SECTION 32 11 23 - AGGREGATE BASE COURSES

Some of the paragraphs may be deleted. When deleting, do not renumber all the paragraphs. Simply leave the section number and title as is, delete the text, and add the words "Not Used".

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes construction of an aggregate subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.

B. Section Includes:

1. Aggregate subbase
2. Aggregate base course

C. Related Sections:

Edit listing below as needed for Project. Renumber if necessary.

1. Section 31 22 13 - Rough Grading
2. Section 31 23 17 - Trenching
3. Section 31 23 23 - Fill
4. Section 31 37 00 - Riprap
5. Section 31 05 16 - Aggregates for Earthwork
6. Section 32 12 16 - Asphalt Concrete Paving

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications
2. T11, Standard Method of Test for Materials Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
3. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

Select only one AASHTO standard based upon input/standards of client.

If no preference is standard, standard is T99.

4. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

OR

5. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

B. ASTM International (ASTM):

Select only one ASTM standard based upon input/standards of client.

ASTM D698 test methods correspond with AASHTO T99

ASTM D1557 test methods correspond with AASHTO T180

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

OR

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

5. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports

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

1.3 DEFINITIONS

A. Completed Course: Compacted, unyielding, free from irregularities and standing water, with smooth, tight, even surface, true to grade, line, and cross-section.

B. Completed Lift: Compacted with uniform cross-section thickness.

C. Keystone: Fine aggregate used to aid in binding of loose surface stone.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data for geotextile fabric and herbicide.

C. Materials Source: Submit name of aggregate materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 SHOULDER AGGREGATE

A. Of the size shown on the Plans.

B. Coarse Aggregate: Type A1, Dense-Graded Aggregate as specified in Section 32 05 16, Aggregates for Earthwork.

2.2 DENSE-GRADED BASE AGGREGATES

A. Of the size shown on the Plans.

B. Coarse Aggregate: Type A1, Dense-Graded Aggregate as specified in Section 32 05 16, Aggregates for Earthwork.

2.3 OPEN-GRADED BASE AGGREGATES

A. Of the size shown on the Plans.

B. Coarse Aggregate: Type A2, Granular Drain Backfill Material as specified in Section 32 05 16, Aggregates for Earthwork.

2.4 SOURCE QUALITY CONTROL

A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.

B. Final approval of aggregate material will be based on test results of installed materials.

C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

2.5 EQUIPMENT

A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

2.6 ACCESSORIES

Use if Geotextile is used to separate subbase from subgrade. If not, replace text with "Not Used".

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

A. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with equipment approved by the Engineer in minimum two perpendicular passes to identify soft spots.

2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place base course or surfacing materials in snow or on soft, muddy, or frozen subgrade.

3.3 HAULING AND SPREADING

A. Hauling Materials:

1. Do not haul over surfacing in process of construction.

2. Loads: Of uniform capacity.

3. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection.

B. Spreading Materials:

1. Distribute material to provide required density, depth, grade, and dimensions with allowance for subsequent lifts.

2. Produce even distribution of material on prepared surface without segregation.

3. Should segregation of coarse from fine materials occur during placing, immediately change methods of handling materials to correct uniformity in grading.

4. Maintain consistent gradation of material. Widely varying gradation will be cause for rejection.

3.4 CONSTRUCTION OF COURSES

A. Untreated Aggregate Base Course:

1. If the required compacted depth of the base course exceeds 6 inches, construct it in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

2. Completed Course Total Thickness: As shown on the Plans, 8-inch minimum.

3. Spread lift on preceding course to required cross-section. Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.

4. Lightly blade and roll surface until thoroughly compacted.

5. Add keystone to achieve compaction and as required when aggregate does not compact readily due to lack of fines or natural cementing properties, as follows:

   a. Use 3/4-inch leveling course or surfacing material as keystone.

   b. Spread evenly on top of base course, using spreader boxes or chip spreaders.

   c. Roll surface until keystone is worked into interstices of base course without excessive displacement.

   d. Continue operation until course has become thoroughly keyed, compacted, and will not creep or move under roller.

6. Blade or broom surface to maintain true line, grade, and cross-section.

B. Gravel Surfacing and Leveling Course:

1. Place shoulder aggregates in a single layer, or two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 9 inches.

2. Spread on preceding course in accordance with cross-section shown.

3. Blade lightly and roll surface until material is thoroughly compacted.

4. Complete Total Thickness: As shown on the Plans, 8-inch minimum.

3.5 ROLLING AND COMPACTION

A. Commence compaction of each layer of base immediately after spreading operations and continue until density of 95 percent of maximum density has been achieved as determined by AASHTO T99.

