MEMORANDUM

TO: SLDMWA Board of Directors, Alternates

FROM: Pablo Arroyave, Chief Operating Officer

DATE: December 8, 2022

RE: Authorization to Execute Amendment to Professional Services Agreement for DMC Subsidence Mitigation Geotechnical Exploration Work, Issue Notice to Proceed for Phases 2 and 3, and Expend up to $2,708,556

BACKGROUND

The DMC Subsidence Correction Project is a high priority project established to restore the conveyance capacity of the Delta-Mendota Canal. The San Luis & Delta-Mendota Water Authority (Authority) has been collaborating closely with Reclamation on the project and is currently collecting data that will be used to inform the final design phase. Last year, staff approached the Board with a three-phased geotechnical exploration program to collect preliminary data to inform the Feasibility Study alternatives. On May 6, 2021, the Board of Directors authorized the Chief Operating Officer to execute a Professional Services Agreement with Terracon, issue a notice to proceed for Phase 1 work, and file a notice of exemption for the geotechnical work under the California Environmental Quality Act (CEQA).

Contractor Terracon completed Phase 1 work on time and under budget, and worked diligently with Reclamation and Authority staff to streamline information sharing. Both Reclamation and the Authority were pleased with the results of Terracon's effort.

As a result of data gathered and lessons learned during Phase 1, staff is proposing an amendment to the current Professional Services Agreement to include certain modifications to Phases 2 and 3 as allowed per Section 10.0 of Exhibit A (Scope of Services) to the current agreement. The modifications are within the general scope of work currently in the contract but involve adjustments to obtain more complete information. Modifications include adjustments to sampling depths, testing plan submittal requirements, soil sample storage containers, and the addition of test pits and associated soil testing as a part of Phase 3. The test pit locations are within the existing project boundaries established in Phase 1 and utilize the established labor and testing rates.

In addition, although original agreement language envisioned separate notices to proceed for Phases 2 and 3, staff now proposes to issue notices to proceed for Phases 2 and 3 concurrently

to allow the work to be done in the most efficient and effective manner. Terracon has demonstrated an ability to perform the work concurrently and critical time will be saved by issuing a notice to proceed for both Phases 2 and 3. During Phase 1, Terracon developed a cost estimate for Phases 2 & 3, as provided in its contract. Terracon has proposed to do the Phase 2 and 3 work, including the additional work indicated in the recommended amendment, for a total of $2,708,556. Staff has determined that the cost estimate is consistent with Terracon's rates for Phase 1, adjusted for reasonable cost inflation/CPI adjustments, and the additional work proposed. In addition, the budget is within the grant amount staff anticipate receiving from Reclamation.

SCOPE OF WORK DETAILS

The primary objective of the geotechnical exploration work is to collect subsurface data that will enable the Authority and Reclamation to characterize subsurface conditions at canal embankments, lining, and structures impacted by subsidence and evaluate geotechnical engineering parameters to be used in defining the subsidence correction project and identifying areas susceptible to erosion of earthen embankment and concrete lining distress.

Phases 2 and 3 include 147 exploratory borings, 89 cone penetrating tests, installation of 36 observation wells, observation and evaluation of 58 Authority excavated test pits, and associated laboratory testing of the soil samples. Deliverables from Phases 2 and 3 include a draft and final Geotechnical Data Report and a comprehensive Characterization Report that summarizes all phases.

Terracon estimates that the combined Phase 2 and 3 effort will take approximately 12 months to complete from the Notice to Proceed to the Final Characterization Report Deliverable. As data is collected by Terracon, it will be shared with Reclamation engineers to support their cost estimates, refine the alternatives in the Feasibility Study, and provide critical data necessary for Final Design.

CEQA Notices of Exemption were filed for the entirety of the geotechnical exploration work with the relevant counties prior to beginning Phase 1 work. The work is exempt from CEQA because it involves minor alterations in the condition of land, water, and vegetation (minor trenching and backfilling where the surface is restored) and consists of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. No new Notices of Exemption will be filed.

ISSUE FOR DECISION

Whether the Board of Directors should authorize execution of an Amendment to the Professional Services Agreement for DMC Subsidence Mitigation Geotechnical Exploration Work, issuance of a Notice to Proceed for Phases 2 and 3, and expenditure of up to $2,708,556.

RECOMMENDATION

Staff recommends that the Board of Directors authorize execution of an Amendment to the Professional Services Agreement for DMC Subsidence Mitigation Geotechnical Exploration Work, issuance of a Notice to Proceed for Phases 2 and 3, and expenditure of up to $2,708,556, with the expectation that a Financial Assistance Agreement will be brought back to the Board for future action.

BUDGET IMPLICATIONS

Although the Authority will initially utilize Fiscal Years 2021 and 2022 EO&M funds to pay for work on Phases 2 and 3, the Authority understands that Reclamation intends to provide non-reimbursable funds to cover the entirety of the cost for Phases 2 and 3 of the geotechnical exploration work through a Financial Assistance Agreement. Authority staff is currently working with Reclamation on a draft Financial Assistance Agreement, which is expected to be brought to the Authority Board of Directors for action in February or March, 2023. Upon receipt of funds from Reclamation, any budget impact will be eliminated.

ATTACHMENTS

1) Draft Amendment to Professional Services Agreement
2) Draft Notice to Proceed

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY

FIRST AMENDMENT TO AGREEMENT
FOR PROFESSIONAL SERVICES
for
DMC Subsidence Mitigation Geotechnical Exploration
Agreement No.: F22-DMC-047

This First Amendment to Agreement No. F22-DMC-047 is made and entered into effective _____ by and between San Luis & Delta-Mendota Water Authority ("Authority") and Terracon Consultants, Inc., ("Consultant").

WHEREAS, on May 06, 2021, Authority and Consultant entered into an Agreement whereby Consultant would perform professional services; and

WHEREAS, the parties now agree that a First Amendment to said Agreement is advisable;

NOW, THEREFORE, THE PARTIES ENTER INTO THIS FIRST AMENDMENT TO AGREEMENT WITH THE CHANGES OUTLINED BELOW:

1. **Modify Exhibit A - Scope of Services to revise the scope of services in Phase 2 and Phase 3. A redline indicating the changes in work on Exhibit A is attached as Attachment 1. The Amended Scope of Work and Phases 2 and 3 tables attached as Attachment 2 shall replace Exhibit A in the Agreement.**

2. **Modify Exhibit C – Fees, Hourly Rates and Reimbursable Costs/Expenses to add the budget for phases 2 and 3 of not to exceed $2,708,556.00. Amended Exhibit C, attached as Attachment 3 hereto, shall replace Exhibit C in the Agreement.**

3. **Modify Section 2 Term of Agreement to revise the completion date and read as follows:**

   This agreement shall become effective as of the date indicated and shall continue until the earlier of the completion of all required services, or June 10, 2024, unless earlier terminated by its terms. Work must be limited to daylight hours throughout the project.

All other tasks, terms and conditions on original agreement remain unchanged.

IN WITNESS WHEREOF, this Amendment has been executed by and on behalf of the parties hereto, the day, month and year so indicated above. If Consultant is a corporation, partnership or limited liability company, documentation must be provided that the person signing below for Consultant has the authority to do so and to so bind Consultant to the terms of this Agreement.

Consultant	San Luis & Delta-Mendota Water Authority
By: _____ Signature _____ Title _____ Print Name _____ Company Name	By:_____ Pablo R. Arroyave Chief Operating Officer San Luis & Delta-Mendota Water Authority

ATTACHMENT 1

EXHIBIT A – SCOPE OF SERVICES

1.0 Scope Summary

The anticipated work to be completed includes cone penetration tests (CPTs), exploratory drill holes, and test pits divided into three (3) phases of work as shown in Appendix A. Work will also include standard penetration tests (SPTs) and soil sampling in all the drill holes, standpipe observation well installations in specified drill holes, downhole seismic testing and pore pressure dissipation testing in specified CPT holes, laboratory testing, a Geotechnical Data Report, and a Geological Characterization Report.

The scope of work is summarized in this section. The requirements for the work are specified in Section 2.0 and deliverables are specified in Section 3.0. The explorations and testing are divided into phases of work, summarized in Appendix A. The intent of the work is to provide Authority and Reclamation with data to inform characterization of the subsurface conditions at canal embankments, lining, and structures impacted by subsidence. Geotechnical analyses of the data other than that specified herein, or design recommendations are not part of the scope.

The scope of work for all phases includes:

1. Kickoff meeting and any other reasonably required meetings necessary to discuss work requirements, coordination, and performance of the work.
2. Submit proposed exploration and testing schedule.
3. Utility clearances for applicable drill hole, CPT, and test pit locations.
4. Permitting of groundwater observation wells and explorations with any applicable local and state agencies.
5. Traffic control, establishing temporary perimeters, and all other measures to ensure that work at exploration locations adjacent to public roadways or areas otherwise accessible to the public is safely performed.
6. Exploratory CPTs (identified as "CPT-###"), drill holes (identified as "DH-###"), and test pits (identified as "TP-###") at designated locations. See the tables in Appendix A for anticipated exploration locations. The Consultant is responsible for evaluating the site conditions, access, and utilities at each targeted exploration location identified herein, and determining the actual exploration locations, subject to Authority approval, as specified in Section 2.0. Drill holes, CPTs, and test pits shall be performed, as described in Section 2.0. The scope of this task is anticipated to include the following:
    a. CPTs with pore pressure dissipation measurements and downhole seismic testing per Appendix A. Maximum individual CPT target depth is 35 feet. See Section 2.1 for relevant work requirements.
    b. Grout backfill of CPT holes. See Section 2.4 for relevant work requirements.
    c. Drill Hole Sampling Plan. See Section 2.2 for relevant work requirements and Section 3.2 for deliverable requirements.
    d. Hollow-stem auger drill holes with a maximum individual drill hole depth anticipated at 120 feet. See Section 2.2 for relevant work requirements.
    e. Completion of selected drill holes, per Appendix A, as standpipe groundwater observation wells with lockable steel flush-mounted surface cover. See Section 2.4 for relevant work requirements.
    f. Backfill of the drill holes that are not completed as observation wells. See Section 2.4 for relevant work requirements.
    g. Collection of bulk samples from all drill holes, drive samples using a combination

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of split-barrel SPT and modified California samplers in all drill holes, intact samples using Shelby tube samplers in all drill holes, and continuous flight auger dry core samples in selected drill holes per Appendix A. See Section 2.2 for relevant work requirements.

h. Log, describe, and photograph subsurface conditions encountered, samples, and drilling activities at each drill hole. See Sections 2.5, 2.6, and 2.7 for relevant work requirements.

i. Laboratory Testing Plan. See Section 2.8 for relevant work requirements and section 3.2 for deliverable requirements.

j. Test pits with a maximum anticipated depth of 20 feet. See Section 2.3 for relevant work requirements.

k. Backfill of the test pits. See Section 2.3 for relevant work requirements.

l. Collection of bulk samples from all test pits per Appendix A. See Section 2.3 for relevant work requirements.

m. Log, describe, and photograph subsurface conditions encountered, samples, and excavation activities at each test pit. See Sections 2.5, 2.6, and 2.7 for relevant work requirements.

n. Survey locations of all CPT, drill hole, and test pit explorations.

7. Perform laboratory testing as identified in the table in Appendix A and specified herein, on selected representative soil samples recovered from drill holes and test pits. See Section 2.8 for relevant work requirements.

8. Interim reporting of draft CPT logs within three (3) business days of completing each CPT, draft drill hole and test pit logs on a weekly basis within eight (8) calendar days of each drill hole completion, and quality-controlled laboratory test results within five (5) business days of each test completion. See Section 3.3 for deliverable requirements.

9. Development of a Draft and Final Geotechnical Data Report for all work including description of exploration and testing methods, logs of explorations, photographs of recovered samples, laboratory test results, and other collected data. See Section 3.4 for deliverable requirements.

10. Development of a Draft and Final Geological Characterization Report for selected explorations and testing from Phase 3 only, including brief summary of exploration and testing methods, logs of explorations, laboratory test results, geologic cross sections showing results of explorations at selected structures, and other collected data. See Section 3.5 for deliverable requirements.

Consultant agrees to perform all work reasonably understood to be necessary to complete the work in the Agreement, even if the tasks are not specifically enumerated in the Agreement. No extra compensation will be allowed for anything omitted but fairly implied to be included in the Scope of Services.

2.0 Work Requirements

The Consultant shall provide all labor, equipment, materials, etc., required to accomplish the work requirements and schedule specified herein.

Within ten (10) calendar days of contract award, the Consultant shall hold a kickoff meeting via teleconference or videoconference including Consultant, Authority, and Reclamation representatives, to discuss the project schedule, communication plan, contract roles and responsibilities, review of the contract scope of work, proposed exploration and sampling methods and locations, procedures for selection of laboratory test samples, and drill hole, test pit, and CPT completion.

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After the kickoff meeting and prior to mobilizing for field exploration work, the Contractor shall submit a proposed schedule for completing individual field explorations identified in Appendix A and laboratory testing. The schedule shall be revised weekly based on actual progress and resulting changes.

After the kickoff meeting and prior to commencing field exploration work, the Consultant shall perform a site visit to evaluate site conditions and access constraints, mark proposed drill hole locations, submit the utility locate tickets, and coordinate utility clearances for exploration locations. The Consultant is responsible for determining the actual exploration locations, subject to Authority and Reclamation approval. Actual exploration locations shall be within the Reclamation right of way (ROW) and within 100 feet of the locations shown on the tables included in Appendix A. Where explorations are targeted at features identified as structures in the Appendix A tables, explorations shall be located as close as practical to the existing structure, but with a minimum setback distance of 10 feet from the structure. If the Consultant determines that there is a need to move explorations from the targeted locations identified herein, the Consultant shall submit a location map or coordinates for the proposed exploration location, including the exploration name, the location identified herein, and the reason for change to the location. The Consultant is responsible for obtaining any local or state permits required for each exploration location.

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Portions of the field exploration work will be performed adjacent to public roadways and on Operation and Maintenance (O&M) roads that may be accessible to the public. Prior to the start of explorations, the Consultant shall establish a perimeter around such work areas to restrict public access. Authority employees regularly travel the O&M roads, and shall be given through access at all times unless and only to the extent that access would compromise the safety of Consultant and/or Authority personnel. The Consultant is responsible for the barriers and signage to restrict public access to the work areas.

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The perimeter shall be marked with a physical barrier and signage at appropriate distances to notify the public to avoid the active work areas. Field explorations along public roadways shall be performed outside the roadway easement; however, some explorations may be located near the roadway shoulder, in which case the Consultant shall provide traffic control to comply with all local, State, and Federal requirements for the work.

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The Consultant shall survey the location of each completed CPT, drill hole, and test pit using a hand- held GPS device with 3-foot or better horizontal accuracy and mark the locations with survey marking paint.

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2.1 CPTs

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The Consultant shall perform CPTs in accordance with ASTM D5778 at each of the approximate CPT locations identified in the tables in Appendix A, with pore pressure measurements in all of the CPTs and pore pressure dissipation testing in those CPTs specified in the table in Appendix A. At least one pore pressure dissipation test shall be performed below the groundwater table per CPT and one additional pore pressure dissipation test shall be performed per each 30 feet of CPT depth below the groundwater table. Pore pressure dissipation testing shall be performed within fine-grained soil layers encountered below the water table and shall be run to pore pressure equilibrium or terminated at 60 minutes' duration if equilibrium is not reached. The down pressure shall be maintained during dissipation testing by clamping the CPT rods to avoid unloading and associated drop in pore pressure. Upon completion of each CPT and removal of the cone, and prior to backfill, the Consultant shall attempt to measure the groundwater in the open CPT hole using an electronic water level sounding device and record the depth of groundwater in the hole or the depth at which collapse of the hole prevented further lowering of the device.

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The Consultant shall commence testing at a depth no greater than 2 feet and attempt to advance the CPTs to the target depths identified for each CPT in the table in Appendix A, or terminate the CPT at practical refusal depth if less than full target depth. The CPT cone used shall not be larger than 3-

inches in diameter.

At CPT locations on the O&M road that are asphalted, the Consultant shall core, saw, or punch through the existing asphalt chip seal paving surface prior to performing each CPT located thereon. Where the asphaltic chip seal surface is encountered on the surface at exploration locations, the Consultant shall restore the paving surface using cold-mix asphalt patch. Additional information regarding CPT completion is included in Section 2.1.

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The Consultant shall perform the CPTs as identified in the tables in Appendix A. The Consultant shall not proceed with CPTs until given Notice to Proceed. Where CPTs are located next to companion drill holes, the Consultant shall perform the CPT prior to drilling the companion hole and shall use the results of the CPT to target specific intact sampling depth(s) and methods in the companion drill hole, subject to approval by Authority. The anticipated quantities of CPTs and downhole seismic tests are listed in Appendix A.

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2.2 Drill Holes

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The Consultant shall drill exploratory hollow stem auger drill holes according to ASTM D6151 at the approximate locations shown on the tables in Appendix A (identified as "DH-###"). The Consultant shall advance the drill holes to the target depths identified for each in the table in Appendix A, or terminate the drill hole at practical refusal depth if less than full target depth, except where rock core drilling is required. Refusal of auger drilling shall be considered advance of less than 6 inches depth per 10 minutes while operating the drill rig at a reasonable level of effort consistent with the equipment specifications for torque, rotary speed, and down pressure, or 50 SPT blow counts per 1 inch, whichever is encountered first. CPT refusal shall be considered no advance with maximum down pressure of the equipment. The Consultant shall make reasonable efforts to advance the drill holes, CPTs, and sampling to the proposed depths, but should not operate their equipment to the point of causing equipment damage when practical refusal is apparent to the operator prior to meeting the refusal criteria. The Authority will not reimburse the Consultant for equipment damaged in performing the work. Outside diameter of augers used for exploratory drill holes shall not be greater than 10 inches.

