PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The extent and location of fence work is indicated on the drawings. The work includes the requirements for furnishing and installing all items and components of a completed fence system in conformance with these specifications and the dimensions and sections indicated on the drawings or as established by the Engineer.

1.02 SUBMITTALS

A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:

1. Fence, gateposts, and fittings.
2. Chainlink fabric, reinforcements, and attachments.
3. Wire Fence, reinforcements and attachments.
4. Submit shop drawings for swing gates.
5. 5/8" minus crushed rock.

B. Product Certificates: Signed by manufacturers of chain-link fences and gates certifying that products furnished comply with requirements.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.03 JOB CONDITIONS

A. Clearing and Grubbing and Grading of the fence lines in accordance with the Contract Documents is required.

B. Grading of the fence line shall be in accordance with the requirements outlined in the Contract Documents. Grubbing incidental to grading shall be accomplished as required. Vegetation resulting from grubbing activities shall be disposed of. Boulders, rocks, or excess excavation shall be removed from the site.

PART 2 PRODUCTS

2.02 WIRE FENCE:

A. In-line Posts: 2-3/8 –inch outside diameter, Schedule 40, galvanized and powder coated.

B. Terminal posts, Pull Posts and Corner Posts: 3.5" O. D. –inch outside diameter, Schedule 40, galvanized and powder coated.

C. All post finials shall be standard moisture proof, heavily galvanized, powdercoated coated, malleable iron securely fastened to posts.

D. Wire: 9 gauge galvanized, vinyl coated tension wire.

E. Eye Bolts: 5/8" Galvanized and powder coated

F. Turnbuckles: 5/8" x 6" Galvanized and powdercoated.

G. Color: Black.

2.03 OTHER MATERIALS

A. Concrete used in anchorage of posts shall be 3000 psi 28 day test, standard ready-mixed concrete from an approved plant.

B. Hog rings shall be 6 gauge galvanized vinyl coated steel.

PART 3 EXECUTION

3.01 GENERAL

A. The location and alignment of the fence corners and gates shall be staked by the Contractor in accordance with the contract documents and approved by the Engineer prior to any fence installation. The Contractor shall locate all intermediate line posts.

B. After clearing and grubbing and grading of the fence lines, compact a 10' corridor (5' either side of the fence line) along the fence line to a minimum of 95% max dry density.

3.02 INSTALLATION

A. Fencing and appurtenances shall be erected and installed by an organization regularly engaged in this business, employing labor skilled in this type of work to provide a complete security fencing system.

B. Posts shall be installed vertically in the concrete with a minimum depth of embedment indicated on the drawings and at the spacing specified for the type of posts approved for the Project. In unpaved areas, the concrete shall be struck off two inches above the surrounding grade. In paved areas it shall be struck off flush with the paving. The top of the concrete shall be trowelled smooth, with a slight slope away from the posts.

C. Drill holes in posts to accommodate wire.

D. Stretch wire taught and secure to terminal posts, corner posts and pull posts. A pull post, corner post or terminal post shall be placed at 100'.

E. All terminal posts pull posts and corner posts shall have turnbuckles and lock nuts on each side of the post.

F. Provide post finials.

3.04 CLEAN UP

A. Minor damage to finish of fabric and fence appurtenances shall be repaired by thorough cleaning of the damaged surfaces and the application of black paint in strict accordance with the manufacturer's recommendations.

B. Upon completion of the fence, the Contractor shall clean the fence of all soiled places and repair marred or abraided areas.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, supplies, equipment, tools and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. Items of work specifically included are:
   1. Procurement of all applicable licenses, permits, and fees.
   2. New conventional temporary irrigation system

1.02 WORK NOT INCLUDED

A. Items of work specifically excluded or covered under other sections are:
   1. Excavation, installation, and backfill of tap into municipal water line.
   2. Excavation, installation, and backfill of water meter and vault.

1.03 RELATED SECTIONS

A. The related work under this section includes, but is not limited to the following:
   1. Section 329300 – Planting

1.04 SUBMITTALS

A. Materials List: Include pipe, fittings, mainline components, water emission components, control system components. Quantities of materials need not be included.

B. Manufacturers' Data: Submit manufacturer's catalog cuts, specifications, and operating instructions for equipment shown on the materials.

1.05 RULES AND REGULATIONS

A. Work and materials shall be in accordance with the latest edition of the National Electric Code; the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.

B. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.

1.06 TESTING

A. Notify the Landscape Architect five working days in advance of testing.

B. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.

C. Subsections of mainline pipe may be tested independently, provided they are separated from sections not to be tested by gate, or similar, valves and approval of the Engineer.

D. Furnish clean, clear water, pumps, labor, fittings and equipment necessary to conduct test or retests.

E. Verification of Existing Static Pressure:
   1. Prior to start of work, test existing static pressure at irrigation point of connection. Notify Engineer immediately if minimum pressure is not achieved.

F. Hydrostatic Pressure Test:
   1. Notify the Owner's Authorized Representative in writing at least three (3) workdays prior to all system test and inspections. Inspection and reports must be made for all tests.
   2. The entire irrigation mainline and lateral system shall be tested at one time.
   3. Thoroughly flush piping before testing and installation of sprinklers.
   4. Test all exposed mainline piping, valves, joints and fittings at 150 psi for one hour prior to inspection by Owner's Authorized Representative. If pressure loss occurs, inspect the entire system, make watertight and retest until no pressure loss occurs for a thirty-minute testing period.
   5. Lateral lines shall be tested at 100 psi for 30 minutes with not more than 5 psi loss.
   6. Pressure test must show no pressure loss greater than allowed above for the specified period and be approved by the Engineer before backfill of trenches will be allowed.

G. Coverage Test:
   1. Activate each remote control valve in sequence. The Engineer will visually observe water application patterns and dripper line layout.
   2. Adjust or move system components to correct coverage deficiencies. Repeat the test until the system passes test.
   3. Use remote control or provide adequate personnel and appropriate communication to operate the irrigation controller.

H. Cement or caulking to seal leaks is prohibited.

1.07 REVIEWS/TRAINING

A. Layout Review:
   1. Notify Landscape Architect five working days in advance of review. Static pressure at water supply and nearby mainline must be verified prior to review.
   2. Stake each sprinkler location, remote control valve assembly, gate valve, and all other irrigation system assemblies. Different sprinkler types shall be clearly marked. Revise layout as directed by Engineer. Layout review may be repeated at discretion of Engineer.
   3. All landscape edging, tree locations, and other known site features must be staked or clearly marked prior to sprinkler layout review.
   4. Where the irrigation system must be modified due to discrepancies between the irrigation plans and actual site conditions, the layout shall be modified per the direction of the Engineer.
   5. Layout review shall occur prior to installation of irrigation system unless otherwise directed by Engineer.

