

## **CITY OF GOLDEN REVEGETATION REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1     Description.**

- A.     This section covers soil preparation, fertilizing, seeding, mulching, installation of erosion control fabrics, watering and initial care, final inspection and approval, and the guarantee period for temporarily and permanently revegetated areas.
- B.     This section addresses work within the limits of disturbance as shown on the Drawings. However, if disturbance does occur outside of this designated area, this section will also pertain to those areas which have been disturbed.

### **PART 2 - MATERIALS**

#### **2.1     Quality.**

All materials used for revegetation shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

#### **2.2     Handling and Storage.**

Protect all materials used for revegetation from damage, deterioration, or loss of any kind while in transit, storage and during installation.

#### **2.3     Fertilizer.**

Commercial product of uniform composition, free flowing and conforming to applicable State and Federal laws. Deliver in original, unopened containers. Application rates shall be based upon recommendations of soils laboratory and shall be reviewed by the CITY. Biosol organic fertilizer is preferred to synthetic fertilizer.

#### **2.4     Herbicide.**

Where site conditions warrant or is determined by the CITY, use "Roundup" herbicide as a one percent (1%) application solution or other approved equal that is recommended and legally approved.

#### **2.5     Soil Conditioners.**

Where topsoil has been stripped or is absent from the soil horizon, soils conditioners may be required by the CITY. Acceptable organic soil amendment may include mycorrhizal inoculums, humate conditioners or certified Class II compost product produced on a site compliant with and in accordance with current Colorado Department of Health and Environment (CDPHE) regulations pertaining to Solid Waste Composting. Compost shall be a totally organic product that has been aerobically and naturally processed without the addition of coarse wood chips. Organic material shall be tilled to a minimum depth of eight inches (8") or per manufacturer's specification. The application of granular humate is acceptable.

## 2.6 Temporary Revegetation Seed.

Furnish in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, percent of weed seed content and the guaranteed percent of purity and germination. All seed shall be free from noxious weeds as listed in the Colorado Noxious Weed Act; seed shall be fresh, clean, new crop seed. Do not use seed which has become wet, moldy or otherwise damaged in transit or storage.

No.	Species	Growth Season	Pounds of Live Seed/acre	Planting Depth (in)
1.	Oats	Cool	35 - 50	1 - 2
2.	Spring Wheat	Cool	25 - 35	1 - 2
3.	Spring Barley	Cool	25 - 35	1 - 2
<del>4.</del>	<del>Annual Ryegrass</del>	<del>Cool</del>	<del>10 - 15</del>	<del>½</del>
5.	Millet	Warm	3 - 15	½ - ¾
6.	Sudangrass	Warm	5 - 10	½ - ¾
7.	Sorghum	Warm	5 - 10	½ - ¾
8.	Winter Wheat	Cool	20 - 35	1 - 2
9.	Winter Barley	Cool	20 - 35	1 - 2
10.	Winter Rye	Cool	20 - 35	1 - 2
11.	Triticale	Cool	25 - 40	1 - 2

Adapted from Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices

Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead plant material residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist.

Seeding rates should be doubled if seed is broadcast; or increased by 50 percent if done by a Brillion drill or by hydraulic seeding.

2.7 Permanent Revegetation Seed.

- A. Furnish in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, percent of weed seed content and the guaranteed percent of purity and germination.
- B. All seed shall be free from noxious weeds as listed in the Colorado Noxious Weed Act; seed shall be fresh, clean, new crop seed. Do not use seed which has become wet, moldy or otherwise damaged in transit or storage.
- C. The seed shall be mixed in proportions, generally matching the following recommended mix designs of the indicated manufacturer's (or approved equals), as indicated and as necessary to obtain the application rate specified.
- D. The following mixes are preferred. The City will review alternatives for approval.

1. Rocky Mountain Native Mix from Arkansas Valley Seeds

Common Name	Variety	Percent	Lbs/Acre
Slender Wheatgrass	Revenue	25	
Mountain Brome	Bromar	20	
Blue Grama	Hachita	20	
Idaho Fescue	Winchester	15	
Buffalograss	Bison	10	
Green Needlegrass	Lodorm	5	
Indian Ricegrass	Paloma	5	
	Total	100%	<b>20</b>

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist.

Seeding rates should be doubled if seed is broadcast; or increased by 50 percent if done by a Brillion drill or by hydraulic seeding.