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The Consultant shall collect bulk samples of each unique material type recovered from auger cuttings. The Consultant shall collect continuous flight auger dry core (FADC) samples, in accordance with ASTM D6151 and Reclamation's Earth Manual, Part 2, Third Edition, USBR 7105 (https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/earth2.pdf), throughout the full depth of selected drill holes identified in the tables in Appendix A. The Consultant shall collect drive samples at 5-foot vertical spacing throughout the full depth of each drill hole. The Consultant shall use an automatic hammer to perform all drive sampling and shall provide documentation of hammer energy transfer rate, per ASTM D4633, from within the 12 months prior to mobilization for this work. The Consultant shall terminate drive sampling at each 5-foot depth interval upon refusal, based on a criterion of 50 hammer blows with advance less than 6 inches. The Consultant shall add water to the hollow-stem augers when drilling and sampling in sands below the water table to avoid heaving sands. The Consultant shall perform drive sampling primarily using SPTs according to ASTM D1586 with a standard 1.375-inch internal diameter, 18-inch sample length split-barrel sampler. The Consultant may perform drive sampling using a split-barrel sampling according to ASTM D3550 with a standard 2.4- inch diameter, 18-inch sample length Modified California sampler in only those drill holes where continuous FADC is not specified and only with the Authority and Reclamation approval of Modified California sampling in the Drill Hole Sampling Plan for the specific drill hole. SPT sampling is the preferred method for use in liquefaction calculations and shall be used in each drill hole for the majority of sampling; however, Modified California sampling may be used to obtain disturbed liner samples where acceptable for specific laboratory tests, as specified in Section 2.8. The Consultant shall provide adequate equipment to allow for the aforementioned sampling methods in relevant drill holes and shall alternate between drive samplers as deemed appropriate based on the conditions encountered, to provide adequate

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SPTs in granular soil layers to allow for liquefaction analyses, and to provide adequate split-barrel liner samples for the specified laboratory testing of samples from drill holes where continuous FADC is not specified. In drill holes where FADC is specified, Lexan lining tube sampling shall be used to obtain adequate intact samples for laboratory testing. The Consultant shall perform intact sampling per ASTM D1587 with 3-inch outside diameter Shelby tubes within fine-grained soil layers and shall collect a minimum number of intact fine-grained soil Shelby tube samples at separate depths within each drill hole as identified in the table in Appendix A, or more Shelby tube samples as required to obtain adequate quantity of specimens for the laboratory testing as identified in Appendix A and specified in Section 2.8. In drill holes where FADC is specified and soil conditions result in poor Shelby tube sample recovery, the Consultant shall use Lexan liner tubes within the FADC barrel in targeted sampling intervals to supplement Shelby tube sampling and obtain adequate quantities of intact samples for the required laboratory testing. Intact sampling in fine-grained soil layers shall be targeted based on the results of companion CPTs nearest to each drill hole or the drilling conditions encountered in the drill hole and other drill holes nearby, subject to approval by Authority and Reclamation.

In selected drill holes specified in Attachment A, the Consultant shall transition from hollow stem auger drilling to rock core drilling at or near the top of bedrock contact and collect rock core samples for the remaining depth of the drill hole, or for minimum of 10 feet into sound bedrock, whichever is deeper. Rock core drilling shall be performed in accordance with ASTM D2113, using triple tube core barrels with H-size or larger and maximum 5-foot core runs. All rock core samples collected shall be logged as specified in Section 2.5 and 2.6, and stored in core boxes purpose-built for the size of rock core sampled. The Consultant shall preserve and transport all rock core in accordance with ASTM D5079.

The Consultant shall submit for approval a brief Drill Hole Sampling Plan for each drill hole at least two full business days prior to the start of drilling, including the proposed schedule for drilling, sampling procedures and equipment, and with target intact Shelby tube sampling depths. The Authority and Reclamation will review the Drill Hole Sampling Plan prior to the proposed time of drilling. The Drill Hole Sampling Plan shall describe the equipment and methods to be used for sampling, hammer energy transfer rate documentation for the drill rig(s) to be used for the work, criteria used to identify targeted depths for intact sampling to obtain laboratory test samples of fine-grained soils in each drill hole (e.g., completed CPT or drill hole data), and specific targeted sampling depths for each drill hole. The Consultant shall not proceed with drilling each hole until the Authority and Reclamation have approved the Drill Hole Sampling Plan for the drill hole.

At drill hole locations on the O&M road that contain asphalt, the Consultant shall core through the existing asphalt chip seal paving surface prior to performing each drill hole thereon. Where the asphaltic chip seal surface is encountered at the surface, the Consultant shall restore the paving surface using cold-mix asphalt patch.

The Consultant shall complete selected drill holes as standpipe groundwater observation wells as identified in Appendix A. Additional information regarding completion of observation wells and other drill holes is included in Section 2.4.

The Consultant shall perform the drill holes as identified in the tables in Appendix A. Explorations may be performed concurrently, except where CPTs are paired with companion drill holes, the Consultant shall complete the CPT prior to performing the companion drill hole in order to use the CPT data to target sampling methods at specific depths within the companion drill hole. The Consultant shall not proceed with work until Notice to Proceed is issued. The anticipated quantities of drill holes and observation wells are listed in Appendix A.

2.3 Test Pits

The Consultant shall coordinate, direct, oversee, and document all test pit excavation activities. The Authority will provide an excavator and equipment operator for the test pit excavation work. The

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Consultant shall coordinate with the Authority on the schedule, locations, access, depths of excavation, backfill, and other details regarding the test pit excavation.

Anticipated test pits locations are shown in Appendix A. The Consultant shall be responsible for determining the locations (within 200 feet of the location shown and subject to Authority approval), dimensions, and depths of test pits to obtain representative samples of the soils deposited in the existing waste piles along the canal.

The test pits shall be excavated and sampled to the maximum depths identified in the attached table, or to the maximum reach of the Authority equipment provided, or to the contact between the waste pile fill materials and underlying native soils, whichever is less. The exact depths to native soils beneath the soil waste pile materials at test pit locations are not known. The intent of the work is to log, photograph, and sample the waste pile materials, but not the underlying native soils. The Consultant shall be responsible for interpreting the approximate depth of contact between the waste pile fill materials and the underlying native soils prior to test pit excavation or where encountered during test pit excavation at each site. The Consultant shall stop excavation activities in each test pit if and when the native soils are encountered. There may be uncertainty in the interpretation of the location of contact between the soil waste pile materials and underlying native soils during test pit excavation, but a reasonable good faith effort shall be made to terminate the excavation at or above the contact between the waste pile materials and the native soils. All test pits shall have a surface footprint no greater than 5 feet by 20 feet.

No shoring will be provided for the test pit excavations. The contractor shall perform test pit logging and photographing from the existing ground surface, not within the test pits. The contractor shall perform in place density testing using the sand cone method (ASTM D1556) in the upper several feet of selected test pits, as identified in Appendix A, prior to excavating the test pit to a depth at which shoring or sloping would be required for entry in accordance with Occupational Safety and Health Administration 29 CFR Part 1926 Subpart P, and any other relevant federal, state, and local regulations. Bulk samples shall be collected from excavated materials placed on the ground surface near the test pits. The Contractor shall be responsible for the safety of Contractor personnel around the open, unsupported test pit excavations and equipment, and shall furnish all safety equipment and training necessary to perform the work in accordance with all Federal, State, and Local regulations and requirements of the Reclamation Safety and Health Standards and Occupational Safety and Health Standards.

The Consultant shall log and photograph the test pits, and collect representative bulk samples from each unique soil type encountered within each test pit excavation. The Contractor shall take care to obtain representative samples of each unique material strata and accurately log the depths from which each sample was collected. The Contractor shall direct the equipment operator to place different materials excavated from separate strata in separate piles to avoid cross contamination or blending of materials prior to sampling.

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2.4 Observation Wells and Drill Hole, Test Pit, and CPT Completion

Prior to performing exploratory drilling, the Consultant shall obtain any necessary permits for completion of the identified drill holes as groundwater observation wells. The Consultant shall design and construct the observation wells based on the conditions encountered and in accordance with all permit requirements, California Department of Water Resources Well Standards, and relevant manufacturer's recommendations, to allow observation of groundwater levels in the observation wells after completion (initial reading by Consultant subsequent readings by others). Observation wells shall be constructed of minimum 2-inch diameter slotted PVC pipe surrounded by a sand filter pack and sealed at the surface with hydrated bentonite chips. The Contractor shall propose screening depths of each observation well in the Drilling and Sampling Plan for each, subject to the approval of the Authority and Reclamation. The lower extent of screened intervals shall be the full target depth, unless otherwise specified or directed by the Authority or Reclamation.

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The extents of screened intervals may be adjusted in the field to suit the conditions encountered in the drill hole based on the professional judgment of the Qualified Representative on site. The observation wells installed where the O&M road is not paved shall be located a minimum of 5 feet off the O&M road with two yellow bollards installed for protection. Unless otherwise specified, assume that all observation wells shall extend to full depths of the drill holes. The Consultant shall develop the observation wells in accordance with ASTM D5521 and continue well development until purged water is visibly clear or the turbidity of the purged water stabilizes to a point of diminishing returns based on the professional judgment of the Qualified Representative. The Consultant shall take at least one reading of the groundwater level within each observation well using an electronic water level sounding device following completion and stabilization of the groundwater level. The Consultant shall install a traffic-rated, flush-mounted steel manhole with lockable cover and concrete collar at each observation well and provide at least two (2) key(s) to Authority. The concrete collars shall be sloped to drain away from the manhole to prevent storm water runoff collecting in the manhole.

At each drill hole that is not completed as a groundwater observation well, the Consultant shall completely backfill the drill hole in accordance with any applicable local, state, and federal regulations and permit requirements, with a minimum 6 inches of aggregate base course at the surface to match the existing grade. In all drill holes where canal embankment fill is encountered, the Consultant shall backfill with cement-bentonite (approximately 1:1 ratio) grout the portion of the drill hole within the embankment fill depths and a minimum of 5 feet below the embankment fill, into the underlining foundation.

Upon completion of the logging, photographing, and sampling of each test pit, the Contractor shall direct the Authority equipment operator to backfill the test pit. The test pits shall be backfilled with the excavated material, tamped with the excavator bucket to compact the backfill, and smoothed with the excavator bucket to restore the area to within 1 foot of original ground surface grade prior to test pit excavation. The Contractor shall oversee the backfill of each test pit and confirm backfill in accordance with these requirements prior to directing the equipment operator to the subsequent test pit location.

Upon completion of each CPT, the Consultant shall completely backfill the CPT hole with cement-bentonite (approximately 1:1 ratio) grout placed by tremie grouting using the re-entry method, and with a minimum 6 inches of aggregate base course at the top to match the existing grade.

Unless otherwise directed by Authority, excess drill cuttings remaining after the completion of each drill hole may be spread out on the ground near the drilling site. Drill cuttings shall be spread only within the Reclamation ROW, but shall not be placed on any existing O&M road, embankment crest, within the canal prism, within natural or manmade drainages, on or within 5 feet of any existing structures, or in any environmentally sensitive areas. Environmentally sensitive areas will be marked in the field with survey flags and the approximate coordinates of these areas will be provided to the Consultant by the Authority once pre-work biological surveys are completed. Drilling sites shall not be located within environmentally sensitive areas.

2.5 Required Data Collection

An experienced and qualified field geologist or engineer (Qualified Representative) shall be onsite to monitor all work and shall be responsible for collecting data during the CPTs, drilling and sampling, SPTs, test pit excavation, soil classification and description, sample preservation, completion of the groundwater observation wells, and backfill of the CPTs, drill holes, and test pits. The Consultant shall provide one Qualified Representative at each drill rig and excavator, who shall be present full time during the work at each drill hole location. The Consultant shall provide multiple Qualified Representatives (one per drill hole) if work is performed concurrently at multiple drill holes. Full time oversight of the CPT work by a Qualified Representative is not required. The Consultant may choose to have a Qualified Representative oversee one or more CPT rigs at their

discretion.

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The Qualified Representative shall collect all required exploration data to develop drill hole and test pit logs. During SPTs and other drive sampling, the Qualified Representative shall record blow counts per each 6-inch depth interval, photograph the soil samples while still within the sampling equipment, and collect the required data specified herein. During test pit excavation, the Qualified Representative shall log and photograph the test pits, collect representative samples from each unique material type

encountered in each test pit, and collect the required data specified herein. The Qualified Representative shall describe each soil type encountered in drill holes and test pits according to Unified Soil Classification System (USCS) visual-manual classification methods specified in ASTM D2488.

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Minimum soil classification data requirements for documentation in drill hole and test pit logs are specified in Section 2.6 and requirements for sample photography are specified in Section 2.7. The Qualified Representative(s) shall document the depth to groundwater, if encountered in drill holes or test pits, as measured during or after drilling using a using an electronic water level sounding device. The Qualified Representative(s) shall document the total depth of the drill hole or test pit.

The Qualified Representative(s) shall log the continuous FADC samples collected during drilling, preserve core samples in sealed sample liners to preserve for samples to be used for laboratory testing, or in waxed fiber or plastic core boxes for samples not to be used for laboratory testing, and photograph the core samples within the sampler before removal for preservation within a core box and again in the labeled core box. The Qualified Representative(s) shall label each sample liner or core box with the following information prior to removing from the drilling site: drill hole name, box number, sample depths, with marking within each box that specify top and bottom depths for core samples per run.

Where bedrock coring is required, the Qualified Representative shall photograph each run of rock core within the split-barrel liner, log the rock core, place all rock core samples collected into core boxes, and photograph each core box once filled with core and labeled. The Qualified Representative shall preserve all rock core samples in purpose-built HQ-diameter core boxes and label each box with the following: project name, drill hole name, box number, sample depths, and with markings within each box that specify top and bottom depths for core samples preserved per run. The Consultant shall calculate and log rock core recovery and Rock Quality Designation (RQD) of each core run in accordance with ASTM D6032.

The Qualified Representative shall photograph each test pit and sample as specified in Section 2.7. The Qualified Representative shall collect representative samples of each unique material encountered in each test pit, in adequate quantities to perform the laboratory tests specified in Section 2.8. Sample receptacles (buckets or bags) shall be labeled with the project name, test pit name, the depth from which the sample was recovered, the data of sample collection, and the name or initials of the Qualified Representative and photographed next to the pile of excavated material from which they were sampled prior to being moved from the test pit site.

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The Qualified Representative(s) shall label, preserve, and transport all soil samples for potential geotechnical laboratory testing according to ASTM D4220 and according to the following groups: bulk samples and SPT samples according to Group B, and drive and intact samples according to Group C. The Consultant shall not allow any samples to freeze or be subjected to excessive heat.

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For all samples to be used for corrosivity testing (see Section 2.8 and Appendix A tables), the Qualified Representative(s) shall collect the samples using clean sealable bags, clean hands or latex gloves, and a rust-free tool (ideally stainless steel). A minimum sample size of one pound shall be sampled from each corrosivity testing location. Corrosivity sample bags shall be tightly sealed, with as much air removed as possible. The Qualified Representative(s) shall label each corrosivity sample bag with project information, sample number, drill hole, depth, date, and time, and shall place the

samples on ice in a cooler, seal the cooler with strapping tape, and ship overnight to laboratory. Corrosivity samples shall be kept at approximately 40 degrees Fahrenheit until tested. Corrosivity testing shall be performed within 28 days of sample collection. The Qualified Representative(s) shall develop two duplicate Inventory Sheets for each set of samples collected at a given location. One copy of the Inventory Sheet will be kept with field notes and the second Inventory Sheet will be shipped with the samples to the laboratory. Inventory Sheets should have spaces designated for signatory and date blocks for the Qualified Representative(s) and lab technicians to form a chain of custody.

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2.6 CPT, Drill Hole, and Test Pit Log Requirements

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The Consultant shall use a naming convention for each drill hole, test pit, and CPT that includes the type of exploration, the last two digits of the year of exploration, and the number of the CPT, DH, or TP according to the tables in Appendix A. For example, drill holes performed during calendar year 2022 shall be named "DH-22-###".

The Consultant shall develop CPT logs that contain the following information at a minimum: CPT name; dates of testing; completion details; CPT location (GPS coordinates and approximate ground surface elevation); field personnel; testing methods; maximum depth of testing; and test results plotted by depth interval, including tip resistance, side friction, friction ratio, pore pressure, pore pressure dissipation test results, soil behavior type, and seismic wave velocities. CPT logs shall include comments regarding the reason for termination if not advanced to full depth and any indications of gravel or coarser materials encountered, as well as the depth to groundwater in the open CPT hole measured using an electronic water level sounding device or the depth at which collapse of the hole prevented further lowering of the device. All raw CPT data collected shall be submitted in digital form along with the CPT logs.

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The Consultant shall develop drill hole logs that contain the following information at a minimum: drill hole name, dates of drilling, completion details, drill hole location (GPS coordinates and approximate ground surface elevation), drill rig, hammer energy transfer measurement, field personnel, drilling methods, drilling conditions, depth(s) of groundwater and date(s) encountered, maximum depth of drilling, geologic unit or origin for each material encountered, depths of contacts between soil types, depths of contacts between fill materials and underlying geologic units, basis for identifying the location of contact between embankment fill and underlying foundation materials (e.g. measured embankment height, material characteristics, etc.), USCS soil descriptions and symbols for each soil strata encountered based on visual-manual and laboratory classifications, sample recovery, laboratory results for each sample tested, and additional notes regarding drilling and sampling details and conditions encountered. For drill logs that include rock core intervals, the Consultant shall provide a description of the recovered rock materials including: type of rock, grain-size, recovery, Rock Quality Designation (RQD), color, hardness, weathering, and depth and dip angles of individual bedding planes and factures; measure dip angles from horizontal (perpendicular to the core axis).

The Consultant shall develop test pit logs that contain the following information at a minimum: test pit name, date of test pit excavation/backfill, test pit location and elevation (GPS coordinates and approximate ground surface elevation), field personnel, excavation equipment used, depths of contacts between each strata and soil type encountered in the test pit, basis for identifying the location of contact between fill and underlying native soil (e.g. measured waste pile fill height, material characteristics, etc.), sample depths, sample names and quantities, groundwater depth, total maximum test pit depth, USCS soil descriptions and symbols for each soil strata encountered based on visual-manual or laboratory classification, laboratory test results for each sample tested, and additional notes regarding details of test pit excavation and backfill activities and conditions encountered.

The Qualified Representative(s) shall provide notes in the logs including: percentage of fines, sand,

gravel, cobbles, and boulders; characterization of plasticity, toughness, dry strength and dilatancy; maximum particle size; color; moisture; reaction to dilute HCl acid; density and consistency; difficulty of drilling or excavation; and other pertinent information. For any bedrock encountered, the Qualified Representative shall provide a description of the rock recovered including type of rock, degree of weathering, grain size, color, and hardness or strength estimate. The Qualified Representative(s) shall document the depth(s) of groundwater and date(s) encountered in the log if groundwater is encountered during drilling or test pit excavation. The Qualified Representative(s) shall document within the log the depths of any suspected voids, cobbles or boulders, organic materials, debris, or anthropogenic fill materials encountered during drilling or test pit excavation.

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The Qualified Representative(s) shall include drill hole, test pit, and observation well completion information in the drill hole logs, with depths referenced from the ground surface at each drill hole. In the logs for drill holes completed as observation wells, the Qualified Representative(s) shall include detailed as-built information regarding all material types and quantities used, and depths of placement. In the logs for drill holes not completed as observation wells, the Qualified Representative(s) shall include detailed information regarding the types and volumes of backfill materials used and depths of placement, and description of materials used to repair to the asphalt paving.

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The Consultant shall submit drill hole log and test pit log templates for Authority and Reclamation approval prior to mobilization for field exploration activities, indicating the information to be provided for each drill hole or test pit.

For all explorations targeted at public road bridges, the Consultant shall also prepare and submit as-built log of test borings (LOTB) sheets in accordance with California Department of Transportation (Caltrans) standards. The Caltrans LOTB sheets will not be required as part of interim data deliverables, but shall be submitted with the Geological Characterization Report deliverables. The Authority will provide topographic data for LOTB sheets.