B. Final review will occur at substantial completion of irrigation system and receipt of record (as-built) drawings and controller charts. Warranty period will begin at the date of Substantial Completion.

1.08 WARRANTY AND REPLACEMENT:

A. The purpose of this warranty is to ensure that the system remains free from defects resulting from construction, and that Engineer receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

B. For the entire Landscaping Period (See 32 93 00 Planting) contractor shall warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within three days of notification from the Engineer.

C. Contract documents govern replacements the same as new work. Make replacements at no cost in contract price.

D. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the warranty period.

PART 2 - MATERIALS

2.01 PLASTIC PIPE

A. PVC pipe (mainline) upstream of the control valves shall be Schedule 40 and conform to all requirements of ASTM D1785-86.

B. PVC pipe (lateral lines) downstream of the control valves shall be Schedule 40 and conform to all requirements of ASTM D1785-86.

C. All PVC pipe shall be marked with the manufacturer's name, class of pipe and NSF seal. Pipe shall bear no evidence of interior or exterior extrusion marks. Pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.

D. All PVC fittings shall be of the solvent weld type except where risers, valves, etc., require threaded transition fittings. All fittings shall conform to the requirements of ASTM D2466-78. All threaded PVC fittings and nipples shall be Schedule 80.

E. All PVC pipe must be delivered in at least twenty-foot (20') lengths.

F. All PVC pipes and fittings for swing joints shall conform to all requirements of ASTM D3139.

G. Sleeves required for main and lateral lines located under paving shall be Schedule 40 PVC, with the inside diameter (I.D.) of sleeve to be twice the outside diameter (O.D.) of the insert pipe, maximum 1 insert pipe per sleeve.

H. Use Teflon tape on all threaded fittings. Do not use Teflon tape at final threaded fitting at sprinkler heads.

I. Primer color shall be purple and glue color shall be grey.

2.02 AUTOMATIC IRRIGATION CONTROLLER

A. Controller: General Conditions

1. Controller shall be hard wired in conduit. All conduits are to be UL approved electrical conduit minimum size 1 1/2-inch diameter, 18-inch deep minimum.
2. Conduit size for irrigation control wires shall be minimum 1 1/2-inch diameter.
3. Communication cable shall be the type recommended by the irrigation controller manufacturer. No splices in the communication cable will be allowed unless approved in writing by Engineer.
4. All controllers and sensor decoders shall be grounded to a resistance less than 2 ohms.

B. Controller to be per Irrigation Plans

C. Remote Control for the controller shall be Compatible with Irrigation Controller

2.03 POP-UP SPRINKLER HEADS

A. All heads shall have a built-in pressure-regulating device. The device shall regulate nozzle pressure to the design pressure. The pressure-regulating device shall be an internal part of the pop-up stem. Provide 10 (ten) spare heads, and 5 (five) each of each nozzle used to the Owners upon completion of the project.

B. The heads shall have matched precipitation rate nozzles with adjusting screws.

C. All heads shall have screens under the nozzles.

D. When noted on schedule, the heads shall be equipped with check valves to prevent low head drainage. The check valves shall hold back pressures equivalent to 10 feet of head.

E. The heads shall be of types, manufacture and sizes shown on the drawings.

2.04 AUTOMATIC VALVES

A. Valves shall be electrically operated, actuated by a solenoid utilizing AC current, 24 volts, and rated at not more than 8.5 VA with an in-rush maximum of 1.0 amp. The solenoid coil is to be sealed in an "Epoxy" material so it is completely waterproof.

B. Operation shall be normally closed solenoid control capable of operating within minimum flow requirements.

C. Diaphragm operated of one-piece construction. The diaphragm is to be fully pressure balanced in both the open and closed positions.

D. Solenoid to be mounted directly on the valve or bonnet. All parts and tubing downstream of the entrance must be of larger size to permit passage of foreign particles.

E. A flow adjustment stem with cross handle shall be provided that limits the travel of the valve plug from full closed to full open, allowing manual closure or flow regulation. A manual control is to be provided for operation with or without the control wiring installed.

F. Construction is to be so that all operating parts are accessible and removable from the top by removing the bonnet without having to disconnect the valve body from the pipeline. The valve must be capable of being operated in any position.

G. Remote Control Valves for sprinkler irrigation zones shall be the type and size shown on the drawings.

H. Remote Control Valves for drip irrigation zones shall be those shown on the drawings.

I. Master Valve - Refer to Plans.

2.05 BATTERY OPERATED CONTROL UNITS

A. Product Info:

2.06 QUICK COUPLING VALVES

A. Shall be one inch (1"), all brass, one or two-piece bodies, with locking brass tops. Provide five (5) operating keys and hose swivels.

B. Quick coupler valve for use of compressed air for winterizing shall be 1" all brass, two piece bodies with locking brass tops. Provide one (1) operating key on each project.

C. Quick Coupling Valves shall be as shown on Drawings.

2.07 MANUAL CONTROL VALVES

A. Isolation Valves shall be as shown on Drawings

B. Isolation Valves shall be sized to the pipe.

2.08 VALVE BOXES

A. Automatic and manual control valves shall be enclosed in a 12" x 18" valve box of polyolefin and fibrous material (preferably recycled material) with a latch lock cover. The bottom section is to be slotted so as to extend below the pipe. Extensions shall be added as required to meet grades per Details. The box cover shall be branded in 2-inch high letters and numbers, controller and valve identification numbers. Automatic control valves shall read ACV, master valve boxes shall read MV, gate valves shall read GV, etc. Black color body and lid.

B. Individual ball valves, quick coupler valves, line flush valves and check valves shall be enclosed in a 10" round valve box of polyolefin and fibrous material with a latch lock and cover. Black color body and lid.

C. Provide two (2) sets of all keys required for valves, valve box covers, and protective sleeve covers unless otherwise noted.

D. Valve boxes shall be of the type, manufacture and size shown on the drawings and/or the following:
1. Ametek or Carson 10-inch diameter round box (quick couplers), black color body and lid.
2. Ametek 12-inch Standard Box or Carson 1419B with bolt down locking lid and extensions as required (for master valve only) black color body and lid.
3. Carson 1730 Super Jumbo with bolt down locking lid and extensions as required (for backflow device) black color body and lid.

2.09 RISERS

A. Riser: 3’ length PVC Sch. 40 plastic pipe

B. Staking: 4’ length #4 steel rebar stakes.

C. Ties: Plastic zip ties

2.10 OTHER SUPPLIES

A. Electrical tape shall be black plastic, three-quarters inch (3/4") wide and a minimum of 0.007 inches thick and the all-weather type.

B. Teflon tape shall be used for all threaded connections. Tape shall be set back a minimum of one-quarter inch (1/4") into the pipe threading. Do not use Teflon tape on final threaded sprinkler head connections or nozzles.

