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BACK COVE ESTATES CONDOMINIUM ASSOCIATION
STREAMBANK STABILIZATION PROJECT
LOCATED BETWEEN EAST ROADWAY AND FALL BROOK
CONSTRUCTION PLAN

Submitted to:

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BACK COVE ESTATES CONDOMINIUM ASSOCIATION
STREAMBANK STABILIZATION PROJECT
CONSTRUCTION PLAN

This project site is located off Ocean Avenue in the City of Portland. This project involves stabilization and reconstruction of the stream bank slope located between Back Cove Estates Road and Fall Brook.

Upslope of the streambank stabilization area, surface water from the adjacent roadway (East Roadway) will be diverted through a diversion swale that will drain to a level lip spreader and then into a vegetated buffer before flowing to the brook.

Rootwad streambank stabilization techniques will be used. The rootwads themselves are trees with the rootball still attached. These are placed at the base of the restored river bank with the face of the roots facing the direction of the water flow. This technique strengthens the bank structure with the tree trunk portion incorporated into the bank. River water forces are deflected away from the bank by the root structure, limiting bank erosion. In addition, the roots provide fish habitat and habitat for other aquatic animals.

The techniques below are described in detail from the "USDA–NRCS Engineering Field Handbook, Chapter 16, Streambank and Shoreline Protection".

Rootwads will be incorporated into the bank structure as shown on plan S-1. This work will be done behind (landward side) the normal highwater mark (NHM). Starting at the downstream end of the reach, footer stones 3 to 4 feet in diameter or a footer log (18-24" diameter, 8'-10' long) will be placed. A second trench will be cut perpendicular to the first back into the streambank angling upstream. The rootwad will be placed in this trench so the trunk side of the root fan rests against the footer stones or footer logs and the bottom of the root fan faces into the flow of water. Stones will then be placed on the top and sides of the footer and rootwad to hold them in place. Moving upstream, the next footer log is placed in the trench with its downstream end extending behind the first footer log or stone and the next root wad is put in place. This process will continue until all rootwads have been installed.

As the rootwad structure is installed, the area between and behind the rootwads will be backfilled with rock/fill. The top of the rootwad structure will transition to a live staked slope. Rock sandwich of compacted 4" stone wrapped in geotextile fabric shall be placed at the top of embankment fill to intercept groundwater. Live stakes will be used through the rootwad and slope areas. Live-stake plantings are useful once the embankment is already in place and helps with drainage by removing soil moisture. The plantings also establish a root mat to trap fine soil particles that would erode without protection. The immediate protection that the live-stakes will provide will increase the effectiveness of the rootwad embankment. The embankment is designed for long-term stability and once it is fully vegetated it can be effective for many years.

CONSTRUCTION SEQUENCE TO RESTORE RIVERBANK

The following outlines the sequential order when construction activities will take place.

- ❑ Install temporary erosion control measures
- ❑ Install stabilized construction entrance / equipment operating pad (15' wide x 50' long)
- ❑ Construction will take place during low flow conditions and will take place behind normal high water.
- ❑ Install bank stabilization measures according to NRCS Engineering Field Handbook Chapter 16
- ❑ Place footer stones at the base of the bank
- ❑ Place tree rootwads at ≈60 degree angle to river flowlines
- ❑ Anchor rootwads with boulders
- ❑ Backfill with gravel
- ❑ Continue building rootwads on lifts (per plan)
- ❑ Rock sandwich of compacted 4" stone wrapped in geotextile fabric shall be placed at the top of embankment fill to intercept groundwater
- ❑ Grade and loam all disturbed areas above rock.
- ❑ Seeding of areas above rock with conservation mix.
- ❑ Plant live stakes
- ❑ Construct surface water diversion swale and level lip spreader (as shown on plan)

PLANTING METHODOLOGY

All species of woody plants to be used have been chosen for their attractiveness to native wildlife, and their abilities to stabilize disturbed areas. The species listed below all occur naturally within the region, and no exotic or potentially nuisance species will be used. Plantings will be done by hand to help assure their successful establishment. Plantings may need to be postponed until spring. Ideal planting times are early spring.

Species to be Planted as Live Stakes

A combination of the following species to be planted

Common Name	Scientific Name	Size
Black Willow	*Salix nigra*	Live stake
Silky Willow	*Salix sericea*	Live stake
Red Osier dogwood	*Cornus stolonifera*	Live stake
Silky Dogwood	*Cornus amomum*	Live stake
Speckled Alder	*Alnus incana*	Live stake

Seed mix shall be erosion control mix. If areas are to be seeded in fall and planted next spring, mix shall include larger percentage of rye to prevent competition with planted shrubs.