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All drill hole logs shall be reviewed by an experienced and qualified Certified Engineering Geologist (CEG) registered in the State of California prior to submittal.

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2.7 Photographs

The Consultant shall document all work activities with color photographs. Selected photographs from each exploration shall be appended to the Geotechnical Data Report and complete digital files for all unique photographs of the exploration activities and samples collected shall be transmitted to Authority with interim data deliverables. All photographs of soil and rock samples shall include a visual scale marked with units of inches or tenths of feet. The Consultant shall annotate each selected photograph that is included in the report with the following information (as applicable): project name, CPT or drill hole or test pit name, sample name and depth, subject of photograph, photographer, and date.

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At a minimum, the Consultant shall photograph:

- each exploration work site, both before work starts and after completion of the observation wells or backfill and asphalt repairs,
- each open test pit,
- each pile of material excavated from test pits,
- each bulk sample in the receptacle,
- each drive sample while still within the sampling equipment,
- each rock core sample within the split-barrel sample, and
- each continuous core box with complete samples and labels.

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During the work at each test pit, the Qualified Representative shall photograph each wall and the bottom of the open test pit, the piles of all materials excavated from the test pit, and the collected

samples in their labeled receptacles. Photographs of the samples shall include the labeled receptacle, with all label information clearly visible, placed on or in front of the pile of material from which the sample was collected, such that the sampled material is visible in the photograph.

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2.8 Laboratory Testing

Laboratory testing quantities by drill hole are estimated in Appendix A; however, actual test quantities and sample locations may vary from those identified in Appendix A depending on subsurface conditions and materials encountered. Total quantities of each test performed shall not exceed those identified in Appendix A unless otherwise directed by Authority.

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The Consultant shall select representative samples for each test, subject to Authority approval, under the guidance and responsible charge of an experienced and qualified Geotechnical Engineer (GE) registered in the State of California to provide appropriate and representative engineering properties for the materials and design of the specific targeted project features. Prior to performing laboratory tests on samples from each drill hole or test pit, the Consultant shall submit to the Authority a Laboratory Testing Plan and draft log for each drill hole or test pit. The Laboratory Testing Plan shall list, at a minimum, the samples obtained from each drill hole or test pit with unique names for each sample, the type of sampler used to collect each sample, USCS soil descriptions or rock type for each sample, and the proposed test method and quantity of tests to be performed on each sample. The Consultant shall propose test loads in the Laboratory Testing Plan, subject to and Reclamation approval. Reclamation will provide guidance on test loads and details of methods for specific strength and consolidation tests and samples as required. The Consultant shall not proceed with the laboratory testing for each drill hole or test pit until the Laboratory Testing Plan for that hole has been approved by Authority. The Consultant shall perform all laboratory soil and rock testing in a Qualified Laboratory and under the supervision of a Qualified Laboratory Manager.

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Selected samples shall be submitted for the following laboratory tests, using the latest version of the specified standards:

- Grain size distribution
  - Sieve analysis using U.S. Standard Sieve sizes – ASTM D6913 (Method A) or D422
  - Hydrometer analysis – ASTM D7928 or D422
- Atterberg limits – ASTM D4318 (1-point method to be used for liquid limit)
- Unit weight – ASTM D1587 Note 6, or ASTM D3550 Note 1, or USBR 7105
- Water content – ASTM D2216
- Consolidated undrained triaxial compression with pore pressure measurements – ASTM D4767 (3 points per test at different confining stresses on separate specimens)
- Unconfined/uniaxial compressive strength
  - Soil – ASTM D2166
  - Rock – ASTM D7012 Method D
- One-dimensional consolidation – ASTM D2435 Method B
- One-dimensional swell or collapse – ASTM D4546 Method C
- Standard or Modified Proctor compaction – ASTM D698 or D1557
- Direct shear – ASTM D3080 (1 point per test)
- Crumb dispersion test – ASTM D6572
- Pinhole dispersion test – ASTM D4647
- Corrosivity test suite
  - pH – ASTM D4972 or G51
  - Chloride content – ASTM D4327 or D512
  - Resistivity – ASTM G57
  - Sulfate content – ASTM D4327 or D516
- R-value – ASTM D2944/AASHTO T190

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- Direct simple shear – ASTM D6528 (1 point per test)
- Cyclic direct simple shear – ASTM D8926 (4 points per test at different cyclic stress ratios on separate specimens, load-controlled testing required)
- Sand cone density – ASTM D1556
- Slake Durability – ASTM D4644

The Consultant shall use only intact Shelby tube samples or FADC Lexan liner tube samples for triaxial and unconfined compression, consolidation, direct shear, and direct simple shear tests; the Consultant shall not use Modified California samples for these tests, unless approved by Authority.

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However, the Consultant may use Modified California samples for other tests specified herein. For drill holes where continuous FADC sampling is specified in the table in Appendix A, unit weight of soil sample(s) shall be measured using a complete FADC sample within the liner using the methods described in Reclamation's Earth Manual, Part 2, Third Edition, USBR 7105, 11.3.6 and 12.

The consultant shall prepare any and all rock core specimens used for laboratory testing in accordance with ASTM D4543. The Consultant shall take care to preserve the field moisture content of rock core samples to be used as laboratory test specimens in accordance with ASTM D5079.

The Consultant shall provide draft laboratory testing data reports as part of interim deliverables within two (2) business days of completion of each test, and shall include all complete laboratory data in the Geotechnical Data Report. In Geotechnical Data Report deliverables, the Consultant shall include tables summarizing laboratory testing results, as well as individual test reports as required by the specific standard test method for each with complete raw data, plots, and photographs from each test. Each test report shall include at a minimum the sample name, drill hole, and sample depth; soil type and USCS symbol according to ASTM D2487; relevant test results, data, and other information specified in each standard test method; date tested; and last name or initials of test technician and quality checker.

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3.0 Deliverables

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All Consultant deliverables and submittals will be reviewed by both Authority and Reclamation. Communication with the Consultant, including comments, approvals, and direction will be provided by Authority.

3.1 Schedule

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The Consultant shall submit a proposed schedule for field exploration and laboratory testing, as specified in Section 2.0, prior to mobilizing for field exploration work. The Consultant shall update the schedule on a weekly basis throughout the duration of the work based on actual progress and resulting schedule changes. The schedule shall be transmitted via email.

3.2 Sampling and Testing Plans

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The Consultant shall submit a brief Drill Hole Sampling Plan for each drill hole, as specified in Section 2.2, prior to drilling, including specifics of sampling methods and target depths. The Consultant shall allow two full business days for Authority to review the Drill Hole Sampling Plan and addenda for each drill hole between the submittal date and the scheduled date to begin drilling activities at that hole.

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The Consultant shall submit a Laboratory Testing Plan for each drill hole and test pit, as specified in Section 2.8, and including a draft drill hole or test pit log, prior to performing laboratory tests on samples from that drill hole or test pit. The Consultant shall allow at least two full business days for

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Authority to review the Laboratory Testing Plan between the submittal date and the scheduled date to begin laboratory testing on samples from that hole.

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Drill Hole Sampling Plan and Laboratory Testing Plan submittals shall be transmitted via email as PDF files.

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3.3 Interim Data Reporting

The Consultant shall transmit draft data from the explorations and testing as interim data deliverables throughout the duration of the field and laboratory work. Draft CPT logs, including raw CPT data files, shall be submitted within five (5) business days of completing each CPT. Draft drill hole and test pit logs shall be submitted weekly and the Consultant shall submit the logs for all drill holes and test pits completed during each week by the close of business on the final business day of the following week and within eleven (11) calendar days of completing each drill hole. Draft drill hole and test pit logs shall be submitted in a clean, legible format and shall include all data specified in Section 2.6, except laboratory test data. Draft laboratory test results shall be submitted within five (5) business days of the date of each test completion. The Consultant shall submit interim data at least once per week throughout the duration of the exploration and testing work. Interim data submittals shall be transmitted via email as PDF files.

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The Consultant shall complete all fieldwork and submit all interim data deliverables within no more than 240 calendar days of receiving Notice to Proceed on the fieldwork.

3.4 Geotechnical Data Report

The Consultant shall provide a Draft and a Final Geotechnical Data Report. A complete Draft Geotechnical Data Report shall be submitted within no more than 60 calendar days of completion of the fieldwork. Authority will review the Draft Geotechnical Data Report and provide comments within four weeks. The Consultant shall have no more than 30 calendar days to submit the Final Geotechnical Data Report after receiving review comments from Authority. The Consultant shall document all review comments and questions from Authority and Reclamation, as well as Consultant responses and actions to address the comments, in a comment resolution log. The Consultant shall submit the comment resolution log one week prior to the Final Geotechnical Data Report.

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The Consultant shall include at a minimum the following information in the Geotechnical Data Report:

- Narrative summary of the work and methods;
- Drill hole, test pit, and CPT logs;
- Laboratory testing data; and
- Photographs of samples, equipment used, and the surface completion for all drill holes and test pits.

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The Final Geotechnical Data Report shall be stamped and signed by the California Licensed GE and CEG in responsible charge of the work. The Consultant shall deliver PDF files of the Draft and Final Geotechnical Data Report via email or other electronic file transmittal method, as well as three (3) hard printed copies (one [1] to Authority and two [2] to Reclamation) and will receive email confirmation of the receipt of the document.

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3.5 Geological Characterization Report (Phase 3 only)

Following completion of the final phase of the work authorized by the Authority, the Consultant shall provide a Draft and a Final Geological Characterization Report within 120 calendar days of submitting the Geotechnical Data Report. A complete Draft Geological Characterization Report shall be

submitted within 75 calendar days of submittal of the Geotechnical Data Report. Authority will review the Draft Geological Characterization Report and provide comments within four weeks. The Consultant shall have 45 calendar days to submit the Final Geological Characterization Report after receiving review comments from Authority. The Consultant shall document all review comments and questions from Authority, as well as Consultant responses and actions to address the comments, in a comment resolution log. The Consultant shall submit the comment resolution log two weeks prior to the Final Geological Characterization Report.

The Consultant shall include at a minimum the following information in the Geological Characterization Report:

- Brief narrative summary of the explorations and testing completed in all phases of the work, with reference to the Geotechnical Data Reports for details;
- Description of the subsurface conditions and engineering geologic units (i.e. soil or rock types with common engineering properties and geologic origin) encountered in explorations at structures, organized by structure or groups of structures that share common geological environments and ground conditions;
- Discussion of foundation design and construction considerations for replacement of structures, relevant to the ground conditions and engineering geologic units encountered;
- Map sheets at 1:10,000 or larger scale (i.e. smaller area of coverage) showing locations and names of all explorations completed as part of the work, surficial geologic map unit symbols and contacts, annotated satellite imagery, and canal centerline milepost stationing labeled at 0.1-mile intervals;
- Geologic cross sections oriented perpendicular to the canal centerline at the locations of each existing structure where explorations have been performed, unless otherwise directed by Authority, showing the following information at a minimum:
  - Existing ground surface topography (to be provided by the Authority);
  - Vertical elevation and horizontal distance axes, with tick marks or half-tone grid lines;
  - Stick logs from CPTs targeted at the structure, annotated with CPT name, ground surface elevation at the CPT, colors indicating soil behavior type from CPT intervals, and plots of tip resistance and side friction by depth along opposite sides of the stick log;
  - Stick logs from drill holes targeted at the structure, annotated with drill hole name, ground surface elevation at the drill hole, contacts between soil types encountered, hatching indicating soil type between contacts, USCS soil symbols and blow counts at sample depths, and groundwater table elevation during drilling and following observation well completion and stabilization;
  - Delineations of interpreted contacts between engineering geologic units present throughout the depths of and interpolated between explorations; and
  - Symbols indicating the engineering geologic units between the delineated contacts.

The Final Geological Characterization Report shall be stamped and signed by the California Licensed GE and CEG in responsible charge of the work. The Consultant shall deliver PDF files of the Draft and Final Geological Characterization Report via email or other electronic file transmittal method, as well as three (3) hard printed copies (one [1] to Authority and two [2] to Reclamation) and will receive email confirmation of the receipt of the document.

3.6 Delivery

Submittals shall be transmitted to the Authority Project Manager for distribution to other parties. Email and mailing addresses will be available once the Notice To Proceed has been issued.

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4.0 Responsibilities of Authority and Reclamation

In addition to the responsibilities identified in the General Conditions, Exhibit B to the Agreement, Authority will provide Consultant access to the O&M roads through locked gates at public road crossings. Cultural (Section 106) and environmental (NEPA, Section 7, and Section 106) clearances for the work will be provided by Reclamation in advance of the work. California State environmental

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compliance documentation in accordance with CEQA will be provided by Authority.

Authority and Reclamation will provide review of Consultant submittals within the durations discussed herein.

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5.0 Additional Responsibilities of the Consultant

The Consultant shall be responsible for performance of the work specified herein. The Consultant shall provide and maintain adequate equipment, personnel, Sub-Consultants, and other resources necessary to complete all the work requirements specified herein and submit deliverables within the schedule specified herein. The Consultant shall be responsible for the quality and on-time submittal of deliverables. The Consultant shall not interfere with work of other Consultants, Authority, or

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The Consultant shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property. At the expense of the Consultant, the Consultant shall repair or replace all existing improvements (e.g., curbs, fences, signs, utilities, street surfaces, structures etc.) damaged as a result of his operations. Repairs and replacements shall be at least equal to existing improvements, and shall match them in finish and dimension.

6.0 Place of Performance

The field explorations and testing performed as part of the work will be entirely within the Reclamation ROW, on the existing DMC O&M roads adjacent to the canal, at locations where the existing ground surface is part of the engineered environment. The O&M roads are along the canal banks and consist of both cut and fill surfaces. Generally speaking, the left-side (facing downstream) O&M road is surfaced with two layers of asphalt chip seal paving, while the right-side O&M road consists of a gravel surface.

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The O&M roads are accessible to and used by adjacent landowners.

A wide shoulder within the DMC right-of-way is present along most of the DMC O&M road. This shoulder can be used as a turnaround, to store material, or to store equipment.

The storage yards listed in the table below are located within the DMC ROW and are available for equipment storage. Authority does not accept responsibility for lost, stolen, or damaged items left at these storage yards. Access to the storage yards will be provided by Authority personnel upon request.

Storage Location	Milepost	Description
Patterson Storage Yard	~~40.00~~	Security Fencing. Un-manned area. No security measures.
Los Banos Field Office	80.00	Security Fencing. Personnel present during business hours. Low tech alarm system in place.

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Laboratory testing and the remainder of the work will be performed at the Consultant's facility. Deliveries will be made to locations as described in Section 3.0.

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7.0 Security

The Consultant shall be responsible for the security of all material and or equipment stored on the DMC right-of-way. Areas along the canal experience high amounts of theft and Authority cannot be held responsible for any theft that occurs.

The Consultant shall be responsible for restricting public access to each work site as described in Section 2.0.

8.0 Period of Performance

The Consultant shall perform and complete all associated Phase 2 and Phase 3 field and laboratory work, as well as the final Geotechnical Data Report within 300 calendar days of notice to proceed. The Consultant shall submit the Final Geological Characterization Report within 65 calendar days of submitting the Final Geotechnical Data Report.

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Deleted: The Consultant shall perform and complete all associated Phase 1 work including the Final Geotechnical Data Report, within no more than 150 calendar days of contract award. The Consultant is encouraged to expedite the schedule as part of the selection criteria and should target transmittal of all interim data by July 30, 2021 and completion date of October 1, 2021 following anticipated award date of May 6, 2021.¶

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Key Personnel¶
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The Key Personnel proposed in the Consultant's proposal shall perform the tasks for which they were proposed unless good cause exists for substitution. Good cause shall mean unavailability of the proposed key individual due to illness, death, retirement, or other separation from employment by Consultant or any identified sub-consultant, or for any other reason that the Authority accepts as good cause in its sole and absolute discretion. If a key individual is substituted, Consultant shall make all reasonable efforts to replace them with someone with equivalent experience and expertise, but no less than the standards required by the RFP for the role for which the substitute is proposed. ¶
Phases 2 and 3 ¶
¶
Upon completion of Phase 1, the Authority will consider the schedule and budget proposed for Phase 2 and the available funding and will determine whether to proceed with Phase 2. Similarly, if the Authority proceeds with Phase 2 then, upon completion of Phase 2, the Authority will consider the schedule and budget proposed for Phase 3 and the available funding and will determine whether to proceed with Phase 3. In making these decisions, the Authority may request that Consultant provide additional information regarding anticipated work in Phase 2 or 3, including additional explorations anticipated in Appendix A. The inclusion of this information is not a guarantee of work and shall be treated as informational only. ¶
¶
The scope of Phases 2 and 3 may be modified based on the findings of Phase 1 or 2 and/or design changes. ¶
¶
The Authority retains sole and absolute discretion whether to proceed with Phase 2 or Phase 3 work. The Consultant shall not perform any Phase 2 or Phase 3 work without first receiving a Notice to Proceed with such phase. Notwithstanding the foregoing, the Authority may amend a phase of work to include additional sites contemplated in a later phase if the budget and time permits. Such a change must be documented by a change order adding the work to the then-current phase, and would not authorize the Consultant to perform other work in any later phase of work. If Notice to Proceed is issued allowing Consultant to proceed with additional phases of work, including specifying the schedule and budget for such later phases, then the work requirements of this Scope of Work apply equally to the later phases of work.¶

Appendix A

- Table 1 (Phase 2-3 Work)
- Maps (Phases 1 – 3) are kept on record with the Authority as a separate document and are available upon request.

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EXHIBIT A – SCOPE OF SERVICES

1.0 Scope Summary

The anticipated work to be completed includes cone penetration tests (CPTs), exploratory drill holes, and test pits divided into three (3) phases of work as shown in Appendix A. Work will also include standard penetration tests (SPTs) and soil sampling in all the drill holes, standpipe observation well installations in specified drill holes, downhole seismic testing and pore pressure dissipation testing in specified CPT holes, laboratory testing, a Geotechnical Data Report, and a Geological Characterization Report.

The scope of work is summarized in this section. The requirements for the work are specified in Section 2.0 and deliverables are specified in Section 3.0. The explorations and testing are divided into phases of work, summarized in Appendix A. The intent of the work is to provide Authority and Reclamation with data to inform characterization of the subsurface conditions at canal embankments, lining, and structures impacted by subsidence. Geotechnical analyses of the data other than that specified herein, or design recommendations are not part of the scope.