C. Pressure gages for the pressure reducing valve assembly shall be liquid-filled Ashcroft 1009 AL with one-quarter inch (1/4") gage cock attached or approved equal.

D. Encapsulate all splices with approved splice kit with sealant. Wire Splice Kit: DBY 3M splice kit, King 3 Safety Connectors, or Spears DS-100 Dri-Splice wire connectors.

PART 3 - EXECUTION

3.01 INSPECTIONS AND REVIEWS

A. Site Inspections:
1. Verify site conditions, including review of the operation of the existing irrigation zones impacted by construction work under this contract, and meet with facilities staff to determine any irregularities affecting work of this section. Report irregularities to the Engineer prior to beginning work.
2. Beginning work of this section implies acceptance of existing conditions.

B. Irrigation System Layout Review: Irrigation system layout review will occur after the layout has been completed. Notify the Engineer five working days in advance of review.

C. Verify locations of underground utilities at Point of Connection.

3.02 LAYOUT OF WORK:

A. Stake out the irrigation system. Items staked include existing irrigation lines and components impacted by this construction contract, and new work: sprinklers, pipe, control valves, and isolation valves.

3.03 CONNECTING TO EXISTING SYSTEM

A. General: Connect new mainline to Irrigation Meter provided by Civil. Install a separate 2-wire path from this location to the new controller.

3.04 EXCAVATION, TRENCHING, AND BACKFILLING:

A. All pipe, valves, risers, and heads to be installed at-grade, with the exception of backflow prevention devices and master valves.

B. Excavate to permit the Point of Connection pipes and equipment to be laid at the intended elevations and to permit workspace for installing connections and fittings.

C. Backfill only after lines have been reviewed and tested. Lines may be partially backfilled, leaving all joints exposed for testing.

D. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than two inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects that may damage the pipe. Backfill and compact in 6” lifts.

E. Dress backfilled areas to original grade, and re-seed, sod or restore plantings and bark, as required to match surrounding conditions.

F. Where utilities interfere with irrigation trenching and pipe work, contact the Engineer for trench depth adjustments.

3.05 ASSEMBLING PIPE AND FITTINGS

A. General:
1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.

B. Mainline Pipe and Fittings:
1. Use only strap-type friction wrenches for threaded plastic pipe.
2. PVC Solvent Weld Pipe:
   a. Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
   b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
   c. Snake pipe from side to side within the trench.

C. Lateral Pipe and Fittings:
1. Use only strap-type friction wrenches for threaded plastic pipe.
2. PVC Solvent Weld Pipe:
   a. Use primer and solvent cement. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
   b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
   c. Snake pipe from side to side within the trench.

D. Brass Pipe and Fittings:
1. Install pipe in accordance with local plumbing code.
2. Apply Teflon-type tape to the male threads only.

3.06 INSTALLATION OF MAINLINE COMPONENTS

A. Point-of-Connection (P.O.C.): As indicated on the drawings.

B. Isolation Gate Valve Assembly: Install where indicated on the drawings.

C. Quick Coupling Valve Assembly: Install where indicated on the drawings.

3.07 INSTALLATION OF SPRINKLER AND IRRIGATION COMPONENTS

A. Remote Control Valve (RCV):

1. Flush mainline before installation of RCV assembly.
2. Install where indicated on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Install connectors and sealant per the manufacturer's recommendations.
3. Adjust RCV to regulate the downstream operating pressure.

B. Sprinkler Assembly:
1. Flush lateral pipe before installing sprinkler assembly.
2. Install per the installation details at locations shown on the drawings.
3. Set sprinklers perpendicular to the finish grade.
4. Supply appropriate nozzle or adjust arc of coverage of each for best performance.
5. Adjust the radius of throw of each sprinkler for best performance.

3.08 INSTALLATION OF BATTERY OPERATED CONTROL SYSTEM COMPONENTS

A. Battery Control Units:
1. The location of the controller unit is to be placed on the west wall of Storage Room #1600A, as shown on the drawings.
2. Attach wire markers to the ends of control wires inside the controller unit housing.
3. Connect control wires to the corresponding controller terminal.

B. Remote Control Valves: Install per details and manufacturer’s instructions.

3.09 CLEANUP

A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish. Sweep and wash pavement, and leave site in a spotless condition.

END OF SECTION 328000

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Soil Specifications and amendments for on-grade applications.

B. Related Sections:
   1. Section 32 92 00 “Turf and Grasses” for seeding and jute mesh.

C. References: The following Specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and Specification conflict with this Specification section the requirements of this Specification shall prevail. In the event that the requirements of any of the following referenced standards and Specifications conflict with each other the more stringent requirement shall prevail.
   1. ASTM: American Society of Testing Materials cited section numbers.
   2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
   3. US Composting Council *www.compostingcouncil.org and* http://compostingcouncil.org/admin/wp-content/plugins/wp-*pdfupload/pdf/191/LandscapeArch_Specs.pdf.*
   4. *Methods of Soil Analysis*, as published by the Soil Science Society of America (http://www.soils.org/).
   5. Up by Roots: healthy soils and trees in the built environment. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.03 DEFINITION

A. A horizon: Top layer of mineral soils as further defined in “Soil Horizons” below.

B. Acceptable drainage: drainage rate is sufficient for the plants to be grown, between 1 - 5 inches per hour for installed planting soil. In natural undisturbed soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers, but could become unstable in high wind events.

C. Amendment: material added to Topsoil to produce planting soil mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.

D. Biological Amendment: amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.

E. Compacted soil: soil where the density of the soil is greater that the threshold for root limiting, and further defined in this Specification.

F. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this Specification.

G. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).

H. Existing soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this Specification.

I. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.

J. Field capacity: The amount of water that adheres to soil particles through surface tension after excess water has drained away. Finer textured soils hold more, coarser textured soils hold less.

K. Fine grading: the final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes other suitable devices, and further defined in this Specification, and further defined in this Specification.

L. Finish grade: surface or elevation of planting soil after fine grading, compaction, and settlement of the soil, and further defined in this Specification.

M. Graded soil: soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this Specification.

N. Installed soil: planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this Specification.

O. Loosened subgrade: Subgrade soil that has been decompacted through scarification or other method as further defined in this Specification.

P. Minor disturbance: minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.

Q. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.

R. Planting Soil: topsoil, or planting soil mixes which are imported or existing at the site, or made from components that exist at the site, or are imported to the site; and further defined in this Specification.

S. Poor drainage: soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable preferable to either to plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage.

T. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this Specification.

U. Soil fracturing: Deep loosening the soil to the depths specified by using a back hoe, and further defined in this Specification.

V. Soil horizons: as defined in the USDA National Soil Survey Handbook:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.

W. Soil ripping: Loosening the soil by dragging a ripping shank or chisel thru the soil to the depths and spacing specified, and further defined in this Specification.

