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. Removal, stockpile and placement of topsoil and subsoil.

B. Excavation, including as required for foundations, slabs-on-grade, paving, and landscaping.

C. Fill and backfilling to required elevations.

D. Consolidation and compaction.

E. Site Contouring.

1.3 REFERENCES

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

B. Standard Specifications for Public Works Construction (SSPWC) "Green Book", 2009 Edition

C. ASTM C136 - Method for Sieve Analysis of Fine and Course Aggregates.

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

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

F. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 3017 - Moisture Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

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 PUBLIC AGENCY STANDARDS

A. Perform all earthwork and related structures and devices indicated as public agency standards 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 STRUCTURAL FILL MATERIAL

A. On-Site Fill Materials:

1. On-site soils may be approved for use in structural and non-structural areas (i.e., landscaping and below the 3-foot pavement capping material).

2. Limit maximum dimension of rock to 6 inches in any dimension.

3. Limit maximum dimension of rock to 1 inch in any dimension at all fills located in landscaped areas within 12 inches of surface.

4. Provide soil fill with no more than 35 percent passing the #200 sieve, or otherwise approved by Geotechnical Engineer.

5. The existing asphalt concrete pavement may be pulverized and incorporated into fills or used as base material.

6. Soils that have an expansion index greater than 20 should not be used within the upper 2 feet of finish building pad subgrade, within the upper 2 feet of finish hardscape subgrade, or as retaining wall backfill.

7. During grading operations, soil types other than those evaluated in the geotechnical report may be encountered. The Geotechnical Engineer should be notified to evaluate the suitability of these soils for use.

B. Import Soils

1. Comply with criteria specified in 2.1.A above, and the following additional requirements.

2. To prevent the importation of contaminated materials to the site, prior to delivery, soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control “Information Advisory, Clean Imported Fill Material”, dated October 2001. Results will be submitted to the District for approval. Contractor is responsible for all costs in obtaining the appropriate documentation, for the District, of any imported materials. Do not import soils that exhibit a known risk to human health, the environment or both.

3. Expansion Index: very low to low with a maximum value of 20, as measured by ASTM D 4829.

4. A minimum resistivity value greater than 1,000 ohm-centimeters, chloride content of less than 500 ppm and sulfate content of less than 1,000 ppm and pH greater than 5.5

5. Agricultural Suitability: Obtain approval of Architect of all fill materials used in landscaped areas prior to placing, including providing soil test/analysis results.

6. Use of clay or adobe soil is not acceptable.

7. Obtain approval of Geotechnical Engineer of all imported fill materials prior to delivery on site and prior to placement.

C. Aggregate Base Course Material: Provide “Crushed Aggregate Base” as per SSPWC Section 200-2.2

D. Controlled Low-Strength Material (CLSM)

1. CLSM shall be used as fill from bottom of building footings to formational in accordance with 3.2.D. Formational materials shall be undisturbed.

a. CLSM sand-cement shall comply with Section 201-6 of the Greenbook Specifications, with minimum compressive strength of 150-psi.

b. Aggregates (sand) shall conform to Section 201-6 and 200-1.5 of the Greenbook Specifications.

c. CLSM shall have a maximum slump of 5-inches.

d. A set of test cylinders shall be sampled for each 150-cubic yards or fraction thereof of CLSM placed per ASTM D 5971. Compressive strength testing of CLSM shall be performed in accordance with ASTM D 4832. CLSM shall also be tested for plastic unti weight in accordance with ASTM C 138. The plastic unit weight shall not deviate more and +/-10% of theoretical unit weight shown on approved mix design.

2.2 PERMEABLE FILL MATERIAL

A. Permeable Backfill at Retaining Walls:

1. Characteristics: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter.

2. Graded within the following limits:

SIEVE SIZE	PERCENT PASSING
1 inch	100
3/4 inch	90 to 100
3/8 inch	40 to 100
No. 4	25 to 40
No. 8	18 to 33
No. 30	5 to 15
No. 50	0 to 7
No. 200	0 to 3

3. Provide material with sand equivalent exceeding 75.

B. Base Material at Interior Building Slabs

1. Characteristics: Clean, fine graded, granular base material, not contaminated with clay, silt, or organic material

2. Graded within the following limits:

SIEVE SIZE	PERCENT PASSING
No. 100	10 to 30

3. The granular material should be compacted and proof-rolled prior to placement of the vapor barrier. The vapor barrier should be protected from puncture and if damaged be repaired per the manufacturer's recommendations.