The scope of work for all phases includes:

1. Kickoff meeting and any other reasonably required meetings necessary to discuss work requirements, coordination, and performance of the work.
2. Submit proposed exploration and testing schedule.
3. Utility clearances for applicable drill hole, CPT, and test pit locations.
4. Permitting of groundwater observation wells and explorations with any applicable local and state agencies.
5. Traffic control, establishing temporary perimeters, and all other measures to ensure that work at exploration locations adjacent to public roadways or areas otherwise accessible to the public is safely performed.
6. Exploratory CPTs (identified as "CPT-###"), drill holes (identified as "DH-###"), and test pits (identified as "TP-###) at designated locations. See the tables in Appendix A for anticipated exploration locations. The Consultant is responsible for evaluating the site conditions, access, and utilities at each targeted exploration location identified herein, and determining the actual exploration locations, subject to Authority approval, as specified in Section 2.0. Drill holes, CPTs, and test pits shall be performed, as described in Section 2.0. The scope of this task is anticipated to include the following:
    a. CPTs with pore pressure dissipation measurements and downhole seismic testing per Appendix A. Maximum individual CPT target depth is 35 feet. See Section 2.1 for relevant work requirements.
    b. Grout backfill of CPT holes. See Section 2.4 for relevant work requirements.
    c. Drill Hole Sampling Plan. See Section 2.2 for relevant work requirements and Section 3.2 for deliverable requirements.
    d. Hollow-stem auger drill holes with a maximum individual drill hole depth anticipated at 120 feet. See Section 2.2 for relevant work requirements.
    e. Completion of selected drill holes, per Appendix A, as standpipe groundwater observation wells with lockable steel flush-mounted surface cover. See Section 2.4 for relevant work requirements.
    f. Backfill of the drill holes that are not completed as observation wells. See Section 2.4 for relevant work requirements.
    g. Collection of bulk samples from all drill holes, drive samples using a combination of split-barrel SPT and modified California samplers in all drill holes, intact samples using

Shelby tube samplers in all drill holes, and continuous flight auger dry core samples in selected drill holes per Appendix A. See Section 2.2 for relevant work requirements.

h. Log, describe, and photograph subsurface conditions encountered, samples, and drilling activities at each drill hole. See Sections 2.5, 2.6, and 2.7 for relevant work requirements.
i. Laboratory Testing Plan. See Section 2.8 for relevant work requirements and section 3.2 for deliverable requirements.
j. Test pits with a maximum anticipated depth of 20 feet. See Section 2.3 for relevant work requirements.
k. Backfill of the test pits. See Section 2.3 for relevant work requirements.
l. Collection of bulk samples from all test pits per Appendix A. See Section 2.3 for relevant work requirements.
m. Log, describe, and photograph subsurface conditions encountered, samples, and excavation activities at each test pit. See Sections 2.5, 2.6, and 2.7 for relevant work requirements.
n. Survey locations of all CPT, drill hole, and test pit explorations.

7. Perform laboratory testing as identified in the table in Appendix A and specified herein, on selected representative soil samples recovered from drill holes and test pits. See Section 2.8 for relevant work requirements.
8. Interim reporting of draft CPT logs within three (3) business days of completing each CPT, draft drill hole and test pit logs on a weekly basis within eight (8) calendar days of each drill hole completion, and quality-controlled laboratory test results within five (5) business days of each test completion. See Section 3.3 for deliverable requirements.
9. Development of a Draft and Final Geotechnical Data Report for all work including description of exploration and testing methods, logs of explorations, photographs of recovered samples, laboratory test results, and other collected data. See Section 3.4 for deliverable requirements.
10. Development of a Draft and Final Geological Characterization Report for selected explorations and testing from Phase 3 only, including brief summary of exploration and testing methods, logs of explorations, laboratory test results, geologic cross sections showing results of explorations at selected structures, and other collected data. See Section 3.5 for deliverable requirements.

Consultant agrees to perform all work reasonably understood to be necessary to complete the work in the Agreement, even if the tasks are not specifically enumerated in the Agreement. No extra compensation will be allowed for anything omitted but fairly implied to be included in the Scope of Services.

2.0 Work Requirements

The Consultant shall provide all labor, equipment, materials, etc., required to accomplish the work requirements and schedule specified herein.

Within ten (10) calendar days of contract award, the Consultant shall hold a kickoff meeting via teleconference or videoconference including Consultant, Authority, and Reclamation representatives, to discuss the project schedule, communication plan, contract roles and responsibilities, review of the contract scope of work, proposed exploration and sampling methods and locations, procedures for selection of laboratory test samples, and drill hole, test pit, and CPT completion.

After the kickoff meeting and prior to mobilizing for field exploration work, the Contractor shall submit a proposed schedule for completing individual field explorations identified in Appendix A and laboratory testing. The schedule shall be revised weekly based on actual progress and resulting changes.

After the kickoff meeting and prior to commencing field exploration work, the Consultant shall perform a site visit to evaluate site conditions and access constraints, mark proposed drill hole locations, submit the utility locate tickets, and coordinate utility clearances for exploration locations. The Consultant is responsible for determining the actual exploration locations, subject to Authority and Reclamation approval. Actual exploration locations shall be within the Reclamation right of way (ROW) and within 100 feet of the locations shown on the tables included in Appendix A. Where explorations are targeted at features identified as structures in the Appendix A tables, explorations shall be located as close as practical to the existing structure, but with a minimum setback distance of 10 feet from the structure. If the Consultant determines that there is a need to move explorations from the targeted locations identified herein, the Consultant shall submit a location map or coordinates for the proposed exploration location, including the exploration name, the location identified herein, and the reason for change to the location. The Consultant is responsible for obtaining any local or state permits required for each exploration location.

Portions of the field exploration work will be performed adjacent to public roadways and on Operation and Maintenance (O&M) roads that may be accessible to the public. Prior to the start of explorations, the Consultant shall establish a perimeter around such work areas to restrict public access. Authority employees regularly travel the O&M roads, and shall be given through access at all times unless and only to the extent that access would compromise the safety of Consultant and/or Authority personnel. The Consultant is responsible for the barriers and signage to restrict public access to the work areas. The perimeter shall be marked with a physical barrier and signage at appropriate distances to notify the public to avoid the active work areas. Field explorations along public roadways shall be performed outside the roadway easement; however, some explorations may be located near the roadway shoulder, in which case the Consultant shall provide traffic control to comply with all local, State, and Federal requirements for the work.

The Consultant shall survey the location of each completed CPT, drill hole, and test pit using a hand-held GPS device with 3-foot or better horizontal accuracy and mark the locations with survey marking paint.

2.1 CPTs

The Consultant shall perform CPTs in accordance with ASTM D5778 at each of the approximate CPT locations identified in the tables in Appendix A, with pore pressure measurements in all of the CPTs and pore pressure dissipation testing in those CPTs specified in the table in Appendix A. At least one pore pressure dissipation test shall be performed below the groundwater table per CPT and one additional pore pressure dissipation test shall be performed per each 30 feet of CPT depth below the groundwater table. Pore pressure dissipation testing shall be performed within fine-grained soil layers encountered below the water table and shall be run to pore pressure equilibrium or terminated at 60 minutes' duration if equilibrium is not reached. The down pressure shall be maintained during dissipation testing by clamping the CPT rods to avoid unloading and associated drop in pore pressure. Upon completion of each CPT and removal of the cone, and prior to backfill, the Consultant shall attempt to measure the groundwater in the open CPT hole using an electronic water level sounding device and record the depth of groundwater in the hole or the depth at which collapse of the hole prevented further lowering of the device.

The Consultant shall commence testing at a depth no greater than 2 feet and attempt to advance the CPTs to the target depths identified for each CPT in the table in Appendix A, or terminate the CPT at practical refusal depth if less than full target depth. The CPT cone used shall not be larger than 3-inches in diameter.

At CPT locations on the O&M road that are asphalted, the Consultant shall core, saw, or punch through the existing asphalt chip seal paving surface prior to performing each CPT located thereon. Where the asphaltic chip seal surface is encountered on the surface at exploration locations, the Consultant shall

restore the paving surface using cold-mix asphalt patch. Additional information regarding CPT completion is included in Section 2.1.

The Consultant shall perform the CPTs as identified in the tables in Appendix A. The Consultant shall not proceed with CPTs until given Notice to Proceed. Where CPTs are located next to companion drill holes, the Consultant shall perform the CPT prior to drilling the companion hole and shall use the results of the CPT to target specific intact sampling depth(s) and methods in the companion drill hole, subject to approval by Authority. The anticipated quantities of CPTs and downhole seismic tests are listed in Appendix A.

2.2 Drill Holes

The Consultant shall drill exploratory hollow stem auger drill holes according to ASTM D6151 at the approximate locations shown on the tables in Appendix A (identified as "DH-###"). The Consultant shall advance the drill holes to the target depths identified for each in the table in Appendix A, or terminate the drill hole at practical refusal depth if less than full target depth, except where rock core drilling is required. Refusal of auger drilling shall be considered advance of less than 6 inches depth per 10 minutes while operating the drill rig at a reasonable level of effort consistent with the equipment specifications for torque, rotary speed, and down pressure, or 50 SPT blow counts per 1 inch, whichever is encountered first. CPT refusal shall be considered no advance with maximum down pressure of the equipment. The Consultant shall make reasonable efforts to advance the drill holes, CPTs, and sampling to the proposed depths, but should not operate their equipment to the point of causing equipment damage when practical refusal is apparent to the operator prior to meeting the refusal criteria. The Authority will not reimburse the Consultant for equipment damaged in performing the work. Outside diameter of augers used for exploratory drill holes shall not be greater than 10 inches.

The Consultant shall collect bulk samples of each unique material type recovered from auger cuttings. The Consultant shall collect continuous flight auger dry core (FADC) samples, in accordance with ASTM D6151 and Reclamation's Earth Manual, Part 2, Third Edition, USBR 7105 (https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/earth2.pdf), throughout the full depth of selected drill holes identified in the tables in Appendix A. The Consultant shall collect drive samples at 5-foot vertical spacing throughout the full depth of each drill hole. The Consultant shall use an automatic hammer to perform all drive sampling and shall provide documentation of hammer energy transfer rate, per ASTM D4633, from within the 12 months prior to mobilization for this work. The Consultant shall terminate drive sampling at each 5-foot depth interval upon refusal, based on a criterion of 50 hammer blows with advance less than 6 inches. The Consultant shall add water to the hollow-stem augers when drilling and sampling in sands below the water table to avoid heaving sands. The Consultant shall perform drive sampling primarily using SPTs according to ASTM D1586 with a standard 1.375-inch internal diameter, 18-inch sample length split-barrel sampler. The Consultant may perform drive sampling using a split-barrel sampling according to ASTM D3550 with a standard 2.4-inch diameter, 18-inch sample length Modified California sampler in only those drill holes where continuous FADC is not specified and only with the Authority and Reclamation approval of Modified California sampling in the Drill Hole Sampling Plan for the specific drill hole. SPT sampling is the preferred method for use in liquefaction calculations and shall be used in each drill hole for the majority of sampling; however, Modified California sampling may be used to obtain disturbed liner samples where acceptable for specific laboratory tests, as specified in Section 2.8. The Consultant shall provide adequate equipment to allow for the aforementioned sampling methods in relevant drill holes and shall alternate between drive samplers as deemed appropriate based on the conditions encountered, to provide adequate SPTs in granular soil layers to allow for liquefaction analyses, and to provide adequate split-barrel liner samples for the specified laboratory testing of samples from drill holes where continuous FADC is not specified. In drill holes where FADC is specified, Lexan lining tube sampling shall be used to obtain adequate intact samples for laboratory testing. The Consultant shall perform intact sampling per ASTM D1587 with 3-inch outside diameter Shelby tubes within fine-grained soil

layers and shall collect a minimum number of intact fine-grained soil Shelby tube samples at separate depths within each drill hole as identified in the table in Appendix A, or more Shelby tube samples as required to obtain adequate quantity of specimens for the laboratory testing as identified in Appendix A and specified in Section 2.8. In drill holes where FADC is specified and soil conditions result in poor Shelby tube sample recovery, the Consultant shall use Lexan liner tubes within the FADC barrel in targeted sampling intervals to supplement Shelby tube sampling and obtain adequate quantities of intact samples for the required laboratory testing. Intact sampling in fine-grained soil layers shall be targeted based on the results of companion CPTs nearest to each drill hole or the drilling conditions encountered in the drill hole and other drill holes nearby, subject to approval by Authority and Reclamation.

In selected drill holes specified in Attachment A, the Consultant shall transition from hollow stem auger drilling to rock core drilling at or near the top of bedrock contact and collect rock core samples for the remaining depth of the drill hole, or for minimum of 10 feet into sound bedrock, whichever is deeper. Rock core drilling shall be performed in accordance with ASTM D2113, using triple tube core barrels with H-size or larger and maximum 5-foot core runs. All rock core samples collected shall be logged as specified in Section 2.5 and 2.6, and stored in core boxes purpose-built for the size of rock core sampled. The Consultant shall preserve and transport all rock core in accordance with ASTM D5079.

The Consultant shall submit for approval a brief Drill Hole Sampling Plan for each drill hole at least two full business days prior to the start of drilling, including the proposed schedule for drilling, sampling procedures and equipment, and with target intact Shelby tube sampling depths. The Authority and Reclamation will review the Drill Hole Sampling Plan prior to the proposed time of drilling. The Drill Hole Sampling Plan shall describe the equipment and methods to be used for sampling, hammer energy transfer rate documentation for the drill rig(s) to be used for the work, criteria used to identify targeted depths for intact sampling to obtain laboratory test samples of fine-grained soils in each drill hole (e.g., completed CPT or drill hole data), and specific targeted sampling depths for each drill hole. The Consultant shall not proceed with drilling each hole until the Authority and Reclamation have approved the Drill Hole Sampling Plan for the drill hole.

At drill hole locations on the O&M road that contain asphalt, the Consultant shall core through the existing asphalt chip seal paving surface prior to performing each drill hole thereon. Where the asphaltic chip seal surface is encountered at the surface, the Consultant shall restore the paving surface using cold-mix asphalt patch.

The Consultant shall complete selected drill holes as standpipe groundwater observation wells as identified in Appendix A. Additional information regarding completion of observation wells and other drill holes is included in Section 2.4.

The Consultant shall perform the drill holes as identified in the tables in Appendix A. Explorations may be performed concurrently, except where CPTs are paired with companion drill holes, the Consultant shall complete the CPT prior to performing the companion drill hole in order to use the CPT data to target sampling methods at specific depths within the companion drill hole. The Consultant shall not proceed with work until Notice to Proceed is issued. The anticipated quantities of drill holes and observation wells are listed in Appendix A.

2.3 Test Pits

The Consultant shall coordinate, direct, oversee, and document all test pit excavation activities. The Authority will provide an excavator and equipment operator for the test pit excavation work. The Consultant shall coordinate with the Authority on the schedule, locations, access, depths of excavation, backfill, and other details regarding the test pit excavation.

Anticipated test pits locations are shown in Appendix A. The Consultant shall be responsible for determining the locations (within 200 feet of the location shown and subject to Authority approval),

dimensions, and depths of test pits to obtain representative samples of the soils deposited in the existing waste piles along the canal.

The test pits shall be excavated and sampled to the maximum depths identified in the attached table, or to the maximum reach of the Authority equipment provided, or to the contact between the waste pile fill materials and underlying native soils, whichever is less. The exact depths to native soils beneath the soil waste pile materials at test pit locations are not known. The intent of the work is to log, photograph, and sample the waste pile materials, but not the underlying native soils. The Consultant shall be responsible for interpreting the approximate depth of contact between the waste pile fill materials and the underlying native soils prior to test pit excavation or where encountered during test pit excavation at each site. The Consultant shall stop excavation activities in each test pit if and when the native soils are encountered. There may be uncertainty in the interpretation of the location of contact between the soil waste pile materials and underlying native soils during test pit excavation, but a reasonable good faith effort shall be made to terminate the excavation at or above the contact between the waste pile materials and the native soils. All test pits shall have a surface footprint no greater than 5 feet by 20 feet.

No shoring will be provided for the test pit excavations. The contractor shall perform test pit logging and photographing from the existing ground surface, not within the test pits. The contractor shall perform in place density testing using the sand cone method (ASTM D1556) in the upper several feet of selected test pits, as identified in Appendix A, prior to excavating the test pit to a depth at which shoring or sloping would be required for entry in accordance with Occupational Safety and Health Administration 29 CFR Part 1926 Subpart P, and any other relevant federal, state, and local regulations. Bulk samples shall be collected from excavated materials placed on the ground surface near the test pits. The Contractor shall be responsible for the safety of Contractor personnel around the open, unsupported test pit excavations and equipment, and shall furnish all safety equipment and training necessary to perform the work in accordance with all Federal, State, and Local regulations and requirements of the Reclamation Safety and Health Standards and Occupational Safety and Health Standards.

The Consultant shall log and photograph the test pits, and collect representative bulk samples from each unique soil type encountered within each test pit excavation. The Contractor shall take care to obtain representative samples of each unique material strata and accurately log the depths from which each sample was collected. The Contractor shall direct the equipment operator to place different materials excavated from separate strata in separate piles to avoid cross contamination or blending of materials prior to sampling.

2.4 Observation Wells and Drill Hole, Test Pit, and CPT Completion

Prior to performing exploratory drilling, the Consultant shall obtain any necessary permits for completion of the identified drill holes as groundwater observation wells. The Consultant shall design and construct the observation wells based on the conditions encountered and in accordance with all permit requirements, California Department of Water Resources Well Standards, and relevant manufacturer's recommendations, to allow observation of groundwater levels in the observation wells after completion (initial reading by Consultant subsequent readings by others). Observation wells shall be constructed of minimum 2-inch diameter slotted PVC pipe surrounded by a sand filter pack and sealed at the surface with hydrated bentonite chips. The Contractor shall propose screening depths of each observation well in the Drilling and Sampling Plan for each, subject to the approval of the Authority and Reclamation. The lower extent of screened intervals shall be the full target depth, unless otherwise specified or directed by the Authority or Reclamation. The extents of screened intervals may be adjusted in the field to suit the conditions encountered in the drill hole based on the professional judgment of the Qualified Representative on site. The observation wells installed where the O&M road is not paved shall be located a minimum of 5 feet off the O&M road with two yellow bollards installed for protection. Unless otherwise specified, assume that all observation wells shall extend to full depths

of the drill holes. The Consultant shall develop the observation wells in accordance with ASTM D5521 and continue well development until purged water is visibly clear or the turbidity of the purged water stabilizes to a point of diminishing returns based on the professional judgment of the Qualified Representative. The Consultant shall take at least one reading of the groundwater level within each observation well using an electronic water level sounding device following completion and stabilization of the groundwater level. The Consultant shall install a traffic-rated, flush-mounted steel manhole with lockable cover and concrete collar at each observation well and provide at least two (2) key(s) to Authority. The concrete collars shall be sloped to drain away from the manhole to prevent storm water runoff collecting in the manhole.

At each drill hole that is not completed as a groundwater observation well, the Consultant shall completely backfill the drill hole in accordance with any applicable local, state, and federal regulations and permit requirements, with a minimum 6 inches of aggregate base course at the surface to match the existing grade. In all drill holes where canal embankment fill is encountered, the Consultant shall backfill with cement-bentonite (approximately 1:1 ratio) grout the portion of the drill hole within the embankment fill depths and a minimum of 5 feet below the embankment fill, into the underlining foundation.