X. Soil tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this Specification.

Y. Soil trenching: Cutting narrow trenches thru the soil at the depths and spacing specified to loosen the soil profile, and further defined in this Specification.

Z. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

Z. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this Specification.

AA. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.04 SUBMITTALS

A. Product data and certificates: For each type of manufactured product, submit within 21 days of Notice to Proceed data and certificates that the product meets the Specification requirements, signed by the product manufacturer, and complying with the following:
   1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.
      a. Compost: Submit the following analysis by a recognized laboratory:
         1) pH
         2) Salt concentration (electrical conductivity)
         3) Particle size % passing a selected mesh size, dry weight basis
         4) Stability carbon dioxide evolution rate mg CO2-C per g OM per day
         5) Physical contaminants (inerts) %, dry weight basis
         6) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)
      b. Coarse Sand: Submit the following analysis by a recognized laboratory:
         1) pH
         2) Particle size distribution
      c. Wood Chip Amendment: Submit information that confirms compliance with product requirements.

B. Samples: Submit within 21 days of Notice to Proceed samples of each product and material identified below to the Engineer for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.
   1. Samples of all Import Planting Soil, Coarse Sand, Compost, and Wood Chip Amendment shall be submitted at the same time as the particle size and physical analysis of that material.
   2. Sample soil mockup for Planting Soil mix 14 days prior to any soil work, comprised of soil mix identified in Part 2 below.

C. Soil Testing for Imported Planting Soil Mixes
   1. Planting Soil Mix testing: Submit soil test analysis report for each sample of Planting Soil from an approved soil-testing laboratory and where indicated in Part 2 of the Specification as follows:
      a. Submit Planting Soil, Compost, and Coarse Sand for testing at least 8 weeks before scheduled installation of Planting Soil Mix. Submit Planting Soil Mix test no more than 2 weeks after the approval of the Compost and Coarse Sand. Do not submit to the testing laboratory, Planting Soil Mix, for testing until Compost and Coarse Sand have been approved.
      b. If tests fail to meet the Specifications, obtain other sources of material, retest and resubmit until accepted by the Engineer.
      c. All soil testing will be at the expense of the Contractor.
   2. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mix shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
   3. Provide the following other soil properties:
      a. pH and buffer pH.
      b. Percent organic content by oven dried weight.
      c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
      d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
      e. Cation Exchange Capacity (CEC).

1.05 OBSERVATION OF THE WORK

A. The Engineer may observe the work at any time. Random samples may be collected to confirm compliance with the Specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting Specifications shall be paid by the Contractor.

B. The Engineer shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Engineer shall be afforded sufficient time to schedule visit to the site. Failure of the Engineer to make field observations shall not relieve the Contractor from meeting all the requirements of this Specification.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Experience: Submit statement and outline of qualifications showing five years' experience in landscape installation and a minimum of five projects that are similar in scale and complexity in addition to requirements in Division 01 Section "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on project site when work is in progress.

C. Soil-Testing Laboratory Qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, planting soil mix, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.

D. All delivered and installed planting soil shall conform to the approved submittal's sample color, texture, and approved test analysis.
1. The Engineer may request samples of the delivered or installed soil be tested, at the cost of the Contractor, for analysis to confirm the planting soil conforms to the approved material.
2. All testing shall be performed by the same soil lab that performed the original planting soil testing.
3. Testing results shall be within 10% plus or minus of the values measured in the approved planting soil mixes.
4. Any planting soil that fails to meet the above criteria, if requested by the Engineer, shall be removed and new soil installed.

1.07 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Engineer, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.
1. Prepare soil only when topsoil is not saturated, muddy, or frozen.
2. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant and/or seed material, the Contractor shall notify the Engineer in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Engineer of such conditions, they shall remain responsible for plant and/or seed material.
3. This Specification requires that all planting soil work be completed and accepted prior to the placement of any seed.

1.08 SOIL COMPACTION – GENERAL REQUIREMENTS

A. Except where more stringent requirements are defined in this Specification, the following parameters shall define the general description of the threshold points of soil compaction in existing or installed soil.
1. Standard Proctor Method ASTM D 698

B. The following are threshold levels of compaction as determined by each method.
1. Unsuitable Compaction: Standard Proctor Method – below 75%; soil below 75% is unstable and will settle excessively.
2. Acceptable Compaction: Standard Proctor Method – 75-85%
3. Root limiting Compaction: Standard Proctor Method – above approximately 85%.

4. Excessive Compaction: Standard Proctor Method – above 90%.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.

B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.

C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.

D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.

E. Bulk material: Coordinate delivery and storage with Engineer and confine materials to neat piles in areas acceptable to Engineer.

1.10 EXCAVATING AND GRADING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Notification of the local utility locator service is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

PART 2 PRODUCTS

2.01 IMPORTED PLANTING SOIL

A. For all planting areas: "Bioretention Mix", as available from Walrath Soil Products, (253) 606-4101, or approved equal.
   1. A Mix of Utility Sand and Medium Compost. The approximate Mix ratio shall be:

Mix component	% by moist volume
Utility Sand	60-70%

Medium Compost 30-40%

2. Final tested organic matter between 4.0 and 7.0% (by dry weight).
3. Conductivity in mmhs/cm <2
4. pH shall be 6.0-7.5
5. CEC shall be 5-10 meq/100g
6. Soluble salt content shall be less than 3.0 mmhos/cm.
7. At the time of final grading, collect representative soil samples and submit for soil testing. If deficiencies from the specification are noted, propose an amendment strategy to correct for any documented deficiencies. Add fertilizer per the amendment strategy only with approval from Engineer.

2.02 MEDIUM COMPOST

A. Composted material must be in compliance with WA Department of Ecology's specifications, which appear in WAC Chapter 173-350 Section 220; plus the following additional requirements:
   1. The carbon to nitrogen ratio of the compost shall be below 35:1.
   2. The compost shall have an organic matter content of 35% to 65% as determined by "loss on ignition" test method.

B. Compost feedstocks shall be:
   98% landscape waste (Type I)
   2% food waste (Type III)

C. Compost shall meet the following particle size distribution:

Sieve	Percent passing
1 inch (9.5 mm)	99-100
5/8 inch (9.5 mm)	90-100
1/4 inch (9.5 mm)	40-90

D. pH shall be between 5.5 and 8.0.

E. Manufactured inert material shall be less than 1% percent by dry weight.

F. Organic matter content shall be between 45 and 65 percent by dry weight.

G. Soluble salt content less than 6.0 mmhos/cm.

H. Maturity shall be over 80% per TMECC 05.05-A, "Germination and Vigor."

I. Stability shall be 7 or below per TMECC method 05.08-B.

J. Yard waste shall be from a permitted composting facility.

2.03 UTILITY SAND

A. Clean, washed, sand, free of toxic materials

1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
3. pH shall be lower than 7.0.
4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 10 (2.36 mm)	75-90
No 40 (.30 mm)	25-40
No 100 (.15 mm)	4-10
No 200 (0.75 mm)	2-5

B. Efforts should be made to use aggregate with gradation meeting Coefficient of Uniformity equal to 4 or above; and Coefficient of Curve of 1 to 3.