2. Foothills Native Mix from Pawnee Buttes Seed

Common Name	Variety	Percent	Lbs/Acre
Indian Ricegrass	Paloma	10	
Little Bluestem	Camper	10	
Blue Grama	Hachita	10	
Indiangrass	Cheyenne	10	
Sandberg Bluegrass	High Plains	10	
Rocky Mountain Fescue	Native	10	
Sideoats Gramma	Butte	10	
Green Needlegrass	Lodorm	10	
Big Bluestem	Roundtree	8	
Sand Dropseed	Reliable	2	
Western Wheatgrass	Arriba	10	
	Total	100%	<b>25</b>

3. Short Grass Prairie Mix from Western Native Seed

Common Name	Variety	Percent	Lbs/Acre
Buffalograss	Bison	40	
Western Wheatgrass	Arriba	30	
Blue Grama	Hachita	24	
Galleta Grass	Viva	3	
Sand Dropseed	Reliable	1.5	
Needle & Thread	Native	1.5	
	Total	100%	<b>20</b>

4. Mix for Detention Ponds.

Common Name	Variety	Percent	Lbs/Acre
Buffalograss	Texoka	4	9.0
Blue Grama	Hachita	39	6.0
Switchgrass	Blackwell	18	6.0
Western Wheatgrass	Barton	4	5.0
Sand Dropseed	Reliable	14	1.0
Inland Saltgrass	Native	14	3.0
Prairie Cordgrass	Native	7	5.0
	Total	100%	35.0

Where there is persistent water, add the following:

Common Name	Variety	Percent	Ozs/Acre
Wooly Sedge	Native	1.4	4.0
Nebraska Sedge	Native	2.3	4.0
Baltic Rush	Native	53.1	4.0
Louisiana Sage	Artemisia ludoviciana	19.4	1.0
Aster	Native	5.2	3.0
Showy Milkweed	Asclepias speciosa	0.3	2.0
Swamp Milkweed	Asclepias incarnata	0.3	2.0
Wild Bergamot	Monarda fistulosa	6.0	3.0
Yarrow	Achillea millefolium	12.0	1.0
	Total	100%	24.0

5. Invasive, Exotic Grasses to AVOID for Revegetation

Common Name	Species	Comments
Canada Bluegrass	Poa compressa	
Creeping Bentgrass	Agrostis stolonifera	Extensively rhizomatous, highly competitive with native species
Crested Wheatgrass	Agropyron desertorum	Forms monoculture
Hard or Sheep Fescue	Festuca ovina	
Intermediate Wheatgrass	Agropyron intermedium	Outcompetes native species
Kentucky Bluegrass	Poa pratensis	
Meadow Fescue	Festuca pratensis	
Meadow Foxtail	Alopecurus pratensis	
Orchardgrass	Dactylis glomerata	
Quackgrass	Agropyron repens	Very aggressive, highly competitive with native species
Reed Canary Grass	Phalaris arundinacea	Replaces native species in riparian areas
Ryegrass: Italian, annual ryegrass, common rye	Lolium perenne	
Smooth Brome	Bromopsis inermis	Outcompetes native species
Tall Fescue	Festuca arundinacea	
Timothy	Phleum pratense	

Adapted from the Colorado Native Plant Society, 2002

The plants listed above are invasive, exotic species which threaten or potentially threaten natural areas, agricultural lands, and gardens. While there are thousands of introduced plants which pose no threat, there are some that become invasive, displacing and outcompeting native vegetation.

2.8 Mulch.

- A. Mulch shall be clean, weed-and seed-free, long stemmed grass hay (preferred) or cereal grain straw. Mulch should be applied evenly at a rate of two tons per acre. At least fifty percent (50%) of the mulch, by weight, should be ten inches or more in length. For steep slopes (slopes steeper than 3:1), drainage swales, in areas of anticipated heavy runoff, and other special situations, blankets anchored with staples, are required instead of mulch.
- B. Hydromulch: Degradable green dyed virgin wood cellulose fiber, free from weeds or other foreign matter toxic to seed germination. Apply product according to

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manufacturer's specifications at a minimum rate of two thousand (2,000) pounds/acre.

- C. Compost Blanket: The use of a Class I Compost Blanket is an acceptable alternative to crimped mulch for stabilizing exposed soils, but shall not be used in drainageways or concentrated flow areas.