Upon completion of the logging, photographing, and sampling of each test pit, the Contractor shall direct the Authority equipment operator to backfill the test pit. The test pits shall be backfilled with the excavated material, tamped with the excavator bucket to compact the backfill, and smoothed with the excavator bucket to restore the area to within 1 foot of original ground surface grade prior to test pit excavation. The Contractor shall oversee the backfill of each test pit and confirm backfill in accordance with these requirements prior to directing the equipment operator to the subsequent test pit location.

Upon completion of each CPT, the Consultant shall completely backfill the CPT hole with cement-bentonite (approximately 1:1 ratio) grout placed by tremie grouting using the re-entry method, and with a minimum 6 inches of aggregate base course at the top to match the existing grade.

Unless otherwise directed by Authority, excess drill cuttings remaining after the completion of each drill hole may be spread out on the ground near the drilling site. Drill cuttings shall be spread only within the Reclamation ROW, but shall not be placed on any existing O&M road, embankment crest, within the canal prism, within natural or manmade drainages, on or within 5 feet of any existing structures, or in any environmentally sensitive areas. Environmentally sensitive areas will be marked in the field with survey flags and the approximate coordinates of these areas will be provided to the Consultant by the Authority once pre-work biological surveys are completed. Drilling sites shall not be located within environmentally sensitive areas.

2.5 Required Data Collection

An experienced and qualified field geologist or engineer (Qualified Representative) shall be onsite to monitor all work and shall be responsible for collecting data during the CPTs, drilling and sampling, SPTs, test pit excavation, soil classification and description, sample preservation, completion of the groundwater observation wells, and backfill of the CPTs, drill holes, and test pits. The Consultant shall provide one Qualified Representative at each drill rig and excavator, who shall be present full time during the work at each drill hole location. The Consultant shall provide multiple Qualified Representatives (one per drill hole) if work is performed concurrently at multiple drill holes. Full time oversight of the CPT work by a Qualified Representative is not required. The Consultant may choose to have a Qualified Representative oversee one or more CPT rigs at their discretion.

The Qualified Representative shall collect all required exploration data to develop drill hole and test pit logs. During SPTs and other drive sampling, the Qualified Representative shall record blow counts per each 6-inch depth interval, photograph the soil samples while still within the sampling equipment, and collect the required data specified herein. During test pit excavation, the Qualified Representative shall log and photograph the test pits, collect representative samples from each unique material type

encountered in each test pit, and collect the required data specified herein. The Qualified Representative shall describe each soil type encountered in drill holes and test pits according to Unified Soil Classification System (USCS) visual-manual classification methods specified in ASTM D2488. Minimum soil classification data requirements for documentation in drill hole and test pit logs are specified in Section 2.6 and requirements for sample photography are specified in Section 2.7. The Qualified Representative(s) shall document the depth to groundwater, if encountered in drill holes or test pits, as measured during or after drilling using a using an electronic water level sounding device. The Qualified Representative(s) shall document the total depth of the drill hole or test pit.

The Qualified Representative(s) shall log the continuous FADC samples collected during drilling, preserve core samples in sealed sample liners to preserve for samples to be used for laboratory testing, or in waxed fiber or plastic core boxes for samples not to be used for laboratory testing, and photograph the core samples within the sampler before removal for preservation within a core box and again in the labeled core box. The Qualified Representative(s) shall label each sample liner or core box with the following information prior to removing from the drilling site: drill hole name, box number, sample depths, with marking within each box that specify top and bottom depths for core samples per run.

Where bedrock coring is required, the Qualified Representative shall photograph each run of rock core within the split-barrel liner, log the rock core, place all rock core samples collected into core boxes, and photograph each core box once filled with core and labeled. The Qualified Representative shall preserve all rock core samples in purpose-built HQ-diameter core boxes and label each box with the following: project name, drill hole name, box number, sample depths, and with markings within each box that specify top and bottom depths for core samples preserved per run. The Consultant shall calculate and log rock core recovery and Rock Quality Designation (RQD) of each core run in accordance with ASTM D6032.

The Qualified Representative shall photograph each test pit and sample as specified in Section 2.7. The Qualified Representative shall collect representative samples of each unique material encountered in each test pit, in adequate quantities to perform the laboratory tests specified in Section 2.8. Sample receptacles (buckets or bags) shall be labeled with the project name, test pit name, the depth from which the sample was recovered, the data of sample collection, and the name or initials of the Qualified Representative and photographed next to the pile of excavated material from which they were sampled prior to being moved from the test pit site.

The Qualified Representative(s) shall label, preserve, and transport all soil samples for potential geotechnical laboratory testing according to ASTM D4220 and according to the following groups: bulk samples and SPT samples according to Group B, and drive and intact samples according to Group C. The Consultant shall not allow any samples to freeze or be subjected to excessive heat.

For all samples to be used for corrosivity testing (see Section 2.8 and Appendix A tables), the Qualified Representative(s) shall collect the samples using clean sealable bags, clean hands or latex gloves, and a rust-free tool (ideally stainless steel). A minimum sample size of one pound shall be sampled from each corrosivity testing location. Corrosivity sample bags shall be tightly sealed, with as much air removed as possible. The Qualified Representative(s) shall label each corrosivity sample bag with project information, sample number, drill hole, depth, date, and time, and shall place the samples on ice in a cooler, seal the cooler with strapping tape, and ship overnight to laboratory. Corrosivity samples shall be kept at approximately 40 degrees Fahrenheit until tested. Corrosivity testing shall be performed within 28 days of sample collection. The Qualified Representative(s) shall develop two duplicate Inventory Sheets for each set of samples collected at a given location. One copy of the Inventory Sheet will be kept with field notes and the second Inventory Sheet will be shipped with the samples to the laboratory. Inventory Sheets should have spaces designated for signatory and date blocks for the Qualified Representative(s) and lab technicians to form a chain of custody.

2.6 CPT, Drill Hole, and Test Pit Log Requirements

The Consultant shall use a naming convention for each drill hole, test pit, and CPT that includes the type of exploration, the last two digits of the year of exploration, and the number of the CPT, DH, or TP according to the tables in Appendix A. For example, drill holes performed during calendar year 2022 shall be named "DH-22-###".

The Consultant shall develop CPT logs that contain the following information at a minimum: CPT name; dates of testing; completion details; CPT location (GPS coordinates and approximate ground surface elevation); field personnel; testing methods; maximum depth of testing; and test results plotted by depth interval, including tip resistance, side friction, friction ratio, pore pressure, pore pressure dissipation test results, soil behavior type, and seismic wave velocities. CPT logs shall include comments regarding the reason for termination if not advanced to full depth and any indications of gravel or coarser materials encountered, as well as the depth to groundwater in the open CPT hole measured using an electronic water level sounding device or the depth at which collapse of the hole prevented further lowering of the device. All raw CPT data collected shall be submitted in digital form along with the CPT logs.

The Consultant shall develop drill hole logs that contain the following information at a minimum: drill hole name, dates of drilling, completion details, drill hole location (GPS coordinates and approximate ground surface elevation), drill rig, hammer energy transfer measurement, field personnel, drilling methods, drilling conditions, depth(s) of groundwater and date(s) encountered, maximum depth of drilling, geologic unit or origin for each material encountered, depths of contacts between soil types, depths of contacts between fill materials and underlying geologic units, basis for identifying the location of contact between embankment fill and underlying foundation materials (e.g. measured embankment height, material characteristics, etc.), USCS soil descriptions and symbols for each soil strata encountered based on visual-manual and laboratory classifications, sample recovery, laboratory results for each sample tested, and additional notes regarding drilling and sampling details and conditions encountered. For drill logs that include rock core intervals, the Consultant shall provide a description of the recovered rock materials including: type of rock, grain-size, recovery, Rock Quality Designation (RQD), color, hardness, weathering, and depth and dip angles of individual bedding planes and factures; measure dip angles from horizontal (perpendicular to the core axis).

The Consultant shall develop test pit logs that contain the following information at a minimum: test pit name, date of test pit excavation/backfill, test pit location and elevation (GPS coordinates and approximate ground surface elevation), field personnel, excavation equipment used, depths of contacts between each strata and soil type encountered in the test pit, basis for identifying the location of contact between fill and underlying native soil (e.g. measured waste pile fill height, material characteristics, etc.), sample depths, sample names and quantities, groundwater depth, total maximum test pit depth, USCS soil descriptions and symbols for each soil strata encountered based on visual-manual or laboratory classification, laboratory test results for each sample tested, and additional notes regarding details of test pit excavation and backfill activities and conditions encountered.

The Qualified Representative(s) shall provide notes in the logs including: percentage of fines, sand, gravel, cobbles, and boulders; characterization of plasticity, toughness, dry strength and dilatancy; maximum particle size; color; moisture; reaction to dilute HCl acid; density and consistency; difficulty of drilling or excavation; and other pertinent information. For any bedrock encountered, the Qualified Representative shall provide a description of the rock recovered including type of rock, degree of weathering, grain size, color, and hardness or strength estimate. The Qualified Representative(s) shall document the depth(s) of groundwater and date(s) encountered in the log if groundwater is encountered during drilling or test pit excavation. The Qualified Representative(s) shall document within the log the depths of any suspected voids, cobbles or boulders, organic materials, debris, or anthropogenic fill materials encountered during drilling or test pit excavation.

The Qualified Representative(s) shall include drill hole, test pit, and observation well completion information in the drill hole logs, with depths referenced from the ground surface at each drill hole. In the logs for drill holes completed as observation wells, the Qualified Representative(s) shall include detailed as-built information regarding all material types and quantities used, and depths of placement. In the logs for drill holes not completed as observation wells, the Qualified Representative(s) shall include detailed information regarding the types and volumes of backfill materials used and depths of placement, and description of materials used to repair to the asphalt paving.

The Consultant shall submit drill hole log and test pit log templates for Authority and Reclamation approval prior to mobilization for field exploration activities, indicating the information to be provided for each drill hole or test pit.

For all explorations targeted at public road bridges, the Consultant shall also prepare and submit as-built log of test borings (LOTB) sheets in accordance with California Department of Transportation (Caltrans) standards. The Caltrans LOTB sheets will not be required as part of interim data deliverables, but shall be submitted with the Geological Characterization Report deliverables. The Authority will provide topographic data for LOTB sheets.

All drill hole logs shall be reviewed by an experienced and qualified Certified Engineering Geologist (CEG) registered in the State of California prior to submittal.

2.7 Photographs

The Consultant shall document all work activities with color photographs. Selected photographs from each exploration shall be appended to the Geotechnical Data Report and complete digital files for all unique photographs of the exploration activities and samples collected shall be transmitted to Authority with interim data deliverables. All photographs of soil and rock samples shall include a visual scale marked with units of inches or tenths of feet. The Consultant shall annotate each selected photograph that is included in the report with the following information (as applicable): project name, CPT or drill hole or test pit name, sample name and depth, subject of photograph, photographer, and date.

At a minimum, the Consultant shall photograph:

- each exploration work site, both before work starts and after completion of the observation wells or backfill and asphalt repairs,
- each open test pit,
- each pile of material excavated from test pits,
- each bulk sample in the receptacle,
- each drive sample while still within the sampling equipment,
- each rock core sample within the split-barrel sample, and
- each continuous core box with complete samples and labels.

During the work at each test pit, the Qualified Representative shall photograph each wall and the bottom of the open test pit, the piles of all materials excavated from the test pit, and the collected samples in their labeled receptacles. Photographs of the samples shall include the labeled receptacle, with all label information clearly visible, placed on or in front of the pile of material from which the sample was collected, such that the sampled material is visible in the photograph.

2.8 Laboratory Testing

Laboratory testing quantities by drill hole are estimated in Appendix A; however, actual test quantities and sample locations may vary from those identified in Appendix A depending on subsurface conditions and materials encountered. Total quantities of each test performed shall not exceed those identified in Appendix A unless otherwise directed by Authority.

The Consultant shall select representative samples for each test, subject to Authority approval, under the guidance and responsible charge of an experienced and qualified Geotechnical Engineer (GE) registered in the State of California to provide appropriate and representative engineering properties for the materials and design of the specific targeted project features. Prior to performing laboratory tests on samples from each drill hole or test pit, the Consultant shall submit to the Authority a Laboratory Testing Plan and draft log for each drill hole or test pit. The Laboratory Testing Plan shall list, at a minimum, the samples obtained from each drill hole or test pit with unique names for each sample, the type of sampler used to collect each sample, USCS soil descriptions or rock type for each sample, and the proposed test method and quantity of tests to be performed on each sample. The Consultant shall propose test loads in the Laboratory Testing Plan, subject to and Reclamation approval. Reclamation will provide guidance on test loads and details of methods for specific strength and consolidation tests and samples as required. The Consultant shall not proceed with the laboratory testing for each drill hole or test pit until the Laboratory Testing Plan for that hole has been approved by Authority. The Consultant shall perform all laboratory soil and rock testing in a Qualified Laboratory and under the supervision of a Qualified Laboratory Manager.

Selected samples shall be submitted for the following laboratory tests, using the latest version of the specified standards:

- Grain size distribution
    - Sieve analysis using U.S. Standard Sieve sizes – ASTM D6913 (Method A) or D422
    - Hydrometer analysis – ASTM D7928 or D422
- Atterberg limits – ASTM D4318 (1-point method to be used for liquid limit)
- Unit weight – ASTM D1587 Note 6, or ASTM D3550 Note 1, or USBR 7105
- Water content – ASTM D2216
- Consolidated undrained triaxial compression with pore pressure measurements – ASTM D4767 (3 points per test at different confining stresses on separate specimens)
- Unconfined/uniaxial compressive strength
    - Soil – ASTM D2166
    - Rock – ASTM D7012 Method D
- One-dimensional consolidation – ASTM D2435 Method B
- One-dimensional swell or collapse – ASTM D4546 Method C
- Standard or Modified Proctor compaction – ASTM D698 or D1557
- Direct shear – ASTM D3080 (1 point per test)
- Crumb dispersion test – ASTM D6572
- Pinhole dispersion test – ASTM D4647
- Corrosivity test suite
    - pH – ASTM D4972 or G51
    - Chloride content – ASTM D4327 or D512
    - Resistivity – ASTM G57
    - Sulfate content – ASTM D4327 or D516
- R-value – ASTM D2944/AASHTO T190
- Direct simple shear – ASTM D6528 (1 point per test)
- Cyclic direct simple shear – ASTM D8926 (4 points per test at different cyclic stress ratios on separate specimens, load-controlled testing required)
- Sand cone density – ASTM D1556
- Slake Durability – ASTM D4644

The Consultant shall use only intact Shelby tube samples or FADC Lexan liner tube samples for triaxial and unconfined compression, consolidation, direct shear, and direct simple shear tests; the Consultant shall not use Modified California samples for these tests, unless approved by Authority.

However, the Consultant may use Modified California samples for other tests specified herein. For drill holes where continuous FADC sampling is specified in the table in Appendix A, unit weight of soil sample(s) shall be measured using a complete FADC sample within the liner using the methods described in Reclamation's Earth Manual, Part 2, Third Edition, USBR 7105, 11.3.6 and 12.

The consultant shall prepare any and all rock core specimens used for laboratory testing in accordance with ASTM D4543. The Consultant shall take care to preserve the field moisture content of rock core samples to be used as laboratory test specimens in accordance with ASTM D5079.

The Consultant shall provide draft laboratory testing data reports as part of interim deliverables within two (2) business days of completion of each test, and shall include all complete laboratory data in the Geotechnical Data Report. In Geotechnical Data Report deliverables, the Consultant shall include tables summarizing laboratory testing results, as well as individual test reports as required by the specific standard test method for each with complete raw data, plots, and photographs from each test. Each test report shall include at a minimum the sample name, drill hole, and sample depth; soil type and USCS symbol according to ASTM D2487; relevant test results, data, and other information specified in each standard test method; date tested; and last name or initials of test technician and quality checker.

3.0 Deliverables

All Consultant deliverables and submittals will be reviewed by both Authority and Reclamation. Communication with the Consultant, including comments, approvals, and direction will be provided by Authority.

3.1 Schedule

The Consultant shall submit a proposed schedule for field exploration and laboratory testing, as specified in Section 2.0, prior to mobilizing for field exploration work. The Consultant shall update the schedule on a weekly basis throughout the duration of the work based on actual progress and resulting schedule changes. The schedule shall be transmitted via email.

3.2 Sampling and Testing Plans

The Consultant shall submit a brief Drill Hole Sampling Plan for each drill hole, as specified in Section 2.2, prior to drilling, including specifics of sampling methods and target depths. The Consultant shall allow two full business days for Authority to review the Drill Hole Sampling Plan and addenda for each drill hole between the submittal date and the scheduled date to begin drilling activities at that hole.

The Consultant shall submit a Laboratory Testing Plan for each drill hole and test pit, as specified in Section 2.8, and including a draft drill hole or test pit log, prior to performing laboratory tests on samples from that drill hole or test pit. The Consultant shall allow at least two full business days for Authority to review the Laboratory Testing Plan between the submittal date and the scheduled date to begin laboratory testing on samples from that hole.

Drill Hole Sampling Plan and Laboratory Testing Plan submittals shall be transmitted via email as PDF files.

3.3 Interim Data Reporting

The Consultant shall transmit draft data from the explorations and testing as interim data deliverables throughout the duration of the field and laboratory work. Draft CPT logs, including raw CPT data files, shall be submitted within five (5) business days of completing each CPT. Draft drill hole and test pit logs

shall be submitted weekly and the Consultant shall submit the logs for all drill holes and test pits completed during each week by the close of business on the final business day of the following week and within eleven (11) calendar days of completing each drill hole. Draft drill hole and test pit logs shall be submitted in a clean, legible format and shall include all data specified in Section 2.6, except laboratory test data. Draft laboratory test results shall be submitted within five (5) business days of the date of each test completion. The Consultant shall submit interim data at least once per week throughout the duration of the exploration and testing work. Interim data submittals shall be transmitted via email as PDF files. The Consultant shall complete all fieldwork and submit all interim data deliverables within no more than 240 calendar days of receiving Notice to Proceed on the fieldwork.

3.4 Geotechnical Data Report

The Consultant shall provide a Draft and a Final Geotechnical Data Report. A complete Draft Geotechnical Data Report shall be submitted within no more than 60 calendar days of completion of the fieldwork. Authority will review the Draft Geotechnical Data Report and provide comments within four weeks. The Consultant shall have no more than 30 calendar days to submit the Final Geotechnical Data Report after receiving review comments from Authority. The Consultant shall document all review comments and questions from Authority and Reclamation, as well as Consultant responses and actions to address the comments, in a comment resolution log. The Consultant shall submit the comment resolution log one week prior to the Final Geotechnical Data Report.