EROSION CONTROL PLAN

Disturbed areas during and after construction shall be stabilized to control soil erosion and sedimentation. Seeding, mulching, and silt fence will be the major controls to provide appropriate measures to manage possible sedimentation and erosion problems from this project. Thus, this plan includes a list of construction activities, as well as temporary and permanent erosion control measures.

Construction Phase -- Erosion & Sedimentation Measures:

In order to protect the soil and water resources within and surrounding the project area, only necessary areas to reconstruct and stabilize the compromised stream bank shall be disturbed. Any soil disturbance when the ground is frozen or saturated shall be minimized to the greatest extent possible.

The following actions are recommended:

1) Areas undergoing actual construction will be left in an untreated or unvegetated condition for a minimum amount of time.

2) Silt fence shall be utilized for construction activities in close proximity to Fall Brook. This is an additional erosion and sedimentation control measure to compliment mulching. Refer to the following section on temporary and permanent erosion/sedimentation control measures for silt fence specifications and installation details.

Permanent -- Erosion & Sedimentation Measures:

Upon completion of each and every phase of construction, all disturbed areas will be graded, smoothed, and prepared for seeding as follows:

1) Four (4) inches of loam will be spread over slopes and raked smooth.

2) Following seedbed preparation, 5lbs per 1000 sq. ft. of a conservation mix consisting of 35% creeping red fescue, 25% tall fescue, 15% annual rye, 12% perennial rye, 10% Kentucky bluegrass, 3% white clover will be broadcast.

3) Hay mulch will be applied to the new seeding to hasten germination and to protect the new seedbeds from erosion during the establishment period. Mulch application rate will be 2 tons per acre.

4) Seeding will be inspected after any significant rainfall and/or at least every thirty days to insure establishment. Any seeding failures will be immediately re-seeded using the above procedures.

TEMPORARY & PERMANANT EROSION / SEDIMENTATION CONTROL

Temporary and permanent erosion and sedimentation control measures are critical in protecting the integrity of water bodies. They detour rapid soil erosion and avoid sedimentation and pollution of these resources. Any measures undertaken to stabilize disturbed soil must be maintained to promote healthy and intact vegetated cover and/or structural integrity.

Erosion control measures will be in place prior to construction or any other soil disturbance, and the maintenance of these controls will be ongoing throughout the construction process. Erosion control measures will be inspected daily and repaired, as necessary. Any disturbed soil is temporarily stabilized at the end of each workday.

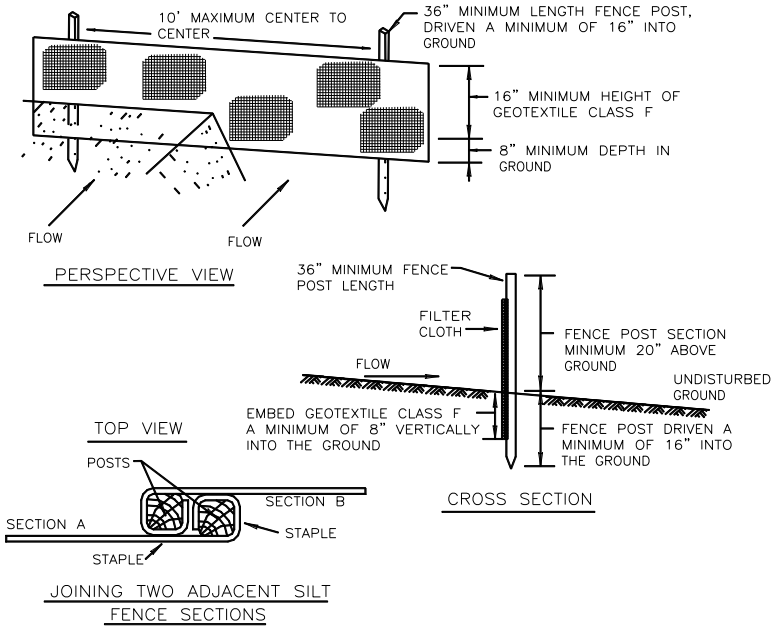
A. EROSION CONTROL PRACTICES / TEMPORARY MEASURES:

The following temporary measures to control erosion and sedimentation shall be used:

1. Each ground area, opened or exposed, whether directly or indirectly due to the project construction, shall be minimized and shall be stabilized within 15 days of initial disturbance of the mineral soil, and shall be permanently stabilized within 7 days of final grading.

