771

HIGH PERFORMANCE TURF REINFORCEMENT MAT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnishing all materials, equipment, and labor necessary for the installation of an Anchor Reinforced Vegetation System as an erosion control and slope protection solution.

1.2 RELATED SECTIONS

- A. Section 02110 – Clearing and Stripping
- B. Section 02221 – Excavating and Stockpiling
- C. Section 02222 – Anchor Trench Backfill
- D. Section 02223 – Clay Cap Preparation
- E. Section 02224 – Vegetative Cover Layer
- F. Section 02270 – Erosion and Sediment Control
- G. Section 02271 – Re-Seeding

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. A 603-98e1 – Standard Specification for Zinc-Coated Steel Structural Wire Rope.
 - 3. A 1023 – Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.
 - 4. B 85 – Standard Specification for Aluminum-Alloy Die Castings.
 - 5. B 240-10 – Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloys in Ingot Form for Foundry and Die Castings.

6. D 570 - Standard Test Methods for Water Absorption of Plastics.
 7. D 6475 - Standard test Method for Measuring Mass Per Unit Area or Erosion Control Blankets.
 8. D 6524 – Standard Test Method for Stiffness of Geosynthetics Used as Turf Reinforcement Mats.
 9. D 6525 - Standard Test Method for Measuring Nominal Thickness of Permanent Erosion Control Products.
 10. D 6575 – Test Method for Stiffness of Geosynthetics Used as Turf Reinforcements Mats (TRM’s).
 11. D 4354 - Practice for Sampling of Geosynthetics for Testing.
 12. D 4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 13. D 4439 - Terminology for Geotextiles.
 14. D 6818 - Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats.
 15. D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.
 16. D 4759 - Practice for Determining the Specification Conformance of Geosynthetics.
 17. D 4873 - Guide for Identification, Storage, and Handling of Geotextiles.
 18. D 6566 - Test Method for Measuring Mass Per Unit Area of Turf Reinforcement Mats.
- B. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).
- C. International Standards Organization (ISO) 9001:2000 - Quality System Certification.

1.4 DEFINITIONS

- A. Anchor Reinforced Vegetation System (ARVS): A soil protection system combining a High Performance Turf Reinforcement Mat (HPTRM), Securing Pins,

and Earth Percussion Anchors. The system protects soil surfaces from two failure mechanisms: surface erosion (non-structural applications) and shallow plane instability (structural applications).

- B. Certificate of Analysis (COA): An official document certified by an authorized representative within the manufacturer's company that the manufactured synthetic turf reinforcement mat product(s) comply with the testing procedures and requisite results expressly stated within the Manufacturing Quality Control (MQC) program.
- C. Certificate of Conformance (COC): An official document certified by an authorized representative within the manufacturer's company that the manufactured synthetic turf reinforcement mat product(s) meet designated property values as manufactured in a facility having achieved ISO 9001:2000 certification, and tested in accordance with GAI-LAP procedures.
- D. High Performance Turf Reinforcement Mat (HPTRM): A long-term, non-degradable RECP composed of UV-stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature natural vegetation. HPTRMs provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix. The HPTRM MARV tensile strength per ASTM D-6818 is 3000 lbs/ft in the weakest principle direction.
- E. Hydraulic Growth Medium (HGM): A hydraulically-applied matrix containing at least 20% by volume of prepackaged decomposed/composted organic fibers accepted as growth mediums, such as compost or peat moss that may or may not contain other materials and tackifiers. An HGM is used to provide a growth medium for seed germination, plant growth/establishment and soil-building characteristics in conditions of marginal or extremely poor soils and where erosion control is required.
- F. Manufacturer: Entity that produces synthetic turf reinforcement mats through a process directly utilizing obtained raw materials, in a facility owned and operated by said entity, using equipment and assemblies owned and operated by said entity, subject to a certified Manufacturing Quality Control (MQC) Program. Upon completion of production, the manufacturer may sell the turf reinforcement mat product(s) directly to the customer, or through a vendor entity.
- G. Manufacturing Quality Control (MQC) Program: A certified and documented

program initiated and operated by the manufacturer that outlines the operational techniques and activities which sustain a quality of the synthetic turf reinforcement mat product(s) that will satisfy given needs.