The Consultant shall include at a minimum the following information in the Geotechnical Data Report:

- Narrative summary of the work and methods;
- Drill hole, test pit, and CPT logs;
- Laboratory testing data; and
- Photographs of samples, equipment used, and the surface completion for all drill holes and test pits.

The Final Geotechnical Data Report shall be stamped and signed by the California Licensed GE and CEG in responsible charge of the work. The Consultant shall deliver PDF files of the Draft and Final Geotechnical Data Report via email or other electronic file transmittal method, as well as three (3) hard printed copies (one [1] to Authority and two [2] to Reclamation) and will receive email confirmation of the receipt of the document.

3.5 Geological Characterization Report (Phase 3 only)

Following completion of the final phase of the work authorized by the Authority, the Consultant shall provide a Draft and a Final Geological Characterization Report within 120 calendar days of submitting the Geotechnical Data Report. A complete Draft Geological Characterization Report shall be submitted within 75 calendar days of submittal of the Geotechnical Data Report. Authority will review the Draft Geological Characterization Report and provide comments within four weeks. The Consultant shall have 45 calendar days to submit the Final Geological Characterization Report after receiving review comments from Authority. The Consultant shall document all review comments and questions from Authority, as well as Consultant responses and actions to address the comments, in a comment resolution log. The Consultant shall submit the comment resolution log two weeks prior to the Final Geological Characterization Report.

The Consultant shall include at a minimum the following information in the Geological Characterization Report:

- Brief narrative summary of the explorations and testing completed in all phases of the work, with reference to the Geotechnical Data Reports for details;

- Description of the subsurface conditions and engineering geologic units (i.e. soil or rock types with common engineering properties and geologic origin) encountered in explorations at structures, organized by structure or groups of structures that share common geological environments and ground conditions;
- Discussion of foundation design and construction considerations for replacement of structures, relevant to the ground conditions and engineering geologic units encountered;
- Map sheets at 1:10,000 or larger scale (i.e. smaller area of coverage) showing locations and names of all explorations completed as part of the work, surficial geologic map unit symbols and contacts, annotated satellite imagery, and canal centerline milepost stationing labeled at 0.1-mile intervals;
- Geologic cross sections oriented perpendicular to the canal centerline at the locations of each existing structure where explorations have been performed, unless otherwise directed by Authority, showing the following information at a minimum:
    - Existing ground surface topography (to be provided by the Authority);
    - Vertical elevation and horizontal distance axes, with tick marks or half-tone grid lines;
    - Stick logs from CPTs targeted at the structure, annotated with CPT name, ground surface elevation at the CPT, colors indicating soil behavior type from CPT intervals, and plots of tip resistance and side friction by depth along opposite sides of the stick log;
    - Stick logs from drill holes targeted at the structure, annotated with drill hole name, ground surface elevation at the drill hole, contacts between soil types encountered, hatching indicating soil type between contacts, USCS soil symbols and blow counts at sample depths, and groundwater table elevation during drilling and following observation well completion and stabilization;
    - Delineations of interpreted contacts between engineering geologic units present throughout the depths of and interpolated between explorations; and
    - Symbols indicating the engineering geologic units between the delineated contacts.

The Final Geological Characterization Report shall be stamped and signed by the California Licensed GE and CEG in responsible charge of the work. The Consultant shall deliver PDF files of the Draft and Final Geological Characterization Report via email or other electronic file transmittal method, as well as three (3) hard printed copies (one [1] to Authority and two [2] to Reclamation) and will receive email confirmation of the receipt of the document.

3.6 Delivery

Submittals shall be transmitted to the Authority Project Manager for distribution to other parties. Email and mailing addresses will be available once the Notice To Proceed has been issued.

4.0 Responsibilities of Authority and Reclamation

In addition to the responsibilities identified in the General Conditions, Exhibit B to the Agreement, Authority will provide Consultant access to the O&M roads through locked gates at public road crossings. Cultural (Section 106) and environmental (NEPA, Section 7, and Section 106) clearances for the work will be provided by Reclamation in advance of the work. California State environmental compliance documentation in accordance with CEQA will be provided by Authority.

Authority and Reclamation will provide review of Consultant submittals within the durations discussed herein.

5.0 Additional Responsibilities of the Consultant

The Consultant shall be responsible for performance of the work specified herein. The Consultant shall provide and maintain adequate equipment, personnel, Sub-Consultants, and other resources necessary to complete all the work requirements specified herein and submit deliverables within the schedule specified herein. The Consultant shall be responsible for the quality and on-time submittal of deliverables. The Consultant shall not interfere with work of other Consultants, Authority, or Reclamation.

The Consultant shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property. At the expense of the Consultant, the Consultant shall repair or replace all existing improvements (e.g., curbs, fences, signs, utilities, street surfaces, structures etc.) damaged as a result of his operations. Repairs and replacements shall be at least equal to existing improvements, and shall match them in finish and dimension.

6.0 Place of Performance

The field explorations and testing performed as part of the work will be entirely within the Reclamation ROW, on the existing DMC O&M roads adjacent to the canal, at locations where the existing ground surface is part of the engineered environment. The O&M roads are along the canal banks and consist of both cut and fill surfaces. Generally speaking, the left-side (facing downstream) O&M road is surfaced with two layers of asphalt chip seal paving, while the right-side O&M road consists of a gravel surface. The O&M roads are accessible to and used by adjacent landowners.

A wide shoulder within the DMC right-of-way is present along most of the DMC O&M road. This shoulder can be used as a turnaround, to store material, or to store equipment.

The storage yards listed in the table below are located within the DMC ROW and are available for equipment storage. Authority does not accept responsibility for lost, stolen, or damaged items left at these storage yards. Access to the storage yards will be provided by Authority personnel upon request.

Storage Location	Milepost	Description
Patterson Storage Yard	40.00	Security Fencing. Un-manned area. No security measures.
Los Banos Field Office	80.00	Security Fencing. Personnel present during business hours. Low tech alarm system in place.

Laboratory testing and the remainder of the work will be performed at the Consultant's facility. Deliveries will be made to locations as described in Section 3.0.

7.0 Security

The Consultant shall be responsible for the security of all material and or equipment stored on the DMC right-of-way. Areas along the canal experience high amounts of theft and Authority cannot be held responsible for any theft that occurs.

The Consultant shall be responsible for restricting public access to each work site as described in Section 2.0.

8.0 Period of Performance

The Consultant shall perform and complete all associated Phase 2 and Phase 3 field and laboratory work, as well as the final Geotechnical Data Report within 300 calendar days of notice to proceed. The Consultant shall submit the Final Geological Characterization Report within 65 calendar days of submitting the Final Geotechnical Data Report.

Statement of Work
Geotechnical Investigations to Support Design Work
Delta-Mendota Canal Subsidence Correction
CPT Summary

Phase	CPT Number	Target Depth (ft)	Approx. Milepost	Canal Bank	Approx. Coordinates (WGS 1984)		Targeted Feature	Pore Pressure Measurement	Pore Pressure Disspiation Testing - Type I
					Latitude	Longitude			
2	CPT-220	30	115.50	left	36.787098	-120.387561	Embankment raise	x	x
2	CPT-116	30	115.50	right	36.78657209	-120.3877254	Embankment raise	x	
2	CPT-221	30	114.00	right	36.803938	-120.403464	Embankment raise	x	x
2	CPT-222	30	113.75	right	36.807165	-120.405286	Embankment raise	x	x
2	CPT-223	30	113.25	right	36.810676	-120.412433	Embankment raise	x	x
2	CPT-224	30	111.00	left	36.830444	-120.442461	Embankment raise	x	x
2	CPT-117	30	111.00	right	36.82994408	-120.4420874	Embankment raise	x	x
2	CPT-119	35	100.75	right	36.87965908	-120.6015565	Embankment raise	x	x
2	CPT-120	35	100.50	left	36.88157363	-120.6055632	Embankment raise	x	x
2	CPT-225	35	100.00	left	36.882731	-120.614015	Embankment raise	x	
2	CPT-121	35	99.80	left	36.88273847	-120.6179327	Embankment raise	x	x
2	CPT-122	30	99.80	right	36.8821846	-120.6179492	Embankment raise	x	
2	CPT-123	30	99.50	left	36.88276195	-120.6237531	Embankment raise	x	x
2	CPT-124	35	99.50	right	36.8821861	-120.6237342	Embankment raise	x	x
2	CPT-125	30	99.25	left	36.88329794	-120.6281704	Embankment raise	x	x
2	CPT-126	30	99.25	right	36.8827663	-120.628515	Embankment raise	x	x
2	CPT-127	30	99.00	left	36.88498017	-120.6320172	Embankment raise	x	x
2	CPT-128	30	99.00	right	36.88443494	-120.6323521	Embankment raise	x	x
2	CPT-129	35	98.50	left	36.88825035	-120.6398371	Embankment raise	x	x
2	CPT-130	35	98.50	right	36.88785825	-120.6400011	Embankment raise	x	
2	CPT-131	35	98.25	left	36.88872274	-120.6442521	Embankment raise	x	
2	CPT-132	35	98.25	right	36.88829952	-120.6442938	Embankment raise	x	x
2	CPT-133	35	98.00	left	36.88917001	-120.6493088	Embankment raise	x	x
2	CPT-134	35	98.00	right	36.88874223	-120.6493461	Embankment raise	x	
2	CPT-135	35	97.50	left	36.89017242	-120.6579419	Embankment raise	x	
2	CPT-137	35	97.25	left	36.89016261	-120.6619743	Embankment raise	x	x
2	CPT-139	35	97.00	left	36.89017634	-120.6664702	Embankment raise	x	
2	CPT-140	35	96.25	right	36.89250693	-120.6789036	Embankment raise	x	x
2	CPT-141	35	96.00	right	36.89569782	-120.6825469	Embankment raise	x	
2	CPT-142	35	95.70	right	36.89765284	-120.686208	Embankment raise	x	x
2	CPT-145	35	51.75	left	37.32449089	-121.1029115	Embankment raise	x	
2	CPT-146	35	51.75	right	37.32449374	-121.1034442	Embankment raise	x	x
2	CPT-147	30	51.25	right	37.33152624	-121.1036722	Embankment raise	x	
2	CPT-148	35	51.00	left	37.33516661	-121.1057969	Embankment raise	x	
2	CPT-149	35	50.75	left	37.33787489	-121.1072458	Embankment raise	x	
2	CPT-150	35	50.50	left	37.34157596	-121.1075279	Embankment raise	x	x
2	CPT-151	35	50.25	left	37.34483231	-121.1064471	Embankment raise	x	
2	CPT-152	30	46.50	left	37.39554881	-121.1099594	Embankment raise	x	x
2	CPT-154	35	44.00	right	37.42403148	-121.1311438	Embankment raise	x	
2	CPT-156	35	43.75	right	37.42817171	-121.131921	Embankment raise	x	x
2	CPT-157	30	43.50	left	37.43154443	-121.1328599	Embankment raise	x	
2	CPT-158	35	43.50	right	37.43152482	-121.1333966	Embankment raise	x	x
2	CPT-159	35	43.00	left	37.43830708	-121.1354444	Embankment raise	x	x
2	CPT-160	35	43.00	right	37.43805504	-121.1358412	Embankment raise	x	
2	CPT-161	35	42.75	left	37.44127202	-121.1382769	Embankment raise	x	x
2	CPT-162	35	42.75	right	37.44103892	-121.1387361	Embankment raise	x	
2	CPT-164	35	38.25	left	37.48103123	-121.1870794	Embankment raise	x	x
2	CPT-165	35	38.00	left	37.48423051	-121.1890787	Embankment raise	x	
2	CPT-166	35	37.75	left	37.48761286	-121.1907851	Embankment raise	x	
2	CPT-167	35	37.50	left	37.49120277	-121.1923351	Embankment raise	x	
2	CPT-169	35	37.25	left	37.49421608	-121.1949835	Embankment raise	x	
2	CPT-170	35	37.25	right	37.49394142	-121.1955053	Embankment raise	x	x
2	CPT-171	35	37.00	left	37.49735318	-121.1958387	Embankment raise	x	x
2	CPT-172	35	37.00	right	37.4973648	-121.19636	Embankment raise	x	
2	CPT-173	30	36.75	left	37.50079428	-121.1959408	Embankment raise	x	x
2	CPT-174	35	36.75	right	37.50058497	-121.1964685	Embankment raise	x	
2	CPT-175	35	36.50	left	37.50287479	-121.2000074	Embankment raise	x	
2	CPT-176	35	36.50	right	37.5024845	-121.2002255	Embankment raise	x	x
2	CPT-177	35	36.25	left	37.50439756	-121.2041635	Embankment raise	x	x
2	CPT-226	35	36.25	right	37.504022	-121.204363	Embankment raise	x	x
2	CPT-178	35	35.25	left	37.509934	-121.216434	Embankment raise	x	
2	CPT-179	35	34.75	left	37.51874457	-121.217626	Embankment raise	x	x
2	CPT-180	35	34.00	left	37.52705032	-121.2214403	Embankment raise	x	x
2	CPT-181	35	33.75	left	37.53025052	-121.2233442	Embankment raise	x	
2	CPT-183	35	30.75	left	37.55938599	-121.2546819	Embankment raise	x	
2	CPT-184	35	30.50	left	37.56105257	-121.2588994	Embankment raise	x	
2	CPT-185	35	30.25	left	37.56039239	-121.2636383	Embankment raise	x	
2	CPT-189	35	23.25	left	37.63251586	-121.3343051	Embankment raise	x	x
2	CPT-190	35	23.25	right	37.63243191	-121.3348194	Embankment raise	x	
2	CPT-191	35	23.00	left	37.6354334	-121.3374685	Embankment raise	x	
2	CPT-192	35	23.00	right	37.63505463	-121.337681	Embankment raise	x	x
2	CPT-193	35	22.75	right	37.63531451	-121.3416872	Embankment raise, pipe crossing	x	
2	CPT-194	35	22.50	left	37.63584292	-121.3460983	Embankment raise	x	x
2	CPT-195	35	22.50	right	37.63544991	-121.3462222	Embankment raise	x	
2	CPT-196	35	22.25	left	37.638659	-121.347656	Embankment raise	x	
2	CPT-197	35	22.25	right	37.63864835	-121.3481512	Embankment raise	x	x
2	CPT-227	35	22.12	left	37.640683	-121.349905	Embankment raise	x	
2	CPT-199	35	21.75	left	37.6411327	-121.3572584	Embankment raise	x	x
2	CPT-200	35	21.75	right	37.64074022	-121.3574577	Embankment raise	x	
2	CPT-201	35	21.13	right	37.64256368	-121.3673227	Embankment raise, pipe crossing	x	x
2	CPT-202	35	20.75	left	37.64268679	-121.3747228	Embankment raise	x	x
2	CPT-203	35	20.75	right	37.64224993	-121.3747645	Embankment raise	x	
2	CPT-204	35	20.50	left	37.64478427	-121.377226	Embankment raise	x	
2	CPT-205	35	20.50	right	37.64455172	-121.3776838	Embankment raise	x	x
2	CPT-206	35	20.00	left	37.649506	-121.384164	Embankment raise	x	x
2	CPT-207	35	20.00	right	37.649167	-121.384472	Embankment raise	x	
2	CPT-208	35	19.50	left	37.65330946	-121.3921252	Embankment raise	x	x
2	CPT-209	35	19.50	right	37.65290897	-121.3922756	Embankment raise	x	
2	CPT-213	35	5.75	right	37.75723802	-121.5750355	Embankment raise	x	x
2	**89**	**3,030**						**89**	**48**

Original Draft Scope	105	3210						105	39
Percentage of Original Draft Scope	85%	94%						85%	123%

Statement of Work
Geotechnical Investigations to Support Design Work
Delta-Mendota Canal Subsidence Correction
Drill Hole and Laboratory Testing Summary