2.3 DESIGN CRITERIA

A. General

1. All improvements shall be constructed per the referenced standards, the improvement drawings, 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 fill materials to be used are acceptable to Geotechnical engineer.

   f. Prior to placement of fill material in areas where formation is not exposed at the bottom of the excavation, verify scarification and compaction of excavated surface is complete. Formational materials should not be scarified or compacted.

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.

B. Preparation

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, at 50 foot grid interval at areas with gradients greater than 2 percent.

4. Set grade stakes, using instrument technology, at 25 foot grid interval at areas with gradients less than 2 percent.

5. Provide all equipment of such type, function and design as required to achieve specified values. Where necessary, provide rubber tired and vibratory sheepsfoot compaction equipment.

C. When the Geotechnical Engineer determines existing soils in excavated areas do not provide sufficient bearing capacity or are otherwise unacceptable, remove such soils as necessary to expose soils with adequate capacity and characteristics, as approved by the Geotechnical Engineer.

D. Clearing and Grubbing

1. Where surficial grasses, weeds and other vegetation has grown in areas of work previously cleared under Section 311200, remove such vegetation to a minimum depth of two inches below existing grade under this contract.

2. Discing and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.

3. Remove all buried debris, rubble, trash, or other material not deemed suitable by the Geotechnical Engineer.

3.2 SUBSOIL EXCAVATION

A. Excavate soil in work areas under this contract as specified in this Section.

1. Stockpile excavated material for reuse. Segregate material complying with specified criteria as suitable for re-use as compacted structural fill.

2. Where approved by Geotechnical Engineer, on-site material that does not comply with structural fill criteria may be used for earthwork that does not support structures or paving.

3. After completion of grading, remove unsuitable and excess soils from site in conformance with the regulations of jurisdictional authority.

B. Excavate subsoil required to accommodate building foundation, slabs-on-grade, paving, landscaped areas, site contouring and site structures.

1. Excavate to sub-grade elevation as required to accommodate spreading of previously removed topsoil in upper 12 inches.

2. Grade top perimeter of excavation to prevent surface water from draining into, or eroding excavation.

C. Grade surfaces to provide positive drainage and prevent water ponding, prevent drainage onto adjoining properties and to implement the work.

1. Provide all field engineering and layout to construct work as shown on drawings, including establishing final grades, slope transitions, drainage paths and swales, and related engineering work.

2. Construct all drainage courses, swales, toes and tops of slopes, and related earthwork operations necessary to maintaining drainage and access as shown on drawings or required by jurisdictional authority.

3. Conform to Storm Water Pollution Protection Plan procedures and methods as shown on current SWPPP. Update plan as required. See Section 015000.

D. Excavate areas as follows:

1. Structures, including all buildings and isolated footings

   a. The entire project site is underlain by a layer of compressible and potentially expansive fill soil. Remove the fill soil within the footprints of the proposed construction per the sections below.

   b. Excavate and remove existing soils until competent paralic soils or formational materials are exposed for all areas that will support structures, improvements, or fill. Excavate laterally a minimum of 5 feet beyond the foundation footprint which includes perimeter spread footings for canopy or covered walkway structures, and at least 2 feet beyond exterior flatwork areas.

   c. If removals beneath the proposed structures result in transitions from formational materials to fill, the formational materials should be over-excavated to provide a uniform fill thickness beneath the entire structure per details shown on plans.

   d. Provide Controlled Low-Strength Material (CLSM) fill from formational to bottom of footing per 2.1.D.

2. All landscaped areas.

   a. Contour site as shown on landscaped drawings and rip existing soils to a minimum depth of 1 foot below existing grade or finished soil grade, whichever is lower.

   b. Excavate a minimum of 1 foot below finish landscape grade and 2 feet beyond landscape edge.

3. Asphalt and Concrete Paving Areas.

   a. Excavate a minimum of two feet beyond paving edge.

4. Utilize excavation methods adjacent to existing structures that prevent the loss of material from beneath foundations, including concrete underpinning where required.

5. Rock Considerations:

   a. 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.

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

6. Excavation at the site may produce oversize rock material (greater than 6 inches in maximum dimension). Special handling may be required for this oversize material.

Oversize material should either be placed in non-structural or landscape areas or hauled off-site.

3.3 COMPACTION OF EXCAVATED SURFACES

A. Prepare areas designated to receive subsequent fill and backfill materials, Portland cement or asphaltic concrete paving as follows:

1. Subsequent to removal of the fill soil layer per 3.2.D, areas to receive fill and/or surface improvements should be scarified to a minimum depth of 8 inches. Scarification and recompaction is not required if competent native soil is exposed at the bottom of the excavation. Stockpile excavated material for non-structural reuse. Formational materials should not be scarified.