- H. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- I. Percussion Driven Earth Anchor (PDEA): A device designed to permanently stabilize soil via a metal cleat, flexible or rigid tendon, and load bearing plate. The anchor is driven through the HPTRM to the specified depth, and then tensioned appropriately to load-lock for desired pull-out resistance.
- J. Rolled Erosion Control Product (RECP): A temporary degradable or long-term non-degradable material manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment and protection of vegetation.
- K. Securing Pin: A device designed to temporarily hold the HPTRM in place while either vegetation establishes, or the installation of the HPTRM occurs. The securing pin offers no long term value to permanent tie-down of the HPTRM in an ARVS.
- L. Trilobal Monofilament Yarn: A multi-dimensional polymer fiber consisting of a minimum of three points, providing increased surface area and grooves/channels along the fiber to capture additional moisture and sediment to enhance vegetative growth.
- M. Typical Roll Value: Property value calculated from average or mean obtained from test data.
- N. Vendor: An entity that provides synthetic turf reinforcement mat product(s) to a customer, on behalf of an independent manufacturer. A vendor does not manufacture the actual synthetic turf reinforcement mat product(s), and therefore is not subject to provisions of a certified MQC Program.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300:
 - 1. Certification:
 - a) The Contractor shall provide the Engineer a certificate of

conformance stating the name of the HPTRM manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the HPTRM.

- b) The Manufacturer is responsible for establishing and maintaining a Quality Control Program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available prior to the approval of the ARVS System for use on the project.
 - c) The manufacturer's certificate of analysis shall state that the furnished HPTRM meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.
 - d) The Contractor shall establish and maintain a quality control procedure to assure compliance of the ARVS with the requirements of the specification. Documentation describing the quality control procedure shall be provided to the Engineer.
2. Manufacturing Quality Control (MQC) test results shall be provided by the manufacturer for the HPTRM component and the anchorage system of the ARVS prior to installation during the duration of the project as material is delivered to the jobsite.
3. Independent Performance Test Results shall be provided upon request.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. HPTRM labeling, shipment and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each HPTRM roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.
- E. During storage, HPTRM rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage,

extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the HPTRM.

1.7 QUALITY ASSURANCE, SAMPLING, TESTING, AND ACCEPTANCE

- A. HPTRM shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.
- B. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All components of the ARVS shall be furnished by a single manufacturer as a complete system.
- B. Approved ARVS Manufacturers:
 - 1. Propex Operating Company, LLC
1110 Market Street, Suite 300
Chattanooga, TN 37402
(800) 621-1273
- C. Substitutions: For consideration, alternate systems meeting the material specification must also have a documented history of ARVS installations totaling more than 350,000 square yards and have been in the marketplace for more than three (3) years. Past project documentation will be required for submittal for evaluation to include project name, date of installation, owner's contact information and size of the project.

2.2 MATERIALS

- A. HPTRM:

1. Three-dimensional, lofty woven polypropylene RECP specially designed for erosion control applications on levees, steep slopes, and vegetated waterways.
2. Matrix composed of Trilobal monofilament yarns woven into uniform configuration of resilient pyramid-like projections that minimize watering requirements while enhancing vegetation establishment.
3. Must be a homogeneous matrix, and not comprised of layers, composites, or discontinuous materials, or otherwise loosely held together by stitched or glued netting.
4. The woven matrix of Trilobal yarns must be heat-set to improve interlock and minimize yarn displacement around anchors and pins, which also results in greater flexibility for improved conformance to uneven surfaces.
5. Material is to exhibit very high interlock and reinforcement capacity with both soil and root systems and demonstrate high tensile modulus.
6. The HPTRM should meet the values listed in Table 02771-1:

**TABLE 02771-1
HPTRM PROPERTIES**

Property	Test Method	Test Parameters	Units	Property Requirement
Mass Per Unit Area ¹	ASTM D-6566	Minimum	g/m ² (oz/yd ²)	457.7 (13.5)
Thickness ¹	ASTM D-6525	Minimum	mm (in)	10.2 (0.40)
Light Penetration ¹ (% Passing)	ASTM D-6567	Maximum	percent	10
Tensile Strength ¹	ASTM D-6818	Minimum	kN/m (lb/ft)	58.4 x 43.8 (4,000 x 3,000)
Tensile Elongation ¹	ASTM D-6818	Maximum	percent	40 x 35
Resiliency ¹	ASTM D-6524	Minimum	percent	80
Flexibility ^{2,3}	ASTM D-6575	Maximum	mg-cm (in-lb)	615,000 (0.534)
UV Resistance ²	ASTM D-4355	Minimum	percent	90 at 6000 hrs

Note:

1. Minimum Average Roll Value (MARV).
2. Typical Value.
3. A smaller value for flexibility denotes a more flexible material.

7. Performance Properties: In a vegetated state, the HPTRM must demonstrate acceptable performance (as defined by the Engineer) when subjected to at least 0.5 hrs of continuous flow producing the following conditions.
 - a) Permissible velocity: 7.6 m/sec (25 ft/sec).
 - b) Permissible tractive force (shear stress): 0.766 kPa (16 psf).
 - c) Performance may be demonstrated by:
 - 1) Flume testing at an independent facility under conditions similar to this project provided that the manufacturer can demonstrate that the material tested is functionally equivalent to the material being supplied. This may be demonstrated by providing index property test results (listed in 2.2.A.4) from a GAI-LAP accredited laboratory for both the tested and supplied materials.
 - 2) A documented case history of successful performance (as defined by the Engineer) at an installation similar to this project where (documented) hydraulic forces met or exceeded the requirements listed above provided that the manufacturer can demonstrate that the case history material is functionally equivalent to the material being supplied. This may be demonstrated by providing index property test results (listed in 2.2.A.4) from a GAI-LAP accredited laboratory for both the case history and supplied materials.
8. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the HPTRM, at frequency exceeding ASTM D-4354, with minimum acceptable testing frequencies listed in Table 02771-2:

TABLE 02771-2
MQC TESTING FREQUENCIES

Property	Test Frequency m² (yd²)
Mass Per Unit Area	1/10,974 (1/13,125)
Thickness	1/10,974 (1/13,125)
Light Penetration (% Passing)	1/10,974 (1/13,125)
Tensile Strength	1/10,974 (1/13,125)
Tensile Elongation	1/10,974 (1/13,125)
Resiliency	1/30,727 (1/36,750)
Flexibility	1/30,727 (1/36,750)
UV Resistance	Annually

2.3 ANCHORING DEVICES

A. Securing Pins:

1. Securing pins should be at least 5 mm (0.20 in.) diameter stainless steel with a 38 mm (1.5 in.) stainless steel washer at the head of the pin. Securing pins should be driven flush to the soil surface.
2. Length: 300 to 600 mm (12 to 24 inches); sufficient ground penetration to resist pullout.
3. Placement: The pins provide for temporary tie-down of the HPTRM to the slope to aid with vegetation establishment. Locations of the pins along trenches are indicated in the drawings at the center of the 0.3 m x 0.3 m (1 ft x 1ft) trench spaced 0.3 m (1 ft) apart. Locations of the pins along the vertical overlaps are spaced 0.3 m (1 ft) apart. HPTRM rolls wider than 3.2 m (10.5 ft) must not have a pin spacing greater than 0.45 m (1.5 ft) in any direction to minimize wrinkling of the material common to wide roll width geosynthetics and the loss of intimate contact beneath the HPTRM.
4. Heavier metal stakes may be required in rocky soils.