							Approx. Coordinates (WGS 1984)							Lab Testing																		
Phase	Drill Hole Number	Drill Hole Target Depth (ft)	Observation Well Number	Observation Well Target Depth (ft)	Approx. Milepost	Canal Bank	Latitude	Longitude	Targeted Feature	Continuous Flight Auger Dry Core Sampling	Rock Core Sampling	Minimum Number of Shelby Tube Samples	Sieve Analysis	Atterberg Limits	Unit Weight	Water Content	CU Triaxial Compression (3 points per each)	Unconfined Compression- Soil	Uniaxial Compressive Strength and Elastic Moduli - Rock	Slake Durability - Rock	1-D Consolidation	1-D Swell or Collapse	Modified Proctor Compaction	Corrosivity Test Suite (pH, sulfates, chlorides, resistivity)	R-Value	Direct Shear (3 points per each)	Crumb Dispersion Test	Pinhole Dispersion Test	Hydrometer	Direct Simple Shear (1 point per each)	Cyclic Direct Simple Shear (4 points per each)
2	DH-30	35	OW-63	30	115.7	right	36.78580273	-120.3847164	Embankment raise, erosion protection, seepage	x		2	2	1	2	2	1				1							1	1	1	1	1
2	DH-31	30	OW-64	30	114.5	right	36.79717775	-120.3976512	Erosion protection, seepage	x			2	1	2	2												1	1	1		
2	DH-32	30	OW-65	30	113.5	right	36.80867807	-120.4069582	Erosion protection, seepage	x			2	1	2	2												1	1	1		
2	DH-33	30	OW-66	30	112.5	right	36.81714113	-120.4224183	Erosion protection, seepage	x			2	1	2	2												1	1	1		
2	DH-34	35			110.25	right	36.82496449	-120.4555634	Erosion protection, slope stability	x			2	1	2	2											1	1	1	1	1	1
2	DH-35	30			109.0	right	36.83314515	-120.474914	Erosion protection				2	1	2	2												1	1	1		
2	DH-36	30			107.9	right	36.84548965	-120.4872486	Erosion protection				2	1	2	2												1	1	1		
2	DH-37	110			106.6	left	36.85881868	-120.5043267	Erosion protection, slope stability, farm bridge	x		3	4	3	2	2	1	1			1	1					1	1	1	1	1	1
2	DH-38	35			105.7	left	36.86676595	-120.5156416	Erosion protection, slope stability				2	1	2	2											1	1	1	1	1	1
2	DH-39	35			104.1	right	36.87437185	-120.5427899	Erosion protection, slope stability	x			2	1	2	2											1	1	1	1	1	1
2	DH-40	30			102.9	left	36.87470094	-120.5631125	Erosion protection				2	1	2	2												1	1	1		
2	DH-41	105			102.0	left	36.87865574	-120.5787966	Erosion protection, farm bridge	x		3	3	2	3	3	1	1			1	1					1	1	1	1		
2	DH-42	35			100.8	left	36.88017426	-120.5998606	Erosion protection, slope stability	x			2	1	2	2											1	1	1	1	1	1
2	DH-43	35			99.8	left	36.88273721	-120.6181033	Embankment raise, erosion protection, slope stability	x		2	2	1	2	2	1				1						1	1	1	1	1	1
2	DH-44	100			98.7	left	36.88659723	-120.6357783	Embankment raise, erosion protection, farm bridge	x		4	3	2	3	3	1	1			1	1						1	1	1	1	1
2	DH-45	30	OW-30	30	97.1	right	36.88973843	-120.6642571	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-46	30	OW-31	30	96.0	right	36.89461473	-120.6812918	Liner distress	x		1	2	1	2	2						1						1	1	1		
2	DH-47	30	OW-32	30	95.6	right	36.89821481	-120.6878692	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-48	30	OW-33	30	93.9	right	36.90417621	-120.7168196	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-49	30	OW-34	30	93.4	right	36.90557008	-120.7256729	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-50	30	OW-35	30	92.7	right	36.905176	-120.739618	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-51	30	OW-36	30	87.9	right	36.93372759	-120.8131265	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-52	30	OW-37	30	87.4	left	36.9379108	-120.820281	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-53	30	OW-38	30	75.3	right	37.05786658	-120.95592	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-54	40	OW-39	40	74.6	left	37.06395369	-120.9643806	Liner distress, slope stability			1	2	1	2	2						1					1	1	1	1		
2	DH-55	80			43.25	right	37.43549699	-121.1337471	Embankment raise, Marshall Rd. bridge	x		3	2	2	2	2	1	1			1	1	1	1	1					1	1
2	DH-56	35			37.3	left	37.49296028	-121.1938521	Embankment raise			2	2	1	2	2	1				1	1									1	1
2	DH-57	30			36.75	left	37.50071555	-121.195912	Embankment raise			2	2	1	2	2	1				1	1									1	1
2	DH-58	35			30.5	left	37.56105386	-121.2589484	Embankment raise			2	2	1	2	2	1				1	1									1	1
2	DH-59	35	OW-40	35	23.2	right	37.63316988	-121.3350838	Liner distress			1	2	1	2	2						1						1	1	1		
2	DH-60	35			23.0	left	37.63541442	-121.3374319	Embankment raise			2	2	1	2	2	1				1										1	1
2	DH-61	35			22.25	right	37.63860375	-121.3481483	Embankment raise			2	2	1	2	2	1				1										1	1
2	DH-62	70			21.5	right	37.64127919	-121.361012	Embankment raise, Bird Rd. bridge	x		3	2	2	2	2	2	1			1	1	1	1	1					1	1
2	DH-63	100			20.96	left	37.64260035	-121.3705698	Embankment raise, farm bridge	x		2	3	2	3	3	1	1			1	1									1	1
2	DH-213	30	OW-58	30	111	left	36.830302	-120.442918	Erosion protection, seepage	x			2	2	2	2												1	1	1		
2	DH-214	30	OW-59	30	111.7	left	36.826733	-120.432155	Erosion protection, seepage	x			2	2	2	2												1	1	1		
2	DH-215	30	OW-60	30	112.6	left	36.816426	-120.420347	Erosion protection, seepage	x			2	2	2	2												1	1	1		
2	DH-216	30	OW-61	30	113.6	left	36.809802	-120.408084	Erosion protection, seepage	x			2	2	2	2												1	1	1		
2	DH-217	30	OW-62	30	114.3	left	36.79922	-120.398339	Erosion protection, seepage	x			2	2	2	2												1	1	1		
2	**39**	**1,620**	**20**	**615**						**20**	**0**	**43**	**83**	**51**	**81**	**81**	**14**	**6**	**0**	**0**	**13**	**20**	**2**	**2**	**2**	**7**	**31**	**31**	**31**	**16**	**16**
3	DH-72	60			13.25	right	37.69909581	-121.4766059	Lammers Rd. bridge	x		2	2	2	2	2	1	1			1	1	1	1	1						
3	DH-73	100			14.8	left	37.691954	-121.452902	Corral Hollow Rd.	x		2	4	2	4	4	1	1			1	1	1								
3	DH-74	70	OW-55	70	14.8	right	37.691551	-121.452742	Corral Hollow Rd.	x		2	2	2	2	2	1	1			1	1	1	1	1						
3	DH-75	30			16.78	left	37.67190384	-121.4302587	Pipe crossing			1	2	1	2	2	1						1								
3	DH-76	30			16.78	right	37.67222483	-121.4306774	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-77	60			17.23	right	37.66710745	-121.4262458	Durham Ferry Rd. bridge	x		2	2	2	2	2	1	1			1	1	1	1	1						
3	DH-78	75			18.04	right	37.65855197	-121.4159954	MacArthur Dr. bridge	x		2	2	2	2	2	1	1			1	1	1	1	1						
3	DH-79	40			18.47	left	37.65594035	-121.4099558	Pipe crossing			1	2	1	2	2	1						1								
3	DH-80	40			18.47	right	37.65557262	-121.4096964	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-83	85			19.18	right	37.65456398	-121.3978723	Chrisman Rd. bridge	x		3	2	3	2	2	2	1			1	1	1	1	1						
3	DH-86	65	OW-41	65	20.96	right	37.64223868	-121.3704795	Farm bridge			3	1	2	1	1	1	1			1	1	1	1							
3	DH-87	30			21.13	left	37.6429622	-121.3675008	Pipe crossing			2	2	1	2	2	1						1								
3	DH-88	30			21.13	right	37.64256781	-121.3674174	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-91	40			22.75	left	37.63573364	-121.3415782	Pipe crossing			1	2	1	2	2	1						1								
3	DH-92	40			22.75	right	37.63531414	-121.3416117	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-93	100			23.36	left	37.63095074	-121.3337831	Farm bridge	x		2	2	2	2	2	1	1			1	1	1								
3	DH-94	65	OW-42	65	23.36	right	37.63094306	-121.3342834	Farm bridge			2	1	2	1	1	1	1			1	1		1							
3	DH-95	30			23.76	left	37.62675846	-121.329063	Pipe crossing			1	2	1	2	2	1						1								
3	DH-96	30			23.76	right	37.62647473	-121.3294167	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-99	55			24.48	right	37.6171291	-121.3253236	Koster Rd. bridge	x		1	2	3	2	2	1	1			1	1	1	1	1						
3	DH-100	55			26.21	right	37.59468052	-121.3164851	Gaffrey Rd. bridge	x		1	2	2	2	2	1	1			1	1	1	1	1						
3	DH-101	75			26.93	left	37.58753091	-121.3065388	Farm bridge	x		2	2	2	2	2	1	1			1	1	1								
3	DH-102	75	OW-43	75	26.93	right	37.58722412	-121.3067908	Farm bridge			3	1	2	1	1	1	1			1	1		1							
3	DH-103	75			28.27	right	37.57594487	-121.2874857	Welty Rd. bridge	x		3	2	2	2	2	1	1			1	1	1	1	1						
3	DH-106	50			29.93	right	37.55959943	-121.2688284	McCracken Rd. bridge	x		1	2	2	2	2	1	1			1	1	1	1	1						
3	DH-107	60			31.12	left	37.55553446	-121.2506848	Farm bridge	x		2	2	2	2	2	1	1			1	1	1								
3	DH-108	60	OW-44	60	31.12	right	37.55516671	-121.2507666	Farm bridge			2	1	2	1	1	1	1			1	1		1							
3	DH-109	60			31.59	left	37.5509716	-121.2453903	Farm bridge	x		3	2	2	2	2	1	1			1	1	1								
3	DH-110	60	OW-45	60	31.59	right	37.55098067	-121.2458647	Farm bridge			2	1	2	1	1	1	1			1	1		1							
3	DH-111	60			32.10	left	37.54375374	-121.2431102	Farm bridge	x		3	2	2	2	2	1	1			1	1	1								
3	DH-112	60	OW-46	60	32.10	right	37.54376206	-121.2435946	Farm bridge			3	1	2	1	1	1	1			1	1		1							
3	DH-113	70			32.61	right	37.53660662	-121.2426038	Howard Rd. bridge	x		2	2	2	2	2	1	1			1	1	1	1	1						
3	DH-114	80			33.29	left	37.53193392	-121.231935	Farm bridge	x		3	2	3	2	2	1	1			1	1	1								
3	DH-115	80	OW-47	80	33.29	right	37.53154892	-121.2319817	Farm bridge			3	1	2	1	1	1	1			1	1		1							
3	DH-117	100			34.39	right	37.52238781	-121.2190262	Needham Rd. Bridge	x		4	2	2	2	2	2	1			1	1	1	1	1						
3	DH-120	85			34.89	left	37.5151529	-121.216918	Farm bridge	x		4	2	3	2	2	2	1			1	1	1								
3	DH-121	85	OW-48	85	34.89	right	37.51509463	-121.2173902	Farm bridge			3	1	2	1	1	1	1			1	1		1							
3	DH-124	80			39.21	right	37.47151247	-121.1773501	Rogers Rd. bridge	x	x	3	2	1	2	2	1	1	3	1	1	1	1	1	1						
3	DH-127	85			42.53	right	37.44220169	-121.1411518	Ward Ave. bridge, liner distress	x		4	2	2	2	2	2	1			1	1	1	1	1				1	1	1
3	DH-130	70			45.77	right	37.40071139	-121.1213134	Davis Rd. bridge	x		4	2	3	2	2	2	1			1	1	1	1	1						
3	DH-131	30			46.17	left	37.39827233	-121.114996	Pipe crossing, embankmnet raise			2	2	1	2	2	1						1								
3	DH-132	30			46.17	right	37.39781174	-121.1150135	Pipe crossing, embankmnet raise			1	1	1	1	1		1			1	1		1							
3	DH-133	70			46.84	right	37.39154948	-121.1067332	Fink Rd. bridge	x		3	2	2	2	2	1	1			1	1	1	1	1						
3	DH-136	80			48.38	right	37.36991895	-121.1046832	Diehl Rd. bridge	x		4	2	3	2	2	2	1			1	1	1	1	1						
3	DH-139	60			51.40	right	37.32986177	-121.1033907	Stuhr Rd. bridge	x		0	4	1	2	2							1	1	1						
3	DH-140	50			52.01	right	37.32158238	-121.1014569	Orestimba Rd. bridge	x	x	0	3	1	2	2	1	1	3	1	1	1	1	1	1						
3	DH-143	80			56.60	right	37.26210428	-121.0896692	Pete Miller Rd. bridge	x		3	4	2	2	2	1	1			1	1	1	1	1						
3	DH-144	95			57.95	right	37.2459683	-121.0784881	Sullivan Rd. bridge	x		3	5	3	2	2	1	1			1	1	1	1	1						
3	DH-147	80			58.46	right	37.23875753	-121.0776512	Gravel Pit Rd. bridge	x		3	5	3	2	2	2	1			1	1	1	1	1						

Statement of Work
Geotechnical Investigations to Support Design Work
Delta-Mendota Canal Subsidence Correction
Drill Hole and Laboratory Testing Summary

							Approx. Coordinates (WGS 1984)							Lab Testing																				
Phase	Drill Hole Number	Drill Hole Target Depth (ft)	Observation Well Number	Observation Well Target Depth (ft)	Approx. Milepost	Canal Bank	Latitude	Longitude	Targeted Feature	Continuous Flight Auger Dry Core Sampling	Rock Core Sampling	Minimum Number of Shelby Tube Samples	Sieve Analysis	Atterberg Limits	Unit Weight	Water Content	CU Triaxial Compression (3 points per each)	Unconfined Compression-Soil	Uniaxial Compressive Strength and Elastic Moduli - Rock	Slake Durability - Rock	1-D Consolidation	1-D Swell or Collapse	Modified Proctor Compaction	Corrosivity Test Suite (pH, sulfates, chlorides, resistivity)	R-Value	Direct Shear (3 points per each)	Crumb Dispersion Test	Pinhole Dispersion Test	Hydrometer	Direct Simple Shear (1 point per each)	Cyclic Direct Simple Shear (4 points per each)
3	DH-148	30			59.50	left	37.22449933	-121.0720349	Pipe crossing			2	2	1	2	2	1						1										
3	DH-149	30			59.50	right	37.22435137	-121.0724736	Pipe crossing			1	1	1	1	1		1			1	1		1								
3	DH-150	100			60.06	right	37.217097	-121.0688569	Taglio Rd. bridge	x		2	5	3	2	2	1	1			1	1	1	1	1						
3	DH-151	90			61.06	right	37.20257249	-121.0688245	Snyder Rd. bridge	x		3	4	2	2	2	2	1			1	1	1	1	1						
3	DH-158	30			83.36	left	36.98828793	-120.8502341	Pipe crossing			2	2	1	2	2	1						1								
3	DH-159	30			83.36	right	36.98792347	-120.8504131	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-160	30			83.57	left	36.98698747	-120.8470697	Pipe crossing			2	2	1	2	2	1						1								
3	DH-161	30			83.57	right	36.98654917	-120.8471478	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-162	30			85.04	left	36.96964983	-120.8318661	Pipe crossing			2	2	1	2	2	1						1								
3	DH-163	30			85.04	right	36.96957688	-120.8323656	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-166	30			86.70	left	36.94784834	-120.8205914	Pipe crossing			2	2	1	2	2	1						1								
3	DH-167	30			86.70	right	36.947765	-120.8210659	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-168	40			89.23	left	36.92861944	-120.790971	Pipe crossing			2	2	1	2	2	1						1								
3	DH-169	40			89.23	right	36.92822502	-120.7910672	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-172	50			90.57	left	36.9202037	-120.7696425	Pipe crossing			2	2	1	2	2	1						1								
3	DH-173	50			90.57	right	36.91995203	-120.7699732	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-174	95			90.91	left	36.9181335	-120.7644943	Farm bridge	x		4	3	2	2	2	2	1			1	1	1								
3	DH-175	95	OW-49	60	90.91	right	36.91778248	-120.7646905	Farm bridge			4	3	2	1	1	2	1			1	1		1			1	1	1		
3	DH-176	30			91.71	left	36.91021494	-120.75434	Pipe crossing			2	2	1	2	2	1						1								
3	DH-177	30			91.71	right	36.9098969	-120.7546179	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-178	40			92.23	left	36.90656973	-120.7465798	Pipe crossing			2	2	1	2	2	1						1								
3	DH-179	40			92.23	right	36.90620555	-120.7465373	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-180	40			93.23	left	36.905774	-120.7285074	Pipe crossing			2	2	1	2	2	1						1								
3	DH-181	40			93.23	right	36.90538417	-120.7284722	Pipe crossing			1	1	1	1	1		1			1	1		1			1	1	1		
3	DH-182	95			95.45	left	36.89865779	-120.6905534	Farm bridge	x		4	3	2	2	2	2	1			1	1	1								
3	DH-183	95	OW-50	60	95.45	right	36.89825878	-120.6905578	Farm bridge			4	3	2	1	1	2	1			1	1		1			1	1	1		
3	DH-184	120			96.61	right	36.89077699	-120.6735557	Althea Ave. bridge	x		4	4	3	2	2	2	1			1	1	1	1	1						
3	DH-185	105			97.68	right	36.88979469	-120.6543847	Russel Ave. bridge	x		4	4	3	2	2	2	1			1	1	1	1	1		1	1	1		
3	DH-186	105	OW-51	60	98.74	right	36.88610862	-120.6361201	Farm bridge	x		4	3	2	2	2	2	1			1	1	1	1							
3	DH-187	40			100.23	left	36.88271007	-120.6101973	Pipe crossing			2	2	1	2	2	1						1								
3	DH-188	40			100.23	right	36.88216531	-120.6101811	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-189	50			101.27	left	36.88008598	-120.5921856	Pipe crossing			2	2	1	2	2	1						1								
3	DH-190	50			101.27	right	36.87955814	-120.5921995	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-191	105	OW-52	60	102.03	right	36.8781846	-120.5789803	Farm bridge	x		4	3	2	2	2	2	1			1	1	1	1							
3	DH-192	40			102.54	left	36.87625192	-120.5699843	Pipe crossing			2	2	1	2	2	1						1								
3	DH-193	40			102.54	right	36.87574841	-120.5702051	Pipe crossing			1	1	1	1	1		1			1	1		1							
3	DH-194	110			105.03	right	36.87057222	-120.527067	Jerrold Ave. bridge, Pipe crossing	x		4	4	3	2	2	2	1			1	1	1	1	1						
3	DH-197	120			105.55	left	36.86845473	-120.5178382	Farm bridge	x		4	2	1	2	2	2	1			1	1	1								
3	DH-198	120	OW-53	60	105.55	right	36.86798591	-120.5180703	Farm bridge			4	2	1	1	1	1	1			1	1		1							
3	DH-199	40			106.48	left	36.85952249	-120.5056513	Pipe crossing				2	1	2	2	1						1								
3	DH-200	40			106.48	right	36.85903811	-120.5060389	Pipe crossing				1	1	1	1		1			1	1		1							
3	DH-201	110	OW-54	60	106.59	right	36.85839061	-120.5046824	Farm bridge	x		4	3	2	1	1	2	1			1	1	1	1							
3	DH-202	90			110.12	right	36.82500101	-120.4580475	Washoe Ave. bridge	x		3	4	3	2	2	2	1			1	1	1	1	1						
3	DH-203	100	OW-56	60	107.42	left	36.851167	-120.492177	Nees Ave. Bridge	x		4	3	2	2	2	2	1			1	1									
3	DH-204	100			107.42	right	36.851160	-120.492943	Nees Ave. Bridge			3	3	2	1	1	1	1			1	1	1	1	1						
3	DH-206	90			111.51	right	36.82784199	-120.4354201	Sierra Ave. bridge	x		3	4	3	2	2	2	1			1	1	1	1	1						
3	DH-218	20			21.91	right	37.640250	-121.353744	Overchute headwall				2	1	1	1							1	1		1					
3	DH-219	20			25.62	right	37.601436	-121.322981	Overchute headwall				2	1	1	1							1	1		1					
3	DH-220	30			30.63	right	37.560232	-121.256586	Culvert headwall				2	1	1	1							1	1		1					
3	DH-221	20			41.93	right	37.442615	-121.152109	Overchute headwall				2	1	1	1							1	1		1					
3	DH-222	30			45.75	right	37.401054	-121.122109	Culvert headwall				2	1	1	1							1	1		1					
3	DH-223	40			64.28	right	37.165504	-121.045059	Overchute headwall				2	1	1	1							1	1		1					
3	DH-224	20			111.51	right	36.827646	-120.435271	Retaining wall			1	2	1	1	1	1						1								
3	DH-225	20			111.51	right	36.827856	-120.435785	Retaining wall			1	2	1	1	1					1			1							
3	DH-226	20			111.51	right	36.827496	-120.435417	Retaining wall			1	2	1	1	1	1						1								
3	DH-227	20			111.51	right	36.827709	-120.435937	Retaining wall			1	2	1	1	1					1			1							
3	DH-228	20			111.51	right	36.827543	-120.435837	Retaining wall			1	2	1	1	1	1						1								
3	DH-229	20			13.25	right	37.698656	-121.476603	Retaining wall			1	2	1	1	1					1			1							
3	DH-230	20			13.25	left	37.699734	-121.476430	Retaining wall			1	2	1	1	1	1						1								
3	**108**	**6,260**	**16**	**1,040**						**43**	**0**	**218**	**225**	**172**	**172**	**172**	**100**	**74**	**6**	**2**	**77**	**74**	**74**	**72**	**29**	**6**	**10**	**10**	**10**	**0**	**0**
Total Combined	***147***	***7,880***	***36***	***1,655***						***63***			***308***	***223***	***253***	***253***	***114***	***80***	***6***	***2***	***90***	***94***	***76***	***74***	***31***	***13***	***41***	***41***	***41***	***16***	***16***
Original Draft Scope	*179*	*9860*	*26*	*1270*						*49*			306	183	306	306	112	105	0	0	113	117	91	91	30	7	27	27	27	16	16
Percentage of Original Draft Scope	*82%*	*80%*	*138%*	*130%*						*129%*			*101%*	*122%*	*83%*	*83%*	*102%*	*76%*			*80%*	*80%*	*84%*	*81%*	*103%*	*186%*	*152%*	*152%*	*152%*	*100%*	*100%*

	total depth FADC
original draft scope	*3,990*
revised scope	*4,570*
change from original	*115%*