B. Roll each layer of material until there is no appreciable reaction or yielding under the compactor before succeeding layer is applied.

C. Shape and maintain the surface of each layer during compaction operations. Commence rolling at outer edges and continue toward center; do not roll center of road first.

D. Apply water as needed to obtain specified densities.

E. Place and compact each lift to the required density before succeeding lift is placed.

F. Surface Defects: Remedy by loosening and rerolling. Reroll entire area, including surrounding surface, until thoroughly compacted.

G. Finished surface shall be true to grade and crown before proceeding with surfacing.

3.6 SURFACE TOLERANCES

A. Blade or otherwise work surfacing as necessary to maintain grade and cross-section at all times, and to keep surface smooth and thoroughly compacted.

B. Finished Surface of Untreated Aggregate: Within plus or minus 0.04-foot of grade shown at any individual point.

C. Overall Average: Within plus or minus 0.04-foot from crown and grade specified.

3.7 FIELD QUALITY CONTROL

A. Quality control testing shall be performed by an independent testing laboratory provided by the Owner.

B. Refer to table below for minimum sampling and testing requirements for aggregate base course and surfacing. The Owner reserves the right to complete additional testing.

Property	Test Method	Frequency	Sampling Point
Gradation	AASHTO T11 and AASHTO T27	One sample every 500 tons but at least every 4 hours of production	Roadbed after processing
Moisture Density (Maximum Density)	AASHTO T99	One test for every aggregate grading produced	Production output or stockpile
In-Place Density and Moisture Content	AASHTO T310	One for each 500 ton but at least every 10,000 square feet of area	In-place completed, compacted area

3.8 CLEANING

A. Remove excess material from the Work area. Clean stockpile and staging areas of all excess aggregate. Restore per Specifications as applicable.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

Some of the paragraphs may be deleted. When deleting, do not renumber all the paragraphs. Simply leave the section number and title as is, delete the text, and add the words "Not Used".

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes chain link steel fencing and gates as shown on the Drawings or specified elsewhere. All fences and gates shall be furnished with top rails and knuckled periphery edges.

B. Section includes:

1. Chain link fabric
2. Posts
3. Rails
4. Tension wires
5. Braces
6. Fittings
7. Gates
8. Lock assemblies and gate stops

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Chain Link Fence Manufacturer's Institute:

1. Galvanized Steel Chain Link Fence Fabric
2. Industrial Steel Specifications for Fenceposts, Gates, and Accessories

B. ASTM International (ASTM):

1. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
2. A313, Standard Specification for Stainless Steel Spring Wire
3. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
4. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
5. A497, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete

6. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

7. A780, Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings

8. A824, Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence

9. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

10. C94, Standard Specification for Ready-Mixed Concrete

11. C150, Standard Specification for Portland Cement

12. C387, Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete

13. F552, Standard Terminology Relating to Chain Link Fencing

14. F567, Standard Practice for Installation of Chain-Link Fence

15. F626, Standard Specification for Fence Fittings

16. F900, Standard Specification for Industrial and Commercial Swing Gates

17. F1043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

18. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

19. F1183, Standard Specifications for Aluminum Alloy Chain Link Fence Fabric

20. F1184, Standard Specifications for Industrial and Commercial Horizontal Slide Gates

21. F1916, Standard Specification for Selecting Chain Link Barrier Systems with Coated Chain Link Fence Fabric and Round Posts for Detention Applications

C. Conflicts in requirements shall use this Section to take precedence.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for chain link fences and gates.

2. Fence, gate posts, rails, and fittings.

3. Chain link fabric.

4. Gates and hardware.

C. Manufacturer's recommended installation instructions.

D. Evidence of Supplier and installer qualifications.

1.4 QUALITY ASSURANCE

A. Use skilled workers thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Provide each type of steel fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in undamaged condition.

B. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fabric

1. Continuous chain link fence.

2. Height: As shown on the Drawings.

3. Mesh: 2-inch. All mesh shall have knuckled periphery to eliminate sharp appendages.

4. #9-gauge steel core wire.

5. Top and bottom selvage: Knuckled finish.

6. Galvanized after weaving.

7. Zinc coating shall not be less than 0.9 ounces per square foot.

B. Line Posts

Line posts shall be hot dipped galvanized 2.375-inch outside diameter hot dipped galvanized pipe, weighing 3.12 pounds per lineal foot.