B. PDEA:

1. Type B1 PDEA with a minimum drive depth of 36 inches shall be used to provide for permanent tie down of the HPTRM in locations specified in the Drawings.
2. The PDEA components shall be made of materials suitable to resist corrosion and UV degradation particularly at the soil/air interface, and strategically selected to achieve an expected design life of 50 years.
3. The anchor head shall have smooth edges and shaped in a bullet like configuration with the driving end tapering to a rounded point, minimizing abrasion and installation damage to the HPTRM.
4. The top load bearing plate shall have openings allowing vegetative growth through the plate and protrude only about 0.2 inches above the surface of the mat after installation. The plate shall also include a recessed cavity so that the cable can be cut below the plate surface.
5. For quality control purposes and warranty claims, PDEAs should be delivered to the jobsite fully assembled and ready for installation, and meet the requirements listed in Table 02771-3 and Table 02771-4:

**TABLE 02771-3
 PDEA REQUIREMENTS**

Component	Standard(s)	Material Composition	Physical Properties
Anchor Head (Bullet Nose)	ASTM B-85	Aluminum A383 Alloy (Gravity Die Cast)	Width: 25mm (1.0in.) Length: 84mm (3.3in.) Bearing Area: 16cm ² (1.5in ²) Weight: 45grams (0.1 lb.).
Cable Tendon	ASTM A-1023	Zinc-Aluminum Coated Carbon Steel	Diameter: 3mm (0.12 in.) 1X19 Strand Construction
Load Bearing Plate	ASTM B-240-10	Die Cast Zinc with an Eight (8) Opening Array; Utilizing a Ceramic Roller & Directional Locking Device	Diameter: 108mm (4.25 in.) Thickness: 2.5mm (0.1in.)
Tendon Sleeves	MS51844	Zinc-Aluminum	Length: 15.875mm (5/8") in Wall Thickness: 4.8mm (3/16")

6. Performance

**TABLE 02771-4
PDEA PERFORMANCE CRITERIA**

Performance Property	Value
Cable Tendon Working Load Strength	3.56 kN (0.8 Kips)
Cable Tendon Yield Strength	4.89 kN (1.1 Kips)
Composite Anchor Load Strength*	2.22 kN (0.5 Kips)
Minimum Anchor Drive Depth	0.91m (3.0ft.)
Maximum Anchor Drive Depth	1.52m (5.0 ft.)

* Anchor performance is a function of insitu soil strength and therefore the load range in this specification should be regarded as a guide only. Site specific soil conditions shall be evaluated by a licensed geotechnical engineer to determine the anchor type, depth, and pattern to resist slope instability. Pre construction pull tests may be recommended.

PART 3 EXECUTION

3.1 PREPARATION

- A. Grade and compact areas to be treated with ARVS (compacted as indicated or as directed by Engineer). Subgrade shall be uniform and smooth.
- B. Remove large rocks, soil clods, vegetation, and other sharp objects so that the installed mat will have direct contact with the soil surface.
- C. Prepare seedbed by loosening 50 to 75 mm (2 to 3 in) of soil above final grade. This may be accomplished with a rotary tiller on slopes 3H:1V or flatter.
- D. Select and apply soil amendments, fertilizer, and seed (if applicable), (in an amount equivalent to 50% of the total mixture required to be installed on the soil surface) in accordance with Section 02271 Re-Seeding, to scarified surface prior to installation of ARVS. Do not mulch areas where mat is to be placed.
- E. Keep areas moist as necessary to establish vegetation. When watering seeded areas, use fine spray to prevent erosion of seeds or soil. If as a result of rain, prepared seedbed becomes crusted or eroded, or if eroded places, ruts, or depressions exist for any reason, rework soil until smooth and reseed such areas.
- F. Excavate a Crest of Slope (COS) trench 300 mm (12 in.) wide by 300 mm (12 in.) deep, a minimum of 900 mm (3 ft.) over the crest of the slope. Excavate a Toe of Slope (TOS) trench 300 mm (12 in.) wide by 300 mm (12 in.) deep, as shown in the Drawings.