2.03 SOIL AMENDMENT

A. Mycorrhizal Amendment: Mycorrhizal Landscape Inoculant root bio stimulant with concentrated blend of Endo and Ecto Mycorrhizal Fungi and beneficial bacteria.

B. Available from: BioOrganics 1-888-332-7676

PART 3 EXECUTION

3.01 SITE EXAMINATION

A. Prior to installation of planting soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
   1. Confirm that surface of all areas to be filled with planting soil are free of construction debris, refuse, compressible or biodegradable materials, soil crusting films of silt or clay that reduces or stops drainage from the planting soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
   2. Confirm that no adverse drainage conditions are present.
   3. Confirm that no conditions are present which are detrimental to plant growth.
   4. Confirm that utility work has been completed per the Contract Documents.

B. If unsatisfactory conditions are encountered, notify the Engineer immediately to determine corrective action before proceeding.

3.02 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

3.03 GRADE AND ELEVATION CONTROL

A. Provide grade and elevation control during installation of planting soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the Contract Documents.

3.04 SITE PREPARATION

A. Refer to Contract Documents for special instructions pertaining to work around existing trees.

B. Maintain all required angles of repose of the adjacent materials as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

C. In areas where planting soil is to be spread, confirm subgrade has been scarified.

D. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
   1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
   2. Any damage to the paving or site features or work shall be repaired at the Contractor’s expense.

E. The Engineer shall review the condition of the subgrade (Excavation Review) prior to placing wood chip amendment or planting soil.

3.05 SOIL MOISTURE

A. Volumetric soil moisture level, in both the planting soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	**Permanent wilting point**	**Field capacity**

Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

B. If moisture is too low, the planting holes shall be filled with water and allowed to drain before starting any planting operations. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.06 COMPACTION REQUIREMENTS FOR INSTALLED PLANTING SOIL

A. Compact installed planting soil to the compaction rates indicated and using the methods approved for the soil mockup.

B. Maintain moisture conditions within the planting soil during installation or modification to allow for satisfactory compaction. Suspend operations if the planting soil becomes wet. Apply water if the soil is overly dry.

C. Provide adequate equipment to achieve consistent and uniform compaction of the planting soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the planting soil mockup.

D. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
   1. Light weight equipment such as trenching machines or motorized wheelbarrows are permitted to pass over finished soil work.
   2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.07 OVER COMPACTION REDUCTION

A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be removed to the full extent of the overcompacted area and reinstalled at no expense to the Port. This requirement includes compaction caused by other sub-contractors after the planting soil is installed and approved.

B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.08 INSTALLATION OF SOIL AMENDMENT

A. Application of mycorrhizae inoculant. Apply to individual tree and shrub planting holes at rate specified by manufacturer.

3.09 INSTALLATION OF CHEMICAL ADDITIVES

A. In the event the soil test requires chemical amendment to the planting soil, Contractor to propose amendment strategy suitable for a marine habitat for review and approval by the Port.

B. Following the installation of the planting soil and prior to fine grading and installation of jute mesh layer, apply chemical additives if approved as recommended by the soil test, and appropriate to the soil and specific plants to be installed.

C. Types, application rates and methods of application shall be approved by the Engineer prior to any applications.

3.10 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
   1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that all tags and flagging tape are removed from the site.
   1. Make all repairs to grades, ruts, and damage to the work or other work at the site.
   2. Remove and dispose of all excess planting soil, subsoil, jute mesh, plants, packaging, and other material brought to the site by the Contractor.

3.11 PLANTING SOIL PROTECTION

A. The Contractor shall protect installed planting soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the installed soil. Treat, repair or replace damaged planting soil immediately.

B. Loosen compacted planting soil and replace planting soil that has become contaminated as determined by the Engineer. Planting soil shall be loosened as specified above to the full depth of overcompaction or replaced at no expense to the Port per Sections 3.08 and 3.09 above.
   1. Decompact and restore grades to all soil that has been driven over or compacted during the installation of seed.

3.12 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.
   1. Maintain protection during installation until the date of plant acceptance. Treat, repair or replace damaged work immediately.
   2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch or plantings.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Port. The Engineer shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The provisions herein shall apply to furnishing and installing container-grown trees, shrubs, groundcover, and ferns; live stake cuttings; and bare root emergents within planting zones shown on the Contract Drawings. This work also includes a Landscaping Period for a period of 2 years that begins following Partial Substantial Completion of project areas and includes maintenance activities within planting zones including weed and pest control, watering, mulching, reseeding, disposal of waste materials, and warranty of plant and other landscape materials.

1.02 REFERENCES

A. American National Standards Institute (ANSI): ANSI Z60.1 - American Standard for Nursery Stock

C. Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.

1.03 SUBMITTALS

A. Product Data and Certifications: Submit manufacturer's or supplier's product data for the following items:

1. Plants:

a. Plant Materials Source: It is the Contractor's responsibility to locate source(s) of plant materials. Verify all sources of supply to ensure that all plants of the species, size, and quality are available as specified herein and on the Contract Drawings. Verify that all plants comply with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock." Submit proof of procurement of all plant materials within 21 days of Notice to Proceed.

b. Plant and Materials Receipts: Sales receipts for nursery stock and other landscape materials shall be provided to the Engineer the same week that materials arrive to the project site.

2. Herbicides and Pesticides:

a. Product Data for Herbicides and Pesticides: Submit proof of applicators' State of Washington license and that herbicide and/or pesticide is registered in the State of Washington. Provide manufacturer's literature, including Material Safety Data Sheets and toxicity levels, for each pesticide and herbicide proposed for use during construction and the Landscaping Period. The Contractor shall furnish the Engineer with a copy of the current product label for each herbicide, pesticide, and spray adjuvant to be used. This information shall be submitted with the Weed Control Plan.

B. Plant Substitutions: If substitution of plant species is required, the Contractor shall request substitution of plants 30 days prior to commencement of planting activities. The Contractor shall not substitute plants without written approval received in advance from the Engineer. The Contractor shall recommend plant species for substitution and provide recommendations on revisions to the planting approach to accommodate the microclimatic needs of the recommended plants.

C. Planting Schedule: Proposed planting schedule, indicating dates corresponding to specific areas of the site that will be planted including references to Contract Drawings. Contractor shall submit the planting schedule to the Engineer a minimum of 14 days prior to planting.

D. Landscaping Schedule: Proposed landscaping schedule, indicating dates joint inspections and maintenance activities after obtaining Partial Substantial Completion. Contractor shall submit landscaping schedule within 14 days after Engineer grants Partial Substantial Completion.