C. Terminal Posts

End, corner, and pull posts shall be hot dipped galvanized pipe 2.875 inches outside diameter and weighing not less than 4.64 pounds per lineal foot.

D. Top Rail

1. Top rail shall be hot dipped galvanized 1.660-inch outside diameter pipe, weighing 1.83 pounds per lineal foot.

2. Furnish in random lengths of approximately 20 feet.

3. Jointed using a pressed steel or malleable sleeve, not only allowing for expansion and contraction, but also providing a continuous brace from end to end of each stretch of fence.

E. Tension Wire

Bottom tension wire shall be #6-gauge heavy galvanized high carbon steel coil spring wire, securely fixed to the fabric, line posts, and terminal posts.

F. Braces

1. All terminal posts shall be braced with 1.660-inch outside diameter. horizontal pipe bracing of the same material as the top rail, securely attached to the terminal and first line post with malleable iron fittings.

2. Braces shall be truss-braced from the first line post to the bottom of the terminal post, with a 3/8-inch galvanized truss rod assembly.

3. Corner posts shall be braced in both directions.

G. Fittings

1. Malleable, cast iron, or pressed steel.

2. Hot dip galvanized.

H. Fabric Ties

1. #11-gauge galvanized wire ties shall be used to tie the fabric to the line posts and rails.

I. Chain Link Gates

1. Frames:

   a. Made of heavy galvanized 1.90-inch outside diameter pipe, weighing 2.28 pounds per lineal foot.

   b. Welded or assembled with corner fittings.

2. Corner fittings, ball and socket hinges, catch stops, and center rest to be heavy galvanized malleable iron.

3. Hinges as required.

4. Provide diagonal cross-bracing.

J. Gate Posts

Posts shall be hot dipped galvanized pipe 2.875-inch outside diameter weighing 4.64 pounds per lineal foot.

K. Framework Material

All posts, rails, and braces to be heavy galvanized.

L. Lock Assembly and Gate Stop

1. Provide for each gate one double-hasp drive gate drop rod lock assembly set in concrete and one gate stop set in concrete.
2. All lock assemblies and gate stops shall be fabricated from heavy galvanized malleable iron.
3. Provide one vandal-proof keyed lock and three keys for each gate assembly.

PART 3 EXECUTION

3.1 INSTALLATION

A. All materials and workmanship shall be first class in all respects and shall be done in a neat and workmanlike manner.

B. Installation shall be conducted in accordance with the requirements of the Chain Link Fence Manufacturers Institute and these Drawings and Specifications.

C. All line, terminal, gate stops, gate drop, and gate posts shall be fixed with a minimum of 3-foot embedment in concrete poured into a 1-foot diameter hole and plumb upon curing of the concrete.

D. Line posts shall be spaced not further than 10-foot on-center.

E. Gates shall have 3-inch clearance above ground surface and sized for the application shown.

F. Space ties at 14 inches on center.

END OF SECTION

SECTION 32 91 21 - FINISH GRADING AND SEEDING

This Section includes seeding and associated tasks to develop plant growth for temporary and permanent erosion control, environmental mitigation, and roadside development, and site enhancement.

This section currently covers work in Oregon and Washington states. For work in Idaho, Colorado, and California, contact the landscape architect.

This Section includes provision for Work performed using unit price and/or lump sum payment method, when applicable.

Manufacturers found in this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Landscape Architect/Engineer. "Landscape Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

Some of the paragraphs may be deleted. When deleting, do not renumber all the paragraphs. Simply leave the section number and title as is, delete the text, and add the words "Not Used".

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil Preparation
2. Weed control
3. Fertilizing
4. Seeding
5. Mulching
6. Hydroseeding
7. Hydromulching
8. Erosion Control Blanket
9. Maintenance and Establishment Period

B. Related Sections:

Delete the following paragraph when preparation of subsoil and placement of topsoil are to be included in this section.

1. Section 31 22 13 - Rough Grading
2. Section 31 23 17 - Trenching
3. Section 32 05 13 - Soils for Exterior Improvements
4. Section 32 93 00 – Plants
5. Section 32 84 00 - Irrigation

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

Instructions: Use this article ONLY when work of this section is performed under unit price payment method. Delete this article when payment is by lump sum price which is typical.

A. Grassed Areas:

1. Basis of Measurement: By [square foot].
2. Basis of Payment: Includes seeding, mulching, watering, weeds control and maintenance to specified [time limit] including [mowing] if specified.