2. Water, mix and aerate as necessary to moisture condition to near optimum moisture content.

3. Compact to a relative compaction of 90 percent minimum based on ASTM D 1557, for all flatwork areas.

4. Compact the upper 12 inches to a relative compaction of 95 percent at paving areas based on ASTM D 1557 for roadways.

B. Prepare areas designated to receive landscaping as follows:

1. Subsequent to removal of the upper 2 feet of unsuitable fill soil layer, areas to receive fill and/or surface improvements should be scarified to a minimum depth of 8 inches.

2. Water, mix and aerate as necessary to moisture condition within near optimum moisture content.

3. Compact to a relative compaction of 90 percent based on ASTM D 1557.

C. Fill Placement

1. Place fill with specified materials at locations as scheduled below.

a. Provide all cribbing, shoring, and sheathing required to perform work. Comply with all applicable regulations for design, installation, maintenance and removal of such construction products, including obtaining any required permits.

2. Do not place fill over porous, wet, or spongy subgrade.

3. Use equipment and procedures outlined in Green Book, 2009 Edition, Section 300-4 and as specified. Green Book Section 300-4.9 is not applicable.

a. Place and compact materials in continuous layers not exceeding 8 inches in loose thickness using methods which do not disturb or damage foundations, perimeter drainage and waterproofing systems, or utilities in trenches.

b. Compact all fill material as scheduled in this Section per ASTM D 1557.

c. Overfill all slope banks and compact. After compaction, trim to grade and contour as shown on drawings.

4. Where occurs, place fill concurrently on both sides of foundation elements in maximum 8 inch loose layers. Compact to 90 percent of maximum density per ASTM D 1557 with mechanical tampers per Article 3.3.A above.

5. Compaction by flooding or jetting is prohibited.

6. Maintain moisture content of fill materials at near or slightly above optimum moisture content and as required to attain required compaction density.

7. Slope grade as shown on drawings.

8. Make grade changes gradual, blending slope into level areas. After completion of grading operation, proof roll earthwork areas. Repair low or spongy spots developed during rolling operation.

9. Extend compacted fill to design surfaces of slopes and compact surface.

10. Remove all excess soils and dispose off site in a legal manner.

11. Provide all fill material required to achieve grades, slopes and contours as shown on drawings at no additional expense to Owner.

D. Provide dust control as required per this section. Conform to Storm Water Pollution Protection Plan procedures and methods as shown on current SWPPP. Update plan as required.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 014529.

B. Geotechnical Engineer shall verify the suitability of soil materials.

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

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

E. 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 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.

F. Compaction testing will be performed in accordance with ASTM D1556 and D6938 or other referenced methods.

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

3.5 TOLERANCES

A. Final elevations shall comply with grades as shown on drawings.

B. Lawn or unimproved areas: Plus or minus 1 inch.

C. Walks: Plus or minus 1 inch.

D. Pavement: Plus or minus 1/2 inch.

E. Not more than one point within any 50 x 50 foot area shall exceed required elevations, measured to a tolerance of plus or minus 0.1 feet.

3.6 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect finished Work under provisions of Section 015000.

C. Re-compact fills subjected to vehicular traffic.

3.7 DUST CONTROL

A. Provide for dust control under the provisions of Section 015000.

B. Maintain all streets and public ways free of dust and mud as directed by local jurisdictional authority, including use of wash down and street sweeper equipment.

3.8 FILL SCHEDULE

A. Structures

1. Place approved import fill material conforming to Section 2.1- Structural Fill, placed to depth as necessary to achieve required subgrade elevations.

B. Site Contouring areas:

1. Place fill materials as required to achieve site grades and profiles as shown on drawings and as required for drainage.

2. In landscaped areas, place stockpiled topsoil as final 12 inches of fill.

3. Compact the upper 12 inches to a relative compaction of 85 percent and 90 percent for the remainder.

C. Paving Areas.

1. Place approved imported fill material, placed to depth as necessary to achieve required subgrade elevations.

2. The uppermost 2 feet of fill below base course at paving areas shall be specified Structural Fill very low to low expansive fill material (EI<50).

3. The uppermost 12 inches of fill below base course at paving areas shall be specified structural fill material.

D. Fill to Correct Over-excavation:

1. Concrete as specified or fill material as directed by, and at the discretion of, the Geotechnical Engineer.

END OF SECTION