E. Qualification Data: For landscape installer and nursery. Submit within 21 days of Notice to Proceed.

F. Watering Plan: Proposed watering plan during Landscaping Period including dates and methods of watering in accordance with Maintenance section of this specification. Contractor shall submit watering plan within 14 days after Engineer grants Partial Substantial Completion.

G. Weed Control Plan: Proposed weed control plan during planting operations and the Maintenance Period. The Weed Control Plan shall be submitted to the Engineer for review and approval a minimum of 14 days prior to earthwork operations. The Weed Control Plan submittal shall include a narrative describing weed control including hand, mechanical and chemical methods, timing, application of herbicides and pesticides including type, rate, use and timing, mowing, and noxious weed control. The Weed Control Plan shall indicate how to identify different weeds at each stage in their life cycle. Target weeds to be removed shall be identified and listed. The Weed Control Plan submittal shall include hand-marked Contract Drawing sheets that show locations and weed species and describe specific control methods and the corresponding schedule for each location. The Weed Control Plan shall be updated monthly. Weed control Work shall not commence until the Weed Control Plan has been approved in writing by the Engineer.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Nursery: Company specializing in growing and cultivating native plants with a minimum of 5 years documented experience. Nursery shall be licensed to sell plants in Washington State.

2. Installer: Company specializing in installing and planting native plants with a minimum of 3 years documented experience as represented by a list of at least 5 completed past projects and names, addresses, and telephone numbers of 3 client references. The company shall provide a supervisor with a minimum of 5 years of experience.

3. Pesticide and Herbicide Applicator: The applicator shall be licensed by the state of Washington as a Commercial Applicator or Commercial Operator.

B. Plant Material Review: The Engineer shall review plant materials including container-grown stock, live stake cuttings; and bare root plants either at the place of growth or at the site before planting, for compliance with requirements for genus, species, variety, size, and quality. The Engineer retains the right to observe plant material further for size and condition of root balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of the work. The Contractor shall remove rejected plant material immediately from the project site.

C. The Engineer: It is required that the Engineer be provided an opportunity to observe the work specified herein. The Contractor shall request observance at least 48 hours in advance of the time such Work is conducted. Observance is required for the following portions of the work:

1. After plants are laid out for planting and before planting holes are excavated;

2. After plants are placed in their planting holes and holes are backfilled; and

3. When planting has been completed.

D. Plant Materials: All plant material shall be nursery grown under climate conditions similar to those at the site and meet or exceed applicable standards: Code of Standards of the current edition of the American Association of Nurserymen in the American Standard for Nursery Stock ANSI Z60.1. Plants shall be of normal habit of growth, healthy, vigorous, and free of disease, disfigurement, bound roots, insects, insect eggs, and larva.

E. Plant Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Measure main body of tree or shrub for height and spread. Do not measure branches or roots tip-to-tip.

1.05 SEQUENCING AND SCHEDULING

A. Planting Seasons:

1. Planting Season: Install bare root emergent plant materials from September 1 through October 1. Install container-grown plant materials and live stake cuttings during frost-free conditions from October 15 through March 1. Install bare root tree and shrub plant materials during frost-free conditions from December 1 through March 1.

2. No work shall be done when the ground is frozen, snow covered, too wet, or in an otherwise unsuitable condition for planting.

3. Special conditions may exist that warrant a variance in the specified planting dates or conditions. Submit a written request to the Engineer stating the special conditions and proposed variance.

1.06 DELIVERY, LABELING, STORAGE, AND HANDLING

A. Delivery:

1. Notify the Engineer of the delivery schedule a minimum of 48 hours in advance so the plant material can be reviewed upon arrival at the project site. Remove rejected plant material from the project site immediately.

2. Timing: Deliver plant materials to the project site no earlier than 3 days before planting.

3. Plant Material Staging: Prior to planting, temporarily stage all plant materials for each planting zone as shown on the Contract Drawings. Container-grown plant materials shall be grouped by same plant species in rows, with 10 plants per row. Notify the Engineer when plants for each planting zone are staged. The Engineer shall verify correct quantity per planting zone prior to layout of plants within the planting zone.

4. Pruning: Do not prune plants before delivery, except as approved by the Engineer.

5. Other Material Delivery: Deliver pesticides, herbicides, wood chip mulch, and other materials in original sealed, labeled, and undamaged containers.

B. Plant Material Labeling

1. Deliver plants with one legible label per 25 plants of the same species, labeled in waterproof ink on waterproof tags with the common and botanical name.

C. Storage:

1. Protect packaged materials from deterioration during storage. Keep herbicides and pesticides in dry storage away from other landscape materials and surface waters.

2. Store plants not installed on the day of arrival at the project site as follows:

a. Shade and protect plants from the wind when stored outside.

b. Keep plants, including those in containers, in a moist condition until planted, by watering root systems.

c. Store live stake cuttings in water on the site, using a garbage can or within edges of surface waters on site buried under 6 inches of water, or other approved means. Live stake cuttings shall be soaked in water for 24 hours prior to planting. Cuttings that have already developed roots shall not be used.

d. Bare root plants shall be kept in a cool, dark place prior to plating. The bare roots shall be kept moist prior to planting. Planting of bare roots shall take place within 48 hours after delivery.

e. Temporarily store plants in moistened peat moss, compost, or soil prior to planting.

D. Containers: Do not remove container-grown stock from containers before time of planting.

E. Handling: Exercise care in handling, loading, unloading, and storing of plant materials. Plant materials damaged in any way shall be discarded and replaced with undamaged materials at the Contractor's expense.

1. Cover plants and tie back branches as necessary.

2. Protect bark from chafing with burlap bags.

3. Do not drag plant material along the ground.

4. Plants shall be protected at all times against drying, sun, wind, heat, freezing, and similar detrimental conditions both during shipment and during related handling. When transported in closed vehicles, plants shall receive adequate ventilation to prevent sweating. When transported in open vehicles, plants shall be protected by tarpaulins or other suitable cover material. Provide adequate protection so that stems and trunks are not scarred in transport and branches are not broken.

5. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage.

6. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape.

7. Do not drop plants or carry plants by shoots, stems, foliage or trunks.

8. Handle planting stock by the root ball only.

1.07 SITE CONDITIONS

A. Planting shall not begin until grading and other improvements, which require access to or through planting zones, have been completed and accepted by the Engineer.

B. Disposal of Waste Materials:

1. Remove all plastic labels, materials, and containers from the project site after plants are in place. Recycle or properly dispose of containers and other waste materials.

1.08 LANDSCAPING PERIOD

A. General: The Landscaping Period shall consist of providing adequate and proper care for all plant materials, planting zones, and seeding zones within the project limits to ensure the resumption of growth of the transplanted material and seeded areas. The Landscaping Period shall begin following Partial Substantial Completion of the project as approved by the Engineer. At the end of each planting season, the Contractor shall submit to the Engineer Contract Drawings that clearly show the boundaries of planted areas that have been approved such that these areas can be tracked during Landscaping Period.