1.3 REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

A. ASTM International (ASTM):

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.
2. 7 USC 1551-1611 - Federal Seed Act.

1.4 DEFINITIONS

Edit the following definitions for Project conditions.

A. Certified Seed: A grass or legume seed named variety that has been reviewed and accepted into the State Certified Seed program. Currently certified seed is individually sold in bags with a Certification Tag.

B. Pure Live Seed (PLS): Is a measure used to describe the percentage of a quantity of seed that will germinate. PLS is obtained by multiplying the purity percentage by the percentage of total viable seed, then dividing by 100.

C. Establishment Period: A period when planting work has been performed and initially accepted, and there is a contract requirement to care for the planted areas in some way until the period ends.

D. Sensitive Areas: Defined areas such as wetlands, natural water and riparian resources, special environmental zones, or where certain activities are restricted such as the use of chemicals.

E. Weeds: Vegetative species other than specified species to be established in given area.

F. Invasive Plants: Any species that appears on the [[State] [Municipality] of <_____> [Highways] [Public Work's] standard.] current noxious weed list, plus known problem species including phalaris arundinacea, mentha pulegium, holcus lanatus, anthoxanthum odoratum. The last crop plants (if listed as non-native on United States Department of Agriculture (USDA) Plants Database) are considered invasive if it comprises more than 15 percent in any newly established vegetation.

G. Weed Control: Removal and prevent regrowth of specified weeds, weed parts, and weed seeds from area within the Project limit.

1.5 SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

A. Product Data: Submit data for seed mix, mulch, tackifier, erosion control blanket, soil amendment materials, pesticides, herbicides, and other accessories. The product should meet or exceeds all product requirements specified herein.

B. Grass Seeds Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1. Certification of seed analysis, germination rate, and inoculation. Include the year of production and date of packaging. Certify that each lot of seed has been tested by a testing laboratory certified in seed testing within 12 months of delivery date. Also include:

a. Name and address of laboratory

b. Date of test

c. Lot number for each seed certified

d. Test Results: Name, percentages of purity and of germination, and weed content for each seed mix.

C. Operation and Maintenance Data: Include maintenance instructions and weed control.

1.6 QUALITY ASSURANCE

Use this article to specify compliance with overall reference standards affecting all products and installation included in this section.

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

Include the following paragraph after review with the client about pesticide use.

B. Pesticide [shall] [shall not] be used in this Project.

1.7 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum 3 years documented experience.

B. Installer: Company specializing in performing work of this section with minimum 2 years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Deliver tackifier sealed containers showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

Include this article when maintenance is required. Coordinate with Operation and Maintenance article. When cost of water for maintenance is a concern, indicate metering or costs for providing water in Division 01.

A. Maintain seeded areas immediately after placement for 12 months from Date of Substantial Completion. Grass shall be well established and exhibits vigorous growing condition.

PART 2 PRODUCTS

2.1 SEED MIXTURE

In this article, list seed suppliers acceptable for this Project.

A. Suppliers:

1. Sunmark Seeds, Portland, OR
2. PT Lawn Seed, Portland, OR
3. NaturesSeed.com
4. [Equal]

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with supplier's products specified above.

Contact local experts and Landscape Architect to ascertain best seed mixture for intended use and climate conditions. Where several seed mixtures are used, utilize

schedule of types at end of this section. Edit the following paragraph carefully. Specify full horticultural names for each species to be sown.

Wide range of seed mixtures available requires scrutiny as to soil types, type of service expected, degree of traffic and use, as well as life expectancy and maintenance expected for Project conditions.

B. Seed Mixes: The following are the functional categories of seed mixes that may be included on projects (a category may have multiple functions on a Project Site):

1. Temporary Seeding - To provide short-term erosion control of disturbed soils and slopes that are not at finished grade, and which will be exposed for 2 months or longer before being disturbed again, until permanent seeding is performed, or all potential for erosion is removed.

2. Permanent Seeding - The final seeding or only seeding performed for erosion control.

3. Lawn Seeding - Seeding for areas where finished turf appearance is desired.

4. Wildflower Seeding - Seeding to develop growth of wildflowers. The seed mix will typically contain grass or other plant seed to provide erosion control.

5. Plant Seeding - Seeding which typically includes more than just grass species, such as seeds of woody or herbaceous plants.

6. Water Quality Seeding - For use in water quality facilities such as swales or settling basins.

7. Wetland Seeding - To vegetate existing or constructed wetlands.

8. Native Plant Seeding - Seeding to restore native vegetation.

The following list of seed mixes represent examples of seed mixes that can be used according to the intended functions (mentioned above), site conditions and other factors. Select one or more of the following seed mixes after consulting with Landscape Architect. Delete other seed mixes. You may use other seed mixes (not listed below).