3.2 INSTALLATION

- A. Install ARVS at elevation and alignment indicated in the Drawings.
- B. Beginning at downstream end of the slope, place initial end of first roll of HPTRM into the COS trench and secure with securing pins at 300 mm (12 in) intervals in between PDEAs at 1.2 m (4 ft.) intervals.
- C. Unroll the HPTRM down the slope and secure the HPTRM end in the TOS trench with securing pins at 300 mm (12 in) intervals in between PDEAs at 1.2 m (4 ft.) intervals.
- D. Position adjacent upstream rolls in same manner, overlapping preceding roll minimum 150 mm (6 in) until the armoring limits are completed securing the overlaps with securing pins at 300 mm (12 in) intervals in between PDEAs at 1.5 m (5 ft.) intervals.
- E. Backfill and compact the trenches with specified soil in accordance with Section 02222 of these Specifications, or as directed by Engineer.
- F. Secure HPTRM to the slope with securing pins at a frequency of 2.5 pins per square meter (2 pins per square yard) and PDEAs at a frequency of 0.6 anchors per square meter (0.5 anchors per square yard). Increased anchoring frequency may be required if site conditions are such that the Engineer determines it necessary.
- G. PDEA:
 1. Insert tapered end of the drive steel into the hollow cavity of the anchor head. Position the anchor head/drive steel tip above the ground at the desired location, being careful to lay the cable tendon and load bearing plate off to the side.
 2. Using a percussion hammer, guide the drive steel into the ground perpendicular to the slope surface at a smooth pace. Continue driving until the desired embedment depth is reached. Be careful not to allow the plate to slip downward along the cable tendon during this step. Remove the plastic stop sleeve from under the plate after desired embedment depth is reached.
 3. Remove the drive steel from the ground. Depending on soil conditions, this may require the use of a setting tool or metal bar for leverage.

4. Slide the load bearing plate down the anchor tendon towards the slope surface manually.
 5. When the plate is close to the slope surface, stand on the anchor plate and insert the setting tool into the loop at the top of the anchor tendon, keeping the anchor tendon perpendicular to the slope surface. With gentle force, slowly start to pull upwards – away from the slope surface – causing the anchor tendon to start to move out of the ground. During this step, the anchor head will turn in the ground – a process known as “anchor setting”. The change in embedment depth to set a Type B1 Anchor is approximately 2 inches.
 6. To load-lock an anchor, continue to apply tension to the anchor tendon using the setting tool without changing the embedment depth any further. While the tendon is in tension, gently tap the anchor plate down with a rubber mallet, creating a slight depression on the slope surface.
 7. Once anchors have been load-locked, cut off the excess looped anchor tendon flush to the plate at the slope surface using wire cutters.
- H. Alternate installation methods must be approved by Engineer prior to execution.
- I. Hydraulically apply HGM and seed to the ARVS in accordance with Section 02271 – Re-Seeding:
- I. Rubber-tired vehicles must be used, and sharp turns avoided. No heavy and/or tracked equipment or sharp turns are permitted on the installed HPTRM. Avoid ANY traffic over the HPTRM if loose or wet soil conditions exist.
 - J. Do not place excessive soil above material.
 - K. Full compensation for complying with the provisions shall be considered as included in the square foot price for the high performance turf reinforcement mat and no additional compensation will be allowed.

3.3 REPAIRS

- A. Repair holes, burn-outs or tears in HPTRM with a patch from the same HPTRM material, by sewing or heat welding in place with a minimum seam overlap of 12 inches in all directions.
- B. Remove any soil or other material which may have penetrated the torn HPTRM.
- C. Notify OWNER and CQA Consultant of all repairs.

3.4 ACCEPTANCE

- A. CONTRACTOR retains all responsibility for HPTRM until acceptance by OWNER.
- B. OWNER accepts installed HPTRM when all the following have been completed:
 - 1. The installation is complete.
 - 2. Documentation of installation is complete including the CQA consultant's final report.
 - 3. Verification of the adequacy of all seams, anchors, and repairs, including associated testing, is complete.
 - 4. Written certification documents have been received by the OWNER.

END OF SECTION