#### 2.9 Organic Tackifier/Binder.

- A. All mulched areas shall receive an application of an organic mulch tackifier/binder. Use a non-toxic, non-corrosive, all organic powder which forms a firm resilient, re-wettable membrane.
- B. Manufacturers:
  - a. Regular application: Nilex Plantango Insul-ari, or approved equal, at two hundred (200) pounds per acre.
  - b. Steep (3:1 or greater) slopes or unstable soil: Rantec Guardian Tackifier, or approved equal, at one-hundred twenty (120) pounds per acre.

#### 2.10 Erosion Control Blanket.

- A. An erosion control blanket shall be used on slopes equal to or steeper than three to one (3:1) and in swale bottoms or in areas of concentrated flows (i.e. detention pond low flow areas, inlets, and outlets), except where sod is used. Biodegradable netting must be used.
- B. Manufacturers:
  - 1. Slope Application: Type SC 150 BN, North American Green, or approved equal.
  - 2. Areas receiving flows: Type C 125 BN, North American Green, or approved equal.

#### 2.11 Water.

The CONTRACTOR will be required to provide all water necessary for hydraulic spray applications. The City bulk water sales station is located on the north end of Golden at 1151 Catamount Drive, adjacent to the City of Golden maintenance shops. This station provides bulk water to contractors without the need for the customer to rent a hydrant meter. A standard 2.5" male fire hose connection is installed on the station. The discharge from the station is currently set at approximately 250 gpm. Contractors will be required to set up a **prepaid** account with the City of Golden. Accounts may be opened at the City of Golden Public Works office located at 1445 10th Street. Be prepared to provide company and truck information, including license plate numbers and truck capacity.

## PART 3 - EXECUTION

### 3.1 Limits of Exposure.

- A. After construction begins, soil surface stabilization shall be applied with fourteen (14) days to all disturbed areas that may or may not be at final grade but will remain undisturbed for periods longer than thirty (30) calendar days or for an indeterminate length of time. The maximum time limit of land exposure for the following erosion control measures is shown by the following table:

Erosion Control Method	Maximum Allowable Period of Exposure (months)
Surface Roughening	1
Mulching	12
Temporary Revegetation	6 - 12
Permanent Revegetation	12 or more
Soil Stockpile Revegetation	2
Early Application of Road Base	1

Modified from Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices

### 3.2 Site Preparation.

- A. Clearing and Grubbing: All damaged native shrubbery and trees adjacent to the disturbed areas must be correctively pruned or removed. All large rocks, boulders, and construction debris must be removed from the site by the CONTRACTOR.
- B. Grading: The disturbed area must be fine graded to allow for tractor-driven mowing machinery. Transition from the disturbed areas to the original grade must have an even, natural, and maintainable appearance.

### 3.3 Soil Preparation.

- A. If needed prior to seeding, spray all areas that are to be seeded with "Roundup" herbicide or approved equal using a one percent (1%) solution as directed on packaging. Do not contaminate surface waters during application(s) and leave adequate residual time for the chemicals prior to seeding.
- B. Thoroughly till all areas which are to be seeded and are 3:1 or flatter; areas that previously supported vehicular traffic shall be tilled to a depth of twelve (12) inches, till all remaining areas to a depth of four (4) inches. Slopes which are steeper than 3:1 shall be raked so that the top one-quarter ( $\frac{1}{4}$ ) inches of soil are loose and friable before seeding. Work the soil only when moisture conditions are suitable. Remove rocks and other objects two (2) inches or greater in any dimension.

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- C. Where required, apply soils conditioners immediately after fine grading.
- D. Spread fertilizer and other soil amendments, when necessary, over all areas to be seeded by broadcast or drill seeding methods. Mix amendments into the top two (2) inches of soil by use of a harrow or rake until a uniform mixture is obtained with no pockets of soil or amendments remaining.
- E. Correct irregularities in the ground surface resulting from soil preparation operations and slope to drain. Confirm that all work is returned to final grade, per construction plans, prior to seeding.