C. Types of Seed Mixes: Seed mixes, quantities, standards, and other information

1. Erosion Control Seed Mix 1: Easy to establish, maintain, and drought-tolerant NW native grasses for erosion protection. Suitable for dry areas with minimum or no irrigation

Botanical Name	Common Name	PLS Lbs. per Acre
Elymus glaucus	Blue Wildrye	21.9
Festuca rubra rubra	Native Red Fescue	13.1
Bromus carnatius	California Brome	4.4
Agrostis exarata	Spike Bentgrass	4.4
TOTALS:		43.71

2. **Erosion Control Seed Mix 2**: Fast establishment NW native erosion control grass mix, low growing with good root masses for reduced erosion of soils. Mychorrhize may be added to enhance root system growth. Less than 24 inches in height with shade and drought tolerance. May work on wet and dry sites.

Botanical Name	Common Name	PLS Lbs. Per Acre
Hordeum brachyantherum	Meadow Barley	17.45
Bromus carinatus	California Brome	15.27
Festuca rubra	Native Red Fescue	8.73
Deschampsia cespitosa	Tufted Hairgrass	1.31
Agrostis exerata	Spike Bentgrass	0.87
TOTALS:		43.63

3. **Erosion Control Seed Mix 3**: NW Native seed mix with low/no maintenance. It has a high percentage of wildflowers and legumes which provide excellent nitrogen fixation. It is drought tolerant low-growing native grasses and low-growing wildflowers.

Botanical Name	Common Name	PLS Lbs. Per Acre
Bromus carinatus	California Brome	16.26
Lupinus albaculus	Sicklekeel Lupine	16.26
Elymus elymodies	Squirreltail	12.36
Gailardia aristata	Blanketflower	7.8
Lotuspurshianus	Spanish Clover	5.2
Festuca occidentalis	Western Fescue	2.6
Eschscholzia californica	California Poppy	2.6
Koeleria macrantha	Prairie Junegrass	0.98
Clarkia unguiculata	Elegant Clarkia	0.65
Achillea millefolium	Common Yarrow	0.33
TOTALS:		65.04

4. **Swale Seed Mix**: NW Native species that establish quickly and provide phytoremediation of stormwater.

Botanical Name	Common Name	PLS Lbs. per Ac

Elymus glaucus	Blue Wildrye	21.74
Festuca rubra	Native Red Fescue	6.52
Hordeum brachyantherum	Meadow Barley	4.35
Glyceria occidentallis	Northwestern Mannagrass	4.35
Beckmannia syzigachne	American Sloughgrass	4.35
Deschampsia caespitosa	Tufted Hairgrass	2.17
TOTAL:		43.48

5. Water Quality Seed Mix: Water quality facilities NW Native bio-filtration seed mix, salmon-friendly, will perform well in the bottom of drainage swales, storm water retention ponds, and bio-filtration swales. This mixture will range from the continuously wet lowlands, up into the riparian zone, offering erosion control and habitat development.

Botanical Name	Common Name	PLS Lbs. per Acr
Elymus glaucus	Blue Wildrye	20
Festuca rubra rubra	Native Red Fescue	16.5
Deschampsia caespitosa	Tufted Hairgrass	5.2
Glyceria occidentallis	Western Mannagrass	0.9
Beckmania syzigachne	American Sloughgrass	0.9
TOTALS:		43.38

6. Roadside Seed Mix: Erosion control mix for vegetation along roadsides. It is also salt tolerant.

Botanical Name	Common Name	PLS Lbs. per Acre
Hordeum vulgare var Poco	Poco Barley	52.24
Hordeum brachyantherum	Meadow Barley	36.57
Bromus carinatus	California Brome	23.51
Festuca idahoensis romerii	Roemer's Fescue	7.18
Trifolium fragiferum	Strawberry Clover	5.22
Clarkia amonea	Farewell to Spring	1.96
Oenothera elata hookeri	Hooker's Evening Primrose	1.96
Deschampsia cespitosa	Tufted Hairgrass	1.31

Agrostis exerata	Spike Bentgrass	0.65
TOTALS:		**130.6**

7. **Wildflowers/Grasses Seed Mix**: Low growing grass, wildflower, and ground cover mix with drought tolerant, soil stabilization, and aesthetically colors.