B. Landscaping Period: Warrant plants, for two years (730 days) following Partial Substantial Completion, against defects including distress, disease, and death.

C. Responsibility: The Contractor is responsible for maintenance of the site throughout the Landscaping Period. See Maintenance section of this specification.

D. All automatic temporary irrigation systems shall be operated fully automatic during the Landscaping Period and until Substantial Completion of the Contract. Payment for water is the responsibility of the Contractor during the Landscaping Period.

E. The Contractor shall meet monthly with the Engineer for the purpose of joint inspection of the planting and seeding zones on a mutually agreed upon schedule. At a minimum, joint inspections shall occur monthly between March and October of each year during the Landscaping Period. During the joint site inspections, the Contractor shall record a punch list of all observed unsatisfactory conditions identified by the Contractor and Engineer requiring maintenance. The Contractor shall correct all unsatisfactory conditions to the Engineer within a 10-day period immediately following the inspection. If plant replacement is required, the Contractor shall, within the 10-day period, submit a plan and schedule for the plant replacement to occur immediately at the beginning of the planting season as specified. Failure to comply with corrective steps as outlined by the Engineer shall constitute justification for the Engineer to take corrective steps and to deduct all costs thereof from any monies due to the Contractor.

F. During the Landscaping Period, the Contractor shall perform all Work necessary for the continued healthy and vigorous growth of all plant materials as directed by the Engineer. At the end of the Landscaping Period, plants that do not show normal growth shall be replaced.

1.09 WEED CONTROL

A. Mandate: Noxious Weed Control is mandated by state weed control law, Chapter 17.10 RCW. Assistance and weed lists are available from the Pierce County Noxious Weed Control Board.

B. Weed Lists: The Contractor shall be responsible for being current on all Washington State and Pierce County noxious weed lists and provide these to the Engineer as requested.

C. Weeds: Weeds include the following:

1. Noxious Weeds: The Contractor shall identify and control all Pierce County and Washington State Noxious Weeds identified by the Pierce County Noxious Weed Control Board.

2. Weeds of Concern: The Contractor shall identify and control all weeds of concern including non-regulated weeds in Pierce County identified by the Pierce County Noxious Weed Control Board and any weed occurring in the “Weeds of the West” publication.

D. Weed Control: The Contractor shall identify and control all weeds within the planting zones shown on the Contract Drawings. Only hand tools and chemical methods shall be used to remove weeds. Prior to drafting the Weed Control Plan, the Contractor shall meet on site with the Engineer to discuss weeds on site and the methods for controlling the weed species. Methods for controlling each weed species shall be proposed in the Weed Control Plan. Mechanical or chemical weed control methods shall be in accordance with recommendations of the Pierce and King County Noxious Weed Control Boards.

E. All seeding zones on the project site as shown on the Contract Drawings shall be maintained in a weed-free condition during construction. No greater than 5% cover of weeds in any 100 square foot area shall be allowed.

F. Any damaged or dead native plants resulting from Contractor weed control efforts shall be replaced immediately at the Contractor’s expense.

G. At no time during construction shall weeds be allowed to reach the seed stage. Should weeds reach the seed stage in violation of this Specification, the Contractor shall physically remove and bag the seed heads. All physically removed vegetation and seed heads shall be disposed of offsite at the Contractor's expense.

PART 2 PRODUCTS

2.02 PLANT MATERIAL

A. Plant materials shall be sound, healthy and vigorous; well-branched and densely foliated when in leaf; free from disease, insect pests, eggs, or larva; and with healthy, well developed root systems.

1. All plant material shall comply with State and Federal laws with respect to inspection for plant diseases and insect infestation.
2. Plant material shall be nursery grown stock.

B. Plant Rejection: Plants as determined by the Engineer shall be rejected for the following reasons:

1. Root bound or girdling of the roots, stem, or a major branch.
2. Grafting.
3. Disfiguring knots.
4. Sun-scale injuries.
5. Bark abrasions.
6. Evidence of improper pruning and other objectionable disfigurement.
7. Thin, weak, and leggy plants.
8. Deformities of the stem or major branches.
9. Lack of symmetry.
10. Dead or defoliated tops or branches.
11. Weeds or mold in pots.
12. Mildew, disease, or insects.
13. Trees having a damaged or missing leader, multiple leaders, or Y-crotches.
14. Defects, injury, and condition which renders the plant unsuitable for its intended use.
15. Plant material not meeting the specifications listed below for container-grown stock

C. Container-Grown Plant Stock:

1. Container-Grown Plant Stock: Plants shall be grown in pots or flats that prevent root growth beyond the sides and bottom of the container. Healthy, vigorous, well-rooted exterior plants shall be grown in a container with a well-established root system reaching the sides of the container and maintaining a firm ball when removed from container. Containers shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

2. Potted and container-grown plant stock shall be well-rooted and vigorous enough to ensure survival and healthy growth. Container plants shall have grown therein a minimum of 6 months (1 full growing season) and a maximum of 2 years, with roots filling the containers but not showing evidence of being or having been root bound.
3. Container-grown trees and shrubs for planting shall be 12 inches to 18 inches in height. Trees and shrubs shall have a minimum of three twigs and with three live buds. All conifer trees shall have only one leader (growing apex) and one terminal bud, and shall not be sheared or shaped.
4. Container-grown trees, shrubs, groundcover, and ferns shall be in 1-gallon size containers.

D. Live Stake Cuttings: Live stakes are plant material without a developed root system. Source plants for cuttings shall be dormant when cuttings are taken and all cuts shall be made with a sharp instrument. Cuttings may be collected. If cuttings are collected, the requirement to be nursery grown or held in nursery conditions does not apply. Written permission shall be obtained from applicable property owners where cuttings are to be sourced and provided to the Engineer before cuttings are collected. The Contractor shall collect cuttings in accordance with applicable local government code requirements. Cuttings shall meet the following requirements:

1. Live stake cuttings shall have a straight top cut immediately above a bud. The lower, rooting end shall be cut at an approximate 45-degree angle. Live stakes shall be cut from one to two year old wood. Live stake cuttings shall be cut and installed with the bark intact with no branches or stems attached, and be ½ to 1-½ inches in diameter and a minimum of 3 feet in length.

E. Bare Root Plant Stock:

1. Bare root plants shall be grown in ground and harvested without soil or growing medium around the roots.
2. All bare root plant materials shall have a heavy fibrous root system.
3. The shoots of bare root plants shall be 18 to 36 inches in height. The roots of bare root plants shall be 8 to 14 inches in depth.