2. Temporary soil stabilization shall be by temporary mulching.

SILT FENCE: This sediment barrier utilizes extra strength synthetic filter fabrics. It is designed for situations in which only sheet or overland flows are expected.



1. Prefabricated silt fence shall be used whenever possible to minimize installation labor requirements.

2. An 8-inch trench shall be dug along the silt fence alignment. The silt fence shall be unrolled and stretched tight while the posts are driven at least 16 inches below the ground surface.

3. Sections of silt fence shall be joined at a post by overlapping the fabric six inches and wrapping it around the post before the post is driven.

4. The trench shall be backfilled and the soil compacted over silt fence after the fence is erected.

5. The silt fence shall be inspected after every runoff event. Damage must be repaired immediately. Sediment and other debris must be removed from upstream side of fence when it accumulates to the extent that visible bulges develop in the silt fence.

6. Remove silt fences after vegetation or other permanent erosion control measures are installed and functioning.

SEQUENCE OF INSTALLATION:

Sediment barriers should be installed prior to any soil disturbance of the contributing drainage area above them.

MAINTENANCE:

1. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. They shall be inspected if there are any signs of erosion or sedimentation below them. Any required repairs shall be made immediately. If there are signs of undercutting at the center or the edges, or impounding of large volumes of water behind them, sediment barriers shall be replaced with a temporary check dam.

2. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier still is necessary, the fabric shall be replaced promptly.

3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

TEMPORARY MULCHING: *Mulch shall consist of chopped hay or straw mulch and spread by mechanical blower evenly at a rate of 100-150#/1000SF. Temporary mulch shall be removed prior to permanent soil stabilization. Mulch must not be placed over snow.*

B. EROSION CONTROL PRACTICES / PERMANENT MEASURES:

1. If excessively steep slopes exist, they shall be protected by erosion control excelsior blanket with biodegradable plastic or jute mesh after seeding.

2. Permanent seeding and planting shall be performed during construction operations as each disturbed area has been brought to finish grade. Seed, woody vegetation plantings, loam, and mulch are to be as follows:

   SEED *The seed mixture shall consist of seeds proportioned by weight. All seed shall be fresh, and clean. Harmless inert matter and weed seeds shall be permitted up to one percent of the gross weight of the seed mix used. All seed supplied shall be packed in approved containers bearing the manufacturer's name and analysis of contents.*

   LOAM *Loam shall be free of grasses and large stone. Place loam at six inches depth over all disturbed areas.*

   MULCH *Mulch shall consist of hay or straw mulch. Mulch shall be spread evenly at a rate of two and one half tons per acre over all seeding. After application, the mulch shall be thoroughly wetted. In steep areas the mulch shall be held in place by the use of jute erosion control netting.*

3. The contractor shall maintain the planted, seeded, and mulched areas until final acceptance of the work. Maintenance shall consist of providing protection against traffic and repairing any areas damaged due to wind, water, erosion, fire or other causes. Such damaged areas shall be repaired to re-establish the condition and grade of the soil prior to seeding then re-seeded and re-mulched.

MONITORING PLAN

The monitoring plan is an inspection and maintenance schedule for all erosion and sedimentation control measures. It ensures the erosion and control plan is properly followed, screens control measures' effectiveness, and provides a means to monitor expected environmental results. The project supervisor monitors erosion controls for the duration of the project.

EMERGENCY PROCEDURES

The weather is constantly monitored with reports throughout the construction period. If a storm is predicted, the project superintendent evaluates all erosion and sediment controls and employs any necessary materials and work force to make critical changes before the storm. Recently disturbed areas or newly created areas are stabilized in preparation of the storm. Monitoring all sediment controls before, during, and after the storm is critical. After the storm, all sediment controls and BMP's are inspected and permanent repairs made within 24 hours. In the event that

sediment controls or BMP's failed or are not effective during the next storm, repairs are made within 24 hours.

SLOPE STABILIZATION

Slope stabilization is monitored to protect against erosion. In the initial stages of stabilization, inspections are done after heavy rainfalls. These areas are also monitored for protection from excessive water flowing over the surface. During construction, mulching and seeding monitoring procedures are followed to ensure slopes are stabilized.

MULCHING

Mulch is monitored daily and before any rainstorms. If bare soil is exposed, mulch is applied. Periodic inspections are required if mulch is placed over seed to ensure the surface establishes vegetation. If mulch is used as a permanent erosion control, monitor its effectiveness periodically throughout the construction contract.

SILT FENCE

Silt fence is checked daily, before, during, and after any storm event. If sediment exceeds 33% of the height of the silt fence, that material is removed. Silt fence is removed once a permanent catch of grass is established on the side slopes.