PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Excavate trenches for utilities and services.

B. Compacted bedding.

C. Backfilling and compaction.

1.3 REFERENCES

A. ASTM C136 -– Standard Test Method for Sieve Analysis of Fine and Course Aggregates.

B. ASTM D1556 -– Standard Test Method for Density of Soil in Place by the Sand - Cone Method.

C. ASTM D1557-– Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3).

D. ASTM D2922 -– Standard Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017-– Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

F. Green Book - Standard Specifications for Public Works Construction, 2009 Edition.

G. Geotechnical Reports: “Report of Geotechnical Investigation, SDSU Engineering Building, San Diego, CA” prepared by Group Delta Consultants, Inc. dated January 28, 2015, and any subsequent revisions.

1.4 QUALITY ASSURANCE:

A. Contractor Qualifications

1. Installing Company: Company specializing in grading and excavation work, with minimum 5 years documented experience in projects of similar scale and scope.

2. Installing Foreman: Individual specializing in grading and excavation work, with minimum 5 years documented experience in projects of similar scale and scope.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 017700.

B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 PROTECTION

A. Protect trees, shrubs, lawns, rock outcropping, and other features remaining as portion of final landscaping.

B. Protect benchmarks, existing structures, fences, roads, sidewalks, paving and curbs.

C. Protect above or below grade utilities, which are to remain.

1.7 REPAIR

A. Repair and/or replace all piping, conduits and appurtenances damaged by the work, without additional cost to Owner. Architect to be notified immediately of any damage done by work.

1.8 PUBLIC AGENCY STANDARDS

A. Perform all work in accordance with the Regional Standards Drawings as indicated on the plans and these specifications and the Standard Specifications for Public Works Construction (SSPWC) "Green Book", 2009 Edition

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

A. Type C - Class 100-E-100 per Table 201-1.1.2 (Green Book) slurry mix, as approved by Owner and geotechnical engineer.

B. Type D - Select Backfill: Imported low to very low expansive soils (EI < 20) complying with Section 310000.

2.2 BEDDING MATERIALS

A. Type A - Crushed Gravel: Angular, natural stone; free of shale, clay, friable material, sand, debris; graded within the following limits:

Sieve Size	Percent Passing
3/4 inch	95 to 100
No. 4	0 to 10
No. 100	0

B. Type B - Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter; maximum particle size and volume of 1/2 inch and 18 percent respectively, with minimum Sand Equivalent value of 30 per California Test Method 217.

C. Type E - Concrete Encasement: Class 480-C-2000 per Table 201-1.1.2,Green Book, as approved by Geotechnical Engineer.

2.3 ACCESSORIES

A. Detection tape: Provide plastic tape with metallic stripping suitable for locating underground piping and conduits. Provide pre-printed label identifying conduit/pipe type, alternating with word "CAUTION".

2.4 DESIGN CRITERIA

A. General

1. All improvements shall be constructed per the referenced standards, the contract documents, and as specified in this section.

2. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.

2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.

a. Verify that survey benchmark and intended elevations for the Work are as indicated.

b. Identify required lines, levels, contours, and datum.

c. Identify known utilities. Stake and flag locations.

d. Maintain and protect existing utilities remaining which pass through work area.

e. Verify proposed fill material is acceptable to Geotechnical Engineer.

f. Where trenching occurs in landscaped areas, verify proposed fill material is acceptable to Landscape Architect.

3. In the event of discrepancy, immediately notify the Architect.

4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

1. Provide all staking and field engineering required to implement the work as shown on the drawings.

2. Protect all stakes and benchmarks. Replace all stakes and benchmarks damaged during the course of construction at no cost to Owner.

3. Set grade stakes using instrument technology.

4. Provide all equipment of such type, function and design as required to achieve specified grades, alignment, and values.

B. Existing Utility and Services Criteria.

1. Locate all existing water, sanitary sewer, storm drain, and gas lines, electrical and telephone conduit and other underground utilities, including service connections and all other underground structures affected by work of this contract.

2. Review existing record drawings, conduct site investigations, retain qualified cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems. Obtain all necessary permits for safety or otherwise, and comply with conditions of permit.

3. Obtain and review all available drawings, notes, and information on the location of underground lines and structures in determining the location of the existing facilities.

4. Prior to demolition or disconnect, obtain Owners approval that such system does not impact facilities or systems beyond the extent of this contract.

5. Pothole utility lines in advance of construction to permit any required adjustment in horizontal or vertical location of pipe line. Submit drawing to Architect showing utility line locations. Backfill pothole, compact and restore surface improvements in accordance with these specifications or in accordance with local jurisdiction having authority if applicable.

6. Maintain electronic pipe finder on the job at all times.

7. Mark all existing lines in advance of trenching operations.

8. Document any surface defects, by photographic or other approved means, prior to conducting trenching operations. Upon completion of construction, all concrete showing non-documented settlement, spalls, gouges, cracks or other defects will be evidence of damage by the Contractor's forces. Repair or replace such damaged surfaces to the satisfaction of the Architect.

9. Return all surface improvements designated to remain, which are removed for excavation, to their original condition, except to comply with other portions of the contract.

10. Prior to commencing trenching, obtain all necessary permits for safety or otherwise, and comply with conditions of permit.

3.3 EXCAVATION

A. Excavate subsoil required for utilities.

1. Remove all earth, sand, gravel, water, quicksand, stone, loose rock, solid rock, clay, shale, cement, hardpan, boulders, and all other materials necessary to be moved in excavating the trench for the designated pipe or conduit.

2. Maintain the excavation by trench sidewall support systems, including shoring, bracing, sheeting or well pointing in compliance with all required regulations.