Botanical Name	Common Name	PLS Lbs. per Acre
Festuca brevipila	Spartan II Hard Fescue	34.4
Festuca ovina var covar	Covar Sheep Fescue	12.9
Dalea purpurea	Purple Prairie Clover	12.9
Centaurea cyanus, dwarf	Dwarf Bachlor Buttons	10.3
Poa sandbergii	Sandberg Bluegrass	5.2
Nemophilia menziesii	Baby Blue Eyes	4.3
Trifolium repens	White Clover	1.7
Lobularia maritium	Sweet Alyssum	1.7
Sphaeralcea coccinea	Scarlet Globemallow	1.7
Achillea millefolium	Common Yarrow	0.86
TOTALS:		**86.12**

2.2 ACCESSORIES

A. Straw Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Wood and Bark Mulching Material: Chipped wood and bark, sawdust, and ground wood mulch should be free of growth or germination inhibiting ingredients.

C. Compost: Commercially manufactured fine and medium compost materials.

D. Tackifier: Commercial tackifier containing no agent toxic to plant life and exhibits no growth or germination inhibiting factors at one of the following forms:

1. Liquid Stabilizer Emulsion - Tackifier with a base material of liquid containing not less than 55 percent total solids by weight. It should allow exchange of air and moisture to the seeds and have an effective life of 1 year or more.

2. Dry Powder Tackifier - Tackifier base consisting of one or more active hydrocolloids from natural plant sources, which hydrates in water and blends with other slurry materials, and upon application tacks the slurry particles to the Soil surface.

Include fertilizer only when applicable. Consult local experts for types used in Project location and types permissible with site soil and seed mixture specified.

E. Fertilizer: Commercial grade; recommended for grass to eliminate deficiencies of topsoil and suitable for application with equipment designed for that purpose.

1. Deliver fertilizers in separate or mixture containers that have the percentage of total nitrogen, available phosphoric acid, and water-soluble potash (NPK) in the amounts specified. Label each container with a quality compliance certificate.

2. Application rate shall be determined by the soil conditions, as indicated in analysis to determine the proportions of Nitrogen percent, phosphoric acid percent, soluble potash percent.

F. Lime: ASTM C602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

G. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.

H. Erosion Control Blanket shall be open, flexible, and dimensionally stable network of fully-biodegradable, bonded, interlocking fibers. The blanket shall have a functional longevity of up to 12 months. Blanket fibers shall be turf green color or natural wood/straw color.

I. Pesticides/Herbicide: Submit proposed pesticides and receive approval before using. Submit a copy of the Manufacturer's federal registered label and, if requested, a Material Safety Data Sheet. The Agency reserves the right to restrict chemicals from being used on sensitive areas.

1. Pesticide registered and approved by the Environmental Protection Agency (EPA), acceptable to authorities having jurisdiction, and of type recommended by Manufacturer for each specific problem and as required for Project conditions and application.

2. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

3. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the erosion control layer.

4. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.3 SOURCE QUALITY CONTROL

Include testing only when topsoil is part of this section and is to be imported and there is some doubt as to its suitability.

A. Analyze soil to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of soil testing.

C. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

Planting season may vary depending on the site location. Verify the best time for seeding with the Landscape Architect and modify this section accordingly.

B. Planting Season: Plant seeds when growing conditions are conducive to seed germination and quick but thorough establishment of seedlings.

1. Depending on latitude and elevation in the Pacific Northwest, these conditions occur either in mid-August through early October or mid-April to late May.

2. Avoid planting seed during the heat of summer or in late fall to avoid freezes that kill sprouting grass seeds.

C. Weed Control Coordinator - Submit certification at the preconstruction conference that the weed control coordinator meets the following minimum requirements:

1. Demonstrates ability to identify noxious and other weed species commonly seen in site location for at least 1 year conducting weed surveys.

2. Has successful weed control experience, with similar duties to those stated under typical duties below, on at least three construction or vegetation management projects. Certification of Pesticide Consultant License is preferred.

3. The weed control coordinator duties include:

a. Identify Specified Weeds.

b. Prepare and update the Weed Control Program.

c. Coordinate Contractor's weed removal Work and records.

d. Ensures the removed weeds are disposed of at an approved off-site facility.

D. Pesticide Applicator - Submit certification before application of pesticide Work begins, that when chemical weed control is used, that each applicator possesses a Commercial Pesticide Applicator's License held in the individual's name. Submit a certification each time a new applicator begins application Work on the Project.