F. Substitution of Plants: No substitution of plant material, species or variety, will be permitted unless evidence is submitted in writing to the Engineer that a specified plant cannot be obtained and has been unobtainable since the Award of the Contract. If substitution is permitted, it can be made only with written approval by the Engineer. The nearest variety, size, and grade, as approved by the Engineer, shall be furnished.

PART 3 EXECUTION

3.01 PREPARATION

A. Plant Layout: Place trees and shrubs area as shown on the Contract Drawings for review by the Engineer prior to planting.

B. Engineer Inspection: No penetration of the jute mesh and no planting holes shall be dug or backfilled without express approval of the Engineer. The Engineer will reserve the right to adjust the locations of landscape elements during the installation period as appropriate to the job.

C. Experienced Workers: Planting shall be performed only by experienced workers familiar with planting procedures for native plants under the supervision of a qualified supervisor.

3.02 INSTALLATION

A. Watering During Planting: Flood holes with sufficient water to settle soil backfill, eliminate air pockets and thoroughly dampen root ball. Allow water to drain completely. Water all plants within 24 hours of initial planting.

B. Install plants as shown on the Contract Drawings.

C. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

D. Obstructions:

1. If obstructions are encountered that are not shown on the Contract Drawings, the Contractor shall not proceed with planting operations until alternate plant locations have been selected. When the Contractor observes microclimatic conditions, or other conditions, that appear detrimental to plant establishment, planting activities shall be suspended in that location until confirmation of planting approach is received, in writing, from the Engineer.

2. Notify the Engineer if unexpected rock or obstructions detrimental to plants are encountered in planting holes.

3.04 MAINTENANCE

A. Maintain plantings, including seeded areas, throughout the Landscaping Period. All maintenance costs shall be at the expense of the Contractor.

B. Maintenance shall include cultivating; weed control; watering; mulching; reseeding; trash and debris removal; and application of appropriate insecticides and fungicides as may be necessary to maintain plants free of insects and disease.

1. Reset settled plants to proper grade and position. Restore adjacent material and remove dead material.

2. Correct defective work as soon as possible after deficiencies become apparent and weather, site access as relates to water levels, and season permit.

3. Plant Material: The Contractor shall be held responsible for the loss of any plant material, whether distressed, diseased, dead or missing, from the time of initial planting to the end of the Landscaping Period. Distressed, diseased, or dead plants are defined as plants containing 50% or more brown or chlorotic leaves and/or dead stems. The Contractor shall replace all distressed, diseased, dead, or missing plants including all plants stolen or damaged by acts of others such as animals. Remove distressed, diseased, or dead plants immediately. Replace immediately unless approved by the Engineer to plant in the succeeding Planting Season.

4. Plant Replacement: The Contractor shall be responsible for growing or providing enough plants for replacement of all plant material rejected through the Landscaping Period. Plants that require replacement shall be documented by the Contractor and a list shall be delivered to the Engineer prior to the Contractor ordering plant material. The Contractor and Engineer shall discuss the need to order plant substitutions to reflect microclimatic conditions of the specific planting locations. Otherwise, all replacement plants shall be of the same species, size, and quality as the plants originally planted in accordance with these specifications and as shown on the Contract Drawings. The Engineer shall be allowed 15 business days to respond to the submittal. The Contractor shall be responsible for procuring replacement plant materials and replanting in accordance with these specifications. All replacement plant material shall be inspected and approved by the Engineer prior to installation. All rejected plant material shall be replaced at dates approved by the Engineer.
5. Watering: Plants shall be watered by the Contractor as needed to keep them in a healthy growing condition during construction and the Landscaping Period. The Contractor shall be responsible for the watering patterns and timing, and for the source of water. All plants shall receive a minimum of 1-inch of water per week from May 1 to July 15 and a minimum of 2 inches of water per week from July 16 to October 1. In lieu of watering during these time frames, the Contractor may submit evidence that the site received the minimum required water based on local rainfall data from the USGS Tacoma Narrows rain gauge. Cost for watering shall be the Contractor's expense.
6. Mulching: At a minimum, replenish wood chip mulch rings surrounding container-grown plants during each spring of the Landscaping Period and at the end of the Landscaping Period.
7. Reseeding: All plant zones and seeding zones as shown on the Contract Drawings shall be satisfactorily seeded in accordance with 32 92 00 – Turf and Grasses. Any areas that do not meet the requirements of Satisfactory Seeded Areas shall be reseeded with fertilizer and mulch with the same seed mixtures as originally applied which also includes eroded areas any bare earth areas exposed during weed control efforts.
8. Clean-up: Conduct cleanup at the site at the beginning of each summer during the Landscaping Period and prior to the end of the Landscaping Period. Remove all litter and man-made materials from within the planting zones, unless approved by the Engineer to support thin stems or prevent damage caused by herbivores.
9. Native plants shall remain that were not planted and have colonized on the site. Native plants shall include those identified in the “Flora of the Pacific Northwest” publication.
10. Insect Pest Control: If insect pests are damaging planted vegetation, prepare for review and approval by the Engineer a strategy to treat and eliminate pests. These strategies could include insecticidal soap or horticultural spray. Implement immediately after approval.

11. Pesticides and Herbicides: Apply pesticides, herbicides, and other chemical products and biological control agents in accordance with label recommendations, the Washington State Department of Ecology regulations, Pierce County critical area regulations, and Washington State Department of Agriculture laws and regulations. Only those herbicides listed in the table “Herbicides Approved for Use on WSDOT Rights of Way may be used (www.wsdot.wa.gov/maintenance/roadside/herbicide_use.htm) and shall be approved by the Engineer. The Contractor shall ensure confinement of the chemicals within the areas designated in the Weed Control Plan. The use of spray chemical pesticides and herbicides shall require the use of anti-drift and activating agents and a spray pattern indicator unless otherwise allowed by the Engineer. Coordinate applications with Engineer's operations and others in proximity to the Work. Notify the Engineer before each application is performed. All applications of herbicides and pesticides shall be posted on the project site in accordance with Washington State Department of Agriculture regulations for 24 hours after application.
12. Weed Control: The Contractor is responsible for control and removal of all Weeds within the project limits during construction and throughout the Landscaping Period. A combination of chemical and mechanical control is allowed subject to approval by the Engineer. Removal shall include above ground shoots and underground roots. Pulled weeds shall be disposed off-site at an appropriate location at the Contractor's expense.
13. Increased Duration: Failure to comply with maintenance measures in this section or to comply with corrective steps outlined by the Engineer shall increase the duration of the Landscaping Period and shall result in a suspension of the Landscaping time period. Any such suspension of time will not be lifted until all unsatisfactory conditions have been corrected to the satisfaction of the Engineer.
14. Disposal: Remove surplus soil and waste material, including excess subsoil; unsuitable soil; trash, litter, and debris; weeds and seed heads; distressed, diseased, and dead plants; and legally dispose of them.

END OF SECTION