3. Remove trench sidewall support systems from trench after installation

4. Very difficult excavation conditions should be anticipated in the Lindavista Formation (Very Old Paralic Deposits) for the excavation of subsurface utility trenches. Heavy ripping, rock-splitting, and/or jack hammering may be necessary to facilitate excavation in the Lindavista Formation. Blasting is not acceptable.

B. Maximum length of open trench:

1. Except by permission of the Owner, no open trench is permitted overnight.

C. Trench Width

1. Provide trench width as indicated on the drawings.

2. Provide minimum 12 inches clear excavation between outer surfaces and the trench sidewall or bracing at manholes, concrete valve boxes, and similar structures.

D. Where trench is parallel to footing, do not permit trench bottom below a plane having a downward slope of 2:1 (H:V) beginning from a line 9 inches above the bottom of the footing, nor closer than 18 inches to face of footing.

E. Excavate trenches to the depths shown on the drawings, including any required allowances for bedding under the pipe, when required, and for the pipe groove.

1. Temporary, shallow excavations with vertical side slopes less than 4 feet high will generally be stable, although there is a potential for localized sloughing. Vertical excavations greater than 4 feet high should not be attempted without proper shoring or slotted methods to prevent local instabilities. Shoring may be accomplished with hydraulic shores and trench plates, trench boxes, and/or soldier piles and lagging, in accordance with CalOSHA regulations.

2. Lindavista formational materials and the compacted fill materials may be considered Type B and Type C soils, respectively, as defined the current CalOSHA soil classification

F. Rock Considerations:

1. Remove all rock of any kind, including material requiring removal by use of heavy earthwork equipment, or hydro-hammers within limits of excavation and within 12-inches of all trenching. Blasting is not acceptable.

2. There is no “rock clause”, and no additional compensation for the removal of rock, if encountered.

G. Provide cover over the top of the pipe as specified or, if not specified, the minimum cover, including any paving, as required by local jurisdiction having authority.

H. Hand trim excavation. Hand excavate for pipe joints. Remove loose matter.

I. Remove lumped subsoil, boulders, and rock.

J. Correct unauthorized excavation at no cost to Owner.

K. Correct areas over-excavated by error in accordance with Section 310000.

L. Remove excess material not being used from site.

M. Test and inspect all utility lines prior to backfilling.

N. Record and verify "As-Built" elevations and locations on Record Drawings prior to backfilling.

3.4 BEDDING

A. Place and compact bedding material as shown on drawings, using mechanical methods. Water Jetting is not acceptable.

B. Comply with requirements specified in this Section.

C. Where concrete encasement is shown, place free of voids and segregation of materials. Consolidate as required by Geotechnical Engineer.

3.5 BACKFILLING

A. Backfill trenches to finish grade with specified materials to depths and levels indicated in as specified in this Section and Section 310000.

B. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

1. Maintain all trenches free from water during the progress of the work.

2. When required by weather conditions, provide channel adjacent to pipe, conduct water to sump and pump out of trench. Do not permit water to enter the pipe.

C. Fill: Place and compact material in continuous layers.

1. Compact by mechanical means by the use of sheeps-foot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers of a size and type necessary to achieve the required degree of compaction.

2. No jetting or water compaction will be allowed.

3. Backfill in lifts not exceeding 6 inches in compacted thickness.

4. Compact trenching located in paving areas to 95 percent in the upper 12 inches, and 90 percent for the remainder.

5. Compact trenching located in landscaped areas to 90 percent.

6. Place detection tape at 12 inches above uppermost portion of pipe or conduit. Extend in continuous alignment with pipe or conduit.

D. Employ a placement method that does not disturb or damage foundation perimeter drainage or utilities.

E. Maintain a near optimum moisture content of backfill materials to attain required compaction density.

F. Remove surplus backfill materials from site.

G. Leave site completely free of excess fill materials.

H. Slurry Backfill: Place slurry backfill at all trenches located in paved areas as shown on drawings and as directed by Geotechnical Engineer.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 014529, and conducted by the Owners Geotechnical Engineer.

B. Perform earthwork under the continuous observation of the Owner's Geotechnical Engineer. Trenching fill operations shall comply with the requirements of Part 2, Title 24, CCR.

C. Tests and analysis of fill material will be performed in accordance with ASTM D1557.

1. The Geotechnical Engineer will review and approve all fill materials, including on-site materials and imported materials.

2. The Geotechnical Engineer will submit reports to the Architect, DSA, and Engineer, comparing results of testing with the requirements of this section and documenting location and scope of tested materials.

D. Tests and analysis of fill material will be performed in accordance with ASTM D1557.

E. Compaction testing will be performed in accordance with ASTM D 1556 and ASTM D6938, or other requested methods.

F. If tests indicate Work does not meet specified requirements, remove Work replace and retest at no cost to Owner.

3.7 PROTECTION OF FINISHED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at manholes or other underground structures or boxes.

D. Provide and maintain all required dams, screens and collection systems necessary to prevent water used in construction operations from damaging adjacent areas.

E. .Recompact fills subjected to vehicular traffic.

3.8 SCHEDULE

A. Concrete Encasement:

1. On-Site Conduit: Type E concrete as specified and as shown on drawings.

B. Bedding Fill:

1. On-Site Piping: Minimum 6 inches below and 12 inches above pipe crown, under the haunches and along side the pipe, and per referenced standard. Type per the following:

a. Storm Drain – Type A wrapped in a non-woven geotextile fabric.

b. Sanitary Sewer – Type B

c. Domestic/Reclaimed Water and Fire Service – Type B

C. Backfill - Unpaved areas:

1. Type D.

2. Place in accordance with Section 310000 and as specified in this Section.

D. Backfill - Paved areas:

1. Type C slurry mix backfill.

2. Place as directed by Owner and geotechnical engineer and as specified in this Section.

END OF SECTION