E. Conduct soil analysis to determine soil fertility. The soil test should at least analyze the current nitrogen, phosphorus, potassium, and PH rates in the soil. Accordingly, the soil test result would suggest the proper soil amendment application including the rates of fertilizers and lime. Obtain the Engineer approval before applying soil amendment.

F. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Engineer and replace with new planting soil.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

2. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.

3. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3.2 SOIL PREPARATION

A. Prepare area for seeding while generally considering the following:

1. Remove any matter detrimental or toxic to the growth of plants, including weeds, clods, rocks, or debris.

2. Application rates of fertilizer or lime shall be based on soil testing results.

3. Prepare a tilled, fine, but firm seedbed.

4. The soil shall have a pH range of 5.5 to 8.0.

B. Refer to Section 32.93.00 Plants, for area preparation for the following kind of seeding:

1. Temporary Seeding - Method E

2. Permanent Seeding - Method D

3. Water Quality Seeding - Method B

4. Wetland Seeding - Method B

5. Lawn Seeding - Method C

Include weed control program if it is part of plant establishment period and behind.

3.3 WEED CONTROL

A. Do not harm or disturb any vegetation that was planted as proposed on the planting plans. Do not compact soil with heavy equipment.

B. Inspect the Project for new growth of specified weeds at least monthly during the plants growing season and apply weed control measures as appropriate.

1. Inspect the area at least every 30 days after growing season has begun or as directed for continuing control of all vegetation considered as weeds.

2. Provide schedule of weed control measures.

3. Request to use wheeled or tracked construction equipment in sensitive areas.

C. Remove and control weeds according to the following:

1. Verify the weed control methods before proceeding with weed control activities.

2. Remove all specified weeds and ensure that weed seeds or reproducing plant parts such as vines, runners, or rhizomes do not remain or become disbursed during control activities.

3. Place weeds and related materials in an approved container and transport to an approved offsite disposal facility according to applicable laws and regulations.

4. Keep the site weed free including weeds not initially documented.

D. Weed Control at Sensitive Areas - as determined by the Engineer:

1. Use only hand or light mechanical weed control methods within 50 feet of sensitive areas.

2. Hand methods include the use of hand tools. Light mechanical methods include the use of hand carried, motorized machinery.

E. Weed Control Corrective Work - If corrective work for areas identified as deficient by the Engineer, it should be completed within a 15 Calendar Day period,

3.4 SEEDING

If there are different areas with different seed mixes applications, list them below according to the plans.

A. Apply <_____> Seed mix at rate of <_____> pounds per 1000 square feet at <_____> area according to the plans.

The following list of seeding methods that can be used according to the intended functions, site conditions, and other factors. Select one or more of the seeding methods after consulting with the Landscape Architect. Delete other seeding methods. You may use other seeding methods (not listed below).

3.5 HYDROSEEDING AND HYDROMULCHING

A. Mix seeds, fertilizers, mulch, and tackifier with water in specific tank as follows:

1. Hydraulic Equipment should continuously mix and agitates the slurry providing a continuous, non-fluctuating delivery.

2. Provide a uniform distribution of the slurry.

3. Place seed, fertilizer, mulch, and tackifier in the hydroseeder tank no more than 30 minutes prior to application.

B. Hydroseeding operation: Perform hydroseeding according to the following:

1. One-Step Operation - Apply materials in one step only for the following situations:

a. When seeding in conjunction with erosion control matting. Apply seed, fertilizer, and tracer before installing matting.

b. When treating small areas that are 1,500 square feet or less and totaling no more than 0.5 acre, double the amount of seed to compensate for seed suspended above Soil by the mulch.

2. Two-Step Operation – for areas over 0.5 acre, use the two-step method for all hydroseeding/hydromulching operations:

a. Step 1 - Apply seed, fertilizer, and tracer.

b. Step 2 - Apply mulch and tackifier.

C. Seed -Thoroughly mix seeds when more than one kind is to be used.

D. Mulch - Apply at the following rates based on dry fiber weight:

1. Slopes Flatter Than 1V:2H - Apply cellulose fiber that includes a tackifier at a rate of 2,000 pounds per acre.

2. Slopes 1V:2H or Steeper - Apply cellulose fiber that includes a tackifier at a rate of 3,000 pounds per acre.

E. Tackifier for Cellulose Fiber Applications – apply dry tackifier to water tank at the following rates unless the Manufacture recommends a greater rate of application:

1. Slopes Flatter Than 1V:2H - 60 pounds per acre mixed with hydromulch fibers at the rate specified.

2. Slopes of 1V:2H or Steeper - 100 pounds per acre mixed with hydromulch fibers at the rate specified.

3.6 MECHANICAL SEEDING

A. Seeding, fertilizing, and covering: The following may be used to stabilize small, disturbed areas that are 1,500 square feet or less and totaling no more than 0.5 acre:

1. Seeds and fertilizer - Seed the disturbed area with the seed mix at the specified rate by mechanical spreader.

2. Cover - Cover seeded areas with one of the following:

a. Straw mulch at a rate of 100 pounds per 1,000 square feet. Spread the mulch uniformly approximately 2 inches deep, in loose condition, which requires roughly 2-1/2 tons per acre of dry mulch. Do not use straw mulch on slopes of 1V:1.5H or steeper.

b. Bark mulch spread uniformly at an approximate depth of 1/2-inch. Use well-decomposed mulch for seed mulching. Do not use bark mulch on slopes of 1V:1.5H or steeper.

c. Suitable open-weave, biodegradable erosion control matting installed according to Manufacturer's instructions.

3.7 SEEDING OVER MULCHED AREAS

A. If an area has been previously mulched for erosion control or temporary seed and mulch is present on the soil surface, double the pound rate for each seed type used. Apply seed and fertilizer hydraulically or mechanically and add a green dye to the mixture to visibly aid uniform application. Upon approval, fertilizer and seed may only be applied after mulching if one of the following conditions apply:

1. Mulch is punched into the soil by mechanized means. Avoid heavy equipment that may compact the soil. Roll seeded area with roller not exceeding 112 pounds/linear foot.

2. Mulch that is held down with netting or like material

3. Mulch is removed prior to seeding.

3.8 WORK QUALITY

A. After application, apply water with fine spray immediately after each area has been hydroseeded Apply water with fine spray immediately after each area has been mulched.

B. Drift - Prevent drift and displacement of seed and fertilizer regardless of equipment and methods used.

C. Displacement - Prevent seed, fertilizer, and mulch from falling or drifting onto other areas where grass is detrimental. Remove material that falls on plants, roadways, gravel shoulders, structures, and other surfaces where material is not specified.

D. Damage - Prevent damage to prepared areas and to completed fertilizer, seed, and mulch work. Replace all material that becomes displaced before acceptance of the work.

3.9 MAINTENANCE

Include this article when maintenance is required.

A. Control growth of weeds. Remedy damage resulting from improper use of herbicides.

B. Weed Control - Remove specified weeds prior to plants going to seed and keep weed control and seeded areas "Weed Free" throughout the Establishment Period.

C. Immediately reseed areas showing bare spots.

D. Repair washouts or gullies.

E. Protect seeded areas with warning signs during maintenance period.

F. Ensure that each seeded area has a uniform, healthy and weed-free stand of grass or other seeded plants growing at the end of the Establishment Period. The minimum living plant coverage standards for acceptance of seeding in a planted area are as follows:

1. Temporary Seeding:

a. West of the Cascades - 70 percent coverage of ground surface.

b. East of the Cascades - 30 percent coverage of ground surface.

2. Permanent Seeding:

a. West of the Cascades - 90 percent coverage of ground surface.

b. East of the Cascades - 30 percent coverage of ground surface.

3. Wetland Seeding - 70 percent coverage of ground surface.

4. Water Quality Seeding - 100 percent of ground surface.

G. Protection - Protect seeded areas from trespass and other hazards of damage. Use protective fences and signs at no additional cost to the Agency. Obtain approval of protective methods used.

H. Fertilizing and Watering - Apply fertilizer according to grass and soil requirements. Apply water according to good horticultural practice under the prevailing conditions, as required to promote a healthy stand of plants. Obtain water at no additional cost to the Agency.

I. Mowing – If mowing is required, do the first mowing of grass when soil is firm enough to prevent rutting and grass is about 3 inches tall. After mowing, leave grass that is approximately 2 inches tall. At each subsequent mowing, leave about 1-1/2 inches of growth. After the second mowing, grass clippings may be left in place upon written approval.

J. Repair and Restore - Repair and restore soil grades and re-seed damaged, settled, or unproductive areas to the specified conditions of this Section at no additional cost to the Agency.

K. Finishing and Cleaning Up Cleanup - Remove weeds, trash, debris, stones, and other extraneous matter from seeded areas as directed and dispose of.

Include schedule for listing locations of various seed mixtures, sowing rate, fertilizer types, or topsoil thickness variations. Schedules can be listed below or with Plant Schedule on Drawings.

END OF SECTION