Delta-Mendota Canal Subsidence Correction
Borrow Source Investigation Summary

Phase	Test Pit Number	Approx. Milepost	Canal Bank	Borrow Area	Approx. Coordinates (WGS 1984)		Estimated Test Pit Depth (ft)	Sand Cone In-situ Density Test	Laboratory Testing								
					Latitude	Longitude			Sieve Analysis	Atterberg Limits	Proctor Compaction	R-Value	Corrosivity Test Suite (pH, sulfates, chlorides, resistivity)	1-D Swell or Collapse	Direct Shear	Crumb Dispersion Test	Pinhole Dispersion Test
3	TP-1	6.8	right	MP 6.9 R	37.752647	-121.563391	20	1	2	1	1						
3	TP-6	7.33	left	MP 7.4 L	37.747253	-121.557727	15		2	1							
3	TP-7	7.38	right	MP 7.4 R	37.746283	-121.557823	15		2	1	1	1	1	1		1	1
3	TP-9	11.62	right	MP 11.7 R	37.709402	-121.498634	20	1	2	1	1	1	1			1	1
3	TP-11	11.73	left	MP 11.7 L	37.710255	-121.499411	20		2	1	1			1			
3	TP-16	23.61	right	MP 23.6 R	37.628016	-121.331483	10		1	1					1		
3	TP-19	25.41	left	MP 25.8 L	37.604158	-121.324305	20	1	2	1	1						
3	TP-21	25.60	left	MP 25.8 L	37.601928	-121.322271	20		2	1							
3	TP-23	25.80	left	MP 25.8 L	37.599708	-121.320181	20		2	1							
3	TP-25	25.99	left	MP 25.8 L	37.597461	-121.318168	20		2	1		1	1				
3	TP-28	25.65	right	MP 25.8 R	37.600440	-121.322432	20	1	2	1	1						
3	TP-32	29.14	left	MP 29.1 L	37.566478	-121.278552	15		1	1							
3	TP-33	29.24	right	MP 29.4 R	37.564746	-121.279595	15	1	1	1	1			1	1	1	1
3	TP-35	29.4	right	MP 29.4 R	37.563053	-121.278036	15		1	1		1	1				
3	TP-37	29.26	left	MP 29.4 L	37.564590	-121.278481	15		2	1							
3	TP-41	45.56	left	MP 45.9 L	37.403662	-121.122533	10		1	1	1	1	1	1	1	1	1
3	TP-43	45.75	left	MP 45.9 L	37.402410	-121.120668	10	1	1	1	1						
3	TP-46	45.84	left	MP 45.9 L	37.400906	-121.120169	10		1	1							
3	TP-48	46.88	right	MP 47.0 R	37.390804	-121.106572	10		1	1		1	1				
3	TP-52	47.27	left	MP 47.2 L	37.385896	-121.103650	10		1	1	1			1	1	1	1
3	TP-54	47.34	right	MP 47.3 R	37.385169	121.104566	10		1	1							
3	TP-56	47.58	left	MP 47.7 L	37.381466	-121.103713	10		1	1	1			1	1	1	1
3	TP-59	47.66	right	MP 47.8 R	37.380403	-121.104594	15	1	1	1	1						
3	TP-63	47.97	right	MP 48.1 R	37.375992	-121.104641	15		1	1	1			1	1	1	1
3	TP-67	48.22	right	MP 48.8 R	37.372218	-121.104597	10		1	1							
3	TP-73	48.90	left	MP 48.8 L	37.362707	-121.106371	10		1	1					1		
3	TP-75	49.88	left	MP 50.0 L	37.349936	-121.104576	20		2	1							
3	TP-77	49.92	right	MP 50.0 R	37.349301	-121.105656	20		2	1							
3	TP-79	50.24	right	MP 50.4 R	37.345261	-121.107176	15		1	1	1			1		1	1
3	TP-80	50.30	left	MP 50.4 L	37.344138	-121.106578	20		2	1		1	1				
3	TP-84	52.32	right	MP 52.2 R	37.319361	-121.097563	20		2								
3	TP-86	52.52	right	MP 52.6 R	37.316853	-121.096414	20	1	2	1	1	1	1				
3	TP-87	52.61	right	MP 52.6 R	37.315513	-121.095875	20		2								
3	TP-88	52.47	left	MP 52.6 L	37.317639	-121.094991	20		2	1					1		
3	TP-89	52.57	left	MP 52.6 L	37.316342	-121.094479	20		2	1		1	1				
3	TP-92	54.60	right	MP 54.6 R	37.287978	-121.087866	20		2	2	1			1		1	1
3	TP-94	54.89	right	MP 55.0 R	37.283980	-121.089343	20	1	2	1	1				1		
3	TP-95	55.02	right	MP 55.0 R	37.283092	-121.090045	20		2	1							
3	TP-97	55.61	right	MP 55.7 R	37.276702	-121.094958	20		2	1					1		
3	TP-99	55.56	left	MP 55.7 L	37.276787	-121.093319	20	1	2	1	1			1		1	1
3	TP-102	56.40	right	MP 56.5 R	37.265032	-121.091646	20	1	2	1	1	1	1				
3	TP-104	56.34	left	MP 56.5 L	37.265575	-121.089601	15		1	1							
3	TP-107	57.09	right	MP 57.2 R	37.257691	-121.084946	20	1	2	1	1				1	1	1
3	TP-110	61.70	right	MP 61.7 R	37.193055	-121.068682	15		1	1	1	1	1	1			
3	TP-113	62.07	right	MP 62.1 R	37.189004	-121.067167	20		2	1	1			1		1	1
3	TP-114	62.03	left	MP 62.1 L	37.189058	-121.065894	20		2	1							
3	TP-117	62.42	right	MP 62.5 R	37.183279	-121.066338	20		2	2					1		
3	TP-119	62.23	left	MP 62.4 L	37.185620	-121.065737	20	1	2	1	1						
3	TP-121	62.48	left	MP 62.4 L	37.183543	-121.065215	20		2	1	1	1	1	1	1	1	1
3	TP-122	66.60	right	MP 66.7 R	37.134544	-121.041868	10		1	1							
3	TP-124	66.87	right	MP 67.0 R	37.130734	-121.040437	15		2	1		1	1				
3	TP-126	67.10	right	MP 67.0 R	37.127581	-121.039264	15	1	1	1	1			1		1	1
3	TP-127	67.25	right	MP 67.4 R	37.125173	-121.037785	15		1	1		1	1		1		
3	TP-129	67.47	right	MP 67.4 R	37.122894	-121.035743	15		1	1							
3	TP-130	71.42	right	MP 71.5 R	37.083032	-121.014360	15		1	1		1	1				
3	TP-131	71.54	right	MP 71.5 R	37.082357	-121.012502	15	1	1	1	1						
3	TP-132	71.48	left	MP 71.5 L	37.083492	-121.013280	15		1	1							
3	TP-133	71.70	left	MP 71.7 L	37.082580	-121.009522	15		1	1	1			1	1	1	1
	58						955	15	90	58	27	15	15	15	15	15	15

Original Draft Scope	58						910	15	90	58	15	15	15	15	15	15	15
Percentage of Original Draft Scope	100%						105%	100%	100%	100%	180%	100%	100%	100%	100%	100%	100%

Terracon Cost Proposal

Project Name	***DMC Subsidence Mitigation Geo Exploration PHASE 2 and 3***
Location	***San Joaquin Central Valley***

Project Start Up

Item	Quantity	Unit Price	Cost	Total	% of Total
USA 811 North Site Recon. and Coord.	240	$ 120.00	$ 28,800.00		
Review and Revise Health and Safety Plan	1	$ 600.00	$ 600.00		
Est. Mileage (layout & utilities only)	2500	$ 0.95	$ 2,375.00		
Exploration Plan	1	$ 4,800.00	$ 4,800.00		
Project Kick Off with Client	1	$ 1,500.00	$ 1,500.00		
Senior PM, GE, hr (Fosse)		$ 200.00			
Project Engineer, hr. (Congrave)		$ 150.00			
Staff Geologist/Engineer Logger, hr (McArthur)		$ 135.00			
SUBTOTAL				**$ 38,075.00**	**2%**

Exploration - Field Work and Supplies

Item	Quantity	Unit Price	Cost	Total	% of Total
Drill,log (147) borings (30-120') totaling 7,880' per RFP	147	$ 7,300.00	$ 1,073,100.00		
CPT, 89 soundings includes field logger/rep	89	$ 3,150.00	$ 280,350.00		
Materials for Observation Wells	36	$ 1,350.00	$ 48,600.00		
Shelby Tube	262	$ 45.00	$ 11,790.00		
Lexan Liners (will vary depending on quantity used)	360	$ 110.00	$ 39,600.00		
Custom Vertical Boxes for Lexan Liners	6	$ 850.00	$ 5,100.00		
Drill Crew Rate w/ rig and all equip (PW), hr.		$ 600.00			
Rock coring surcharge if needed, per foot		$ 165.00			
CPT Crew Rate w/ rig and all equipment (PW), hr.		$ 650.00			
Drill Mgr/Site Coordinator, hr (Dockery)		$ 150.00			
Staff Geologist/Engineer Logger, hr (McArthur)		$ 135.00			
Field Laborer, PW, hr		$ 145.00			
SUBTOTAL				**$ 1,458,540.00**	**59%**

Laboratory Testing

Item	Quantity	Unit Price	Cost	Total	% of Total
Sieve, C+F	308	$105.00	$ 32,340.00		
PI	223	$125.00	$ 27,875.00		
Moisture & Density	253	$20.00	$ 5,060.00		
Tri-Ax. (CU), 3 points	114	$1,475.00	$ 168,150.00		
Uncon. Strength	80	$120.00	$ 9,600.00		
Uncon. Strength (Rock)	6	$250.00	$ 1,500.00		
Slake Durability	2	$400.00	$ 800.00		
1D Consol.	90	$450.00	$ 40,500.00		
1D Swell and Collapse	94	$425.00	$ 39,950.00		
Proctor - 4"	76	$245.00	$ 18,620.00		
Corrosivity Suite	74	$395.00	$ 29,230.00		
R-Value	31	$350.00	$ 10,850.00		
Direct Shear, 3 points	13	$525.00	$ 6,825.00		
Crumb Test	41	$75.00	$ 3,075.00		
Pin Hole	41	$300.00	$ 12,300.00		
Hydrometer	41	$325.00	$ 13,325.00		
Direct Simple Shear (single load increment)	16	$900.00	$ 14,400.00		
Cyclic Direct Simple Shear (4 points per test at different CSR on separate samples)	16	$6,900.00	$ 110,400.00		
Lab Plan Submittals, weekly	24	$350.00	$ 8,400.00		
Lab Manager (Arends)	240	$175.00	$ 42,000.00		
Lab Supervisor		$ 115.00			
Lab Technician		$ 92.00			
SUBTOTAL				**$ 595,200.00**	**24%**

Geotechnical Data Report and Project Management

Item	Quantity	Unit Price	Cost	Total	% of Total
Admin	110	$ 90.00	$ 9,900.00		
Project Management	380	$ 200.00	$ 76,000.00		
Exploration Coordination (Dockery)	220	$ 150.00	$ 33,000.00		
Logs, gInt, weekly upload to Website (Congrave)	240	$ 155.00	$ 37,200.00		
GE/CEG Review of Logs/CPT and PM (Fosse,Hall)	240	$ 190.00	$ 45,600.00		
Data Report (incl LOTB for DH and CPT with x sects)	760	$ 150.00	$ 114,000.00		
Principal GE Reviewer/QA (Hubbart, Smith)	60	$ 225.00	$ 13,500.00		
Senior Consultant, hr (Heinzen)		$ 225.00			
Geological Characterization Report (Congrave)	120	$ 150.00	$ 18,000.00		
Geological Characterization Report (Fosse, Hall)	60	$ 200.00	$ 12,000.00		
Geological Characterization Report (Hubbart, Smith)	30	$ 225.00	$ 6,750.00		
SUBTOTAL				**$ 365,950.00**	**15%**
TOTAL				**$ 2,457,765.00**	**100%**

Per RFP:

Rates are good through end of 2023.
Sampling every 5 feet and continuous core where indicated
CPT Backfill with Cement Bentonite Grout
Dispose cutting on embankment, no offhaul
We will mark and call in 811 North utility ticket
Normal work hours, M-S, about 6am to 6pm (Daylight)
Borings performed in order determined by Terracon
No access limitation or environmental constraints
Drill Time and Travel are Subject to CA Prevailing wage
No private utility locate per client
Costs do not include any Local/County Drill and/or Encroachment Pemitting.

Borings	rev Scope
Phase 2	1620
Phase 3	6260
	7880

Phase 2, CPT	rev Scope
Phase 2	3030

Terracon Cost Proposal

Project Name	***DMC Subsidence Mitigation, Phase 3, BORROW PIT EVAL.***
Location	***San Joaquin Central Valley***

Project Start Up

Item	Quantity	Unit Price	Cost	Total	% of Total
Site Recon. and Field Coordination	60	$ 120.00	$ 7,200.00		
Health and Safety Plan	1	$ 1,500.00	$ 1,500.00		
Est. Mileage (layout & utilities only)	800	$ 0.95	$ 760.00		
Exploration Plan	1	$ 1,920.00	$ 1,920.00		
Project Kick Off with Client	1	$ 1,200.00	$ 1,200.00		
Senior PM, GE, hr (Fosse)		$ 190.00			
Project Engineer, hr. (Congrave)		$ 145.00			
Staff Geologist/Engineer Logger, hr (Huang)		$ 135.00			
SUBTOTAL				**$ 12,580.00**	**5%**

Exploration - Field Work and Supplies

Item	Quantity	Unit Price	Cost	Total	% of Total
Geologist, hr (Hall)	384	$ 165.00	$ 63,360.00		
Geologist, hr (Hall), OT	96	$ 195.00	$ 18,720.00		
Per Diem, days	48	$ 275.00	$ 13,200.00		
Sample Containers and supplies per foot	910	$ 2.00	$ 1,820.00		
Mileage	3680	$ 0.95	$ 3,496.00		
Compaction Testing, PW, hr	60	$ 155.00	$ 9,300.00		
SUBTOTAL				**$ 109,896.00**	**44%**

Laboratory Testing

Item	Quantity	Unit Price	Cost	Total	% of Total
Sieve, C+F	90	$105.00	$ 9,450.00		
PI	58	$125.00	$ 7,250.00		
Tri-Ax. (CU)		$625.00	$ -		
Uncon. Strength		$120.00	$ -		
1D Consol. (incl. surcharge for recompact)	15	$475.00	$ 7,125.00		
1D Swell and Collapse (includes surcharge for recompact)	15	$520.00	$ 7,800.00		
Proctor - 4"	27	$245.00	$ 6,615.00		
Corrosivity Suite	15	$300.00	$ 4,500.00		
R-Value	15	$350.00	$ 5,250.00		
Direct Shear, 3 point (includes surcharge for recompact)	15	$625.00	$ 9,375.00		
Crumb Test	15	$75.00	$ 1,125.00		
Pin Hole	15	$300.00	$ 4,500.00		
Hydrometer		$325.00	$ -		
Direct Simple Shear		$300.00	$ -		
Sand Cone	15	$105.00	$ 1,575.00		
Remolding Samples (Consol, Swell, and Direct Shear)	45	$125.00	$ 5,625.00		
Lab Plan Submittals, weekly	4	$350.00	$ 1,400.00		
Lab Manager (Edwards)	20	$160.00	$ 3,200.00		
Lab Supervisor		$ 115.00			
Lab Technician		$ 92.00			
SUBTOTAL				**$ 74,790.00**	**30%**

Geotechnical Data Report and Project Management

Item	Quantity	Unit Price	Cost	Total	% of Total
Admin	20	$ 90.00	$ 1,800.00		
Exploration Coordination (Dockery)	15	$ 150.00	$ 2,250.00		
Logs, gInt, weekly upload to Website (Congrave)	85	$ 150.00	$ 12,750.00		
GE/CEG Review of Logs and PM (Fosse,Martin)	45	$ 200.00	$ 9,000.00		
Photo Presentation	105	$ 145.00	$ 15,225.00		
Compaction Testing Reporting	20	$ 190.00	$ 3,800.00		
Geo Data Report (Congrave)	40	$ 150.00	$ 6,000.00		
Principal GE Reviewer/QA (Hubbart)	12	$ 225.00	$ 2,700.00		
Senior Consultant, hr (Heinzen)		$ 225.00			
SUBTOTAL				**$ 53,525.00**	**21%**
TOTAL				**$ 250,791.00**	**100%**

Per RFP:

Sampling at every soil change

Authority to call in USA and provide excavator with experienced operator as well as backhoe or additional equip to backfill.

Normal work hours, M-S, about 6am to 6pm (Daylight)

Test pits to be performed in order selected by Terracon

No access limitation or environmental constraints

No private utility locate per client

Any other consulting and meetings, T and M.

Test Pits	Depth	**Total Footage**
58	10 to 20	910

Costs do not include any Local/County Drill and/or Encroachment Pemitting.

December 9, 2022

Garret Hubbart
Terracon Consultants, Inc.
PO Box 959673
St. Louis, MO 63195-9673

Subject: Contract Specification No.: F22-DMC-047 DMC Subsidence Mitigation Geotechnical Exploration Phases 2 & 3.
Notice of Contract Amendment and Notice to Proceed

Dear Mr. Hubbart

Enclosed for your files is a fully executed Contract Amendment for the above mentioned project.

This letter also constitutes your Notice to Proceed for Phases 2 and 3 effective December 9, 2022. Phases 2 and 3 are expected to be complete by December 22, 2023. Jacob Bejarano is the Project Manager and will be the primary point of contact for administration of this Contract. You can reach him at (209) 832-6216 or Jacob.bejarano@sldmwa.org.

All invoices must reference the Contract Specification No. and Purchase Order No. 1046 for timely processing.

Sincerely,

Travis Roberts
Contract Specialist