#### 3.4 Seeding.

- A. Seed all areas which have been disturbed as a result of construction operations.
- B. Seed all areas which are flatter than 3:1 with a mechanical power-drawn drill when possible. When access is not possible, broadcast seeding is allowable. All broadcast seeding must be raked in prior to mulching.
- C. Areas which are equal to or steeper than 3:1 shall:
  - 1. Include the use of erosion control blankets.
  - 2. Hydroseeding/mulching shall be used only in areas that are not accessible by other equipment/methods.
- D. Seeding shall occur immediately after soil preparation and prior to erosion control blanket installation.
- E. Do not seed during windy weather or when the ground is frozen, muddy or untillable.
- F. Seed at the rates specified in "PART 2 - MATERIALS."
- G. Drill seeding: Set depth bands to a depth of three and one-half inches (3 ½"). Set to space rows not more than seven inches (7") apart. Sow seeds of different sizes from at least two (2) separate hoppers adjusted to provide the proper coverage. The drill must have the capacity to handle fluffy seeds adequately.
- H. Broadcast seeding: Do not broadcast seed except in small areas which are not accessible by machine methods. Distribute seed as evenly as possible. Rake in or otherwise cover seed with soil to a depth of one eighth inch (1/8") to one quarter inch (1/4").
- I. Hydraulic seeding: Apply seed and fertilizer at the recommended rates. Perform hydraulic spray applications in such a manner that the liquid carrier will uniformly distribute the material over the entire area to be seeded at rates not less than indicated herein. Equipment used for hydraulic seeding must meet the following criteria:
  - 1. Equipment shall include a pump capable of being operated at one hundred (100) gallons per minute, at one hundred (100) psi.

2. Equipment shall have an acceptable gauge and a nozzle adaptable to hydraulic seeding requirements.
3. Storage tanks shall have a means of agitation and a means of estimation of the volume used or remaining in the tank.

3.5 Mulch Application.

- A. Mulch will be required for all seeded areas. Mulch should be applied immediately following seeding operations.
- B. Crimped Hay: Mulch areas with two (2) tons/acre grass hay or cereal grain straw. Spread uniformly by hand or mechanically. Immediately following application, stabilize mulch by means of crimping such that mulch is anchored at least two inches (2") into the soil.. Follow with application of tackifier.
- C. Hydromulch with tackifier: Mulch with hydromulch and tackifier. After seeding, apply mulch in a *separate* hydraulic spray application. Combine mulch with water to create a slurry and apply according to manufacturer's specifications at a minimum rate of two thousand (2,000) pounds/acre. Perform hydraulic application of mulch in such a manner that the liquid carrier will uniformly distribute the material over the entire seeded area at rates not less than described herein. Do not perform hydraulic spray applications during windy weather.

3.6 Erosion Control Blanket.

- A. After seeding, an approved erosion control blanket must be placed vertically on the slope. Bury upslope end in a narrow trench six inches (6") deep and tamp trench firmly closed. Adjacent rolls should have a four inch (4") overlap. Staple edges and centers at two foot (2') intervals. Slope shall be prepared to maximize contact with blanket. Correction of gaps and separation due to rocks or other debris will be required.
- B. All drainage swales shall be covered by erosion control blankets

3.7 Protection of Seeded Areas.

Protect seeded areas from unnecessary pedestrian or vehicular traffic until well established through the use of fences, barricades and signage. Provide any additional erosion control measures which are necessary for the successful establishment of vegetation.

3.8 Re-seeding and Repair.

Reseed and mulch areas where there is not a satisfactory stand of grass immediately following the CITY's evaluation. The CONTRACTOR, at his discretion, may repair any areas at any time prior to a CITY evaluation.

3.9 Maintenance and Acceptance.

Care for seeded areas, including weed control and watering until Final Acceptance by the CITY. Seeded areas shall monitored monthly and be evaluated after one (1) full growing season. Acceptance depends on evidence of a satisfactory stand of grass and weed control.

A satisfactory stand of grass is defined as where a minimum of seventy percent (70%) of a planted area has an evenly distributed grass cover and a minimum of three (3) to four (4) desirable plants per square foot with limited occurrence of State listed Noxious Weed species.

3.10 Roads and Soil Stockpiles.

All non-paved portions of road cut, fill, and parking lot areas should be seeded and mulched as soon as possible after final grading has occurred, but in no case later than fourteen (14) days after the grading has been completed.

If stockpiles are located within close proximity to a drainageway (i.e., 100 feet) additional sediment control measures, such as a temporary diversion dike or silt fence, shall be provided.

END OF SECTION