









Ball Creek

Lake Oswego

(Tualatin River
watershed)



DEPARTMENT OF PLANNING AND DEVELOPMENT

BALL CREEK GREENSPACES RESTORATION PROJECT

Catherine Clark, Associate Planner
City of Lake Oswego
Metro Presentation Paper
December 7, 1992

PROJECT DESCRIPTION

Ball Creek is a small stream located in the far northwest corner of Lake Oswego -north of Kruse Way and east of I-5 within a developed subdivision (Figure 1). The creek is a tributary of the Tualatin River by way of Fanno Creek. The project consisted of planting native trees and shrubs along the creek and around a small wetland. The project area was on the upper reach of Ball Creek - between Deerfield Court and Twin Creek Court (Figure 2).

This part of town was a farm field before it was subdivided in the 1980's, so this part of the creek did not have trees around it. The creek was relocated when the site developed, resulting in steep, eroded sides and siltation in the wetland. The project funds were used to remove blackberries, clear tall grasses to make way for plants, and for planting stream-friendly trees and shrubs that could survive in open areas.

WORK TASKS AND TIME-LINES

Work tasks for the Ball Creek Project included:

- Developing a planting plan and plant list
- Producing a bid document and selecting a contractor
- Creating posters and other publicity
- Arranging for "weed-whacking" and install drip irrigation
- Unloading plants and staking locations
- Arranging for drop box for yard debris & delivery of compost
- Participating and overseeing two planting events

The in-house planning work for the project began in late March, 1992. Plant bid lists were sent out in early June, and the two planting events were on June 13 and June 27. The project was begun and completed within three months, not including billing and documentation submitted after the planting events.

PROJECT BUDGET

The Ball Creek Restoration Project was given a \$7,500 matching grant by Metro. The original request had been for \$27,000 so the scope of work and the project area had to be downsized considerably. Direct City Outlays for the project came to a total of \$7,549.39 for personnel, materials, plants and supplies, and equipment rental. This was matched by staffing costs in the Engineering and Planning Departments, and with volunteer labor from the Lake Oswego Land Trust in the amount of \$5,739.04. The local match was 76% of the reimbursement request, which exceeded the 50% minimum local match required.

PROJECT STAFF/WORKERS/VOLUNTEERS

Project staff consisted of an associate planner, a senior planner, an engineering technician and the manager of the Lake Oswego Surface Water Utility. The City's Maintenance Services manager also provided ancillary advice during the planning stage, and directed his workers to clear high grass and lay drip irrigation prior to planting. The Lake Oswego Land Trust (co-applicant on the grant) assisted with publicity and mailings, and with contacts in the neighborhood. In addition, the Natural Resources Commission provided advice in preparing and presenting the grant application, and provided two "team leaders" for the planting event.

Volunteers came primarily from the immediate neighborhood, with several contributing from the Lake Oswego Land Trust. On the first planting event date, there were 34 volunteers, and 13 at the second event, including many children. The Surface Water Utility also donated the time of several of their employees to help unload over 200 plants, haul compost, and dig.

BENEFITS OF THE PROJECT

The plantings installed for the project provided direct benefit to Ball Creek and the Twin Creek Wetland by establishing a treed corridor with riparian understory along its banks. The shade and improved diversity of vegetation will provide wildlife food and habitat, and will help to control erosion. The planting event offered neighbors an opportunity to meet each other and to begin talking about developing a uniform management plan for the creek. The planting events were well publicized, and inspired several other neighborhood representatives to call the city to see if similar projects could be done for them.

RELATIONSHIP TO THE GREENSPACES PROGRAM

As previously mentioned, Ball Creek is a tributary of Fanno Creek, which is of regional significance on the Metropolitan Greenspaces Map. An educational display board on the project was used to show the City Council the benefits of the project, and was later shown in the library as an example of a greenspaces project.

WHAT WORKED/WHAT DIDN'T/HELPFUL HINTS

Since the two planting events were held in the summer during a severe drought, the temporary drip irrigation was a life-saver that enabled the survival of more than 90% of the plants. The addition of compost to the planting holes and as a top dressing also worked to deter evaporation and keep down weeds as well.

One thing that we had proposed to do with the grant funds was to install some rock check dams and erosion control netting within the stream corridor. Unfortunately, we did not apply to the Division of State Lands to do work within a stream in a timely fashion, and had to skip that work item entirely.

ADVICE FOR OTHER PROJECT MANAGERS

- Allow yourself several months of pre-planning time if possible. If you have a joint grant with a land trust or other non-profit, this allows them to participate more meaningfully to build idea of stewardship.
- If you need permits from State agencies, give yourself plenty of lead time to apply.
- Make sure everyone on your in-house staff uses the same work order number from Day One, and ask participants to keep copies of their timesheets for you - you'll need them.
- Remember to use Slide Film for your before/during/after pictures. It's expensive to recreate slides from print negatives.
- Keep a copy of every receipt and purchase order issued or you'll have to dredge them up later for your documentation.
- Temporary drip irrigation with wide compost circles for each plant is highly recommended even if you don't plant in the dry season. If planting during summer, make sure people bring pick axes, post hole diggers, and buckets for softening the ground with water if ground is hard or rocky.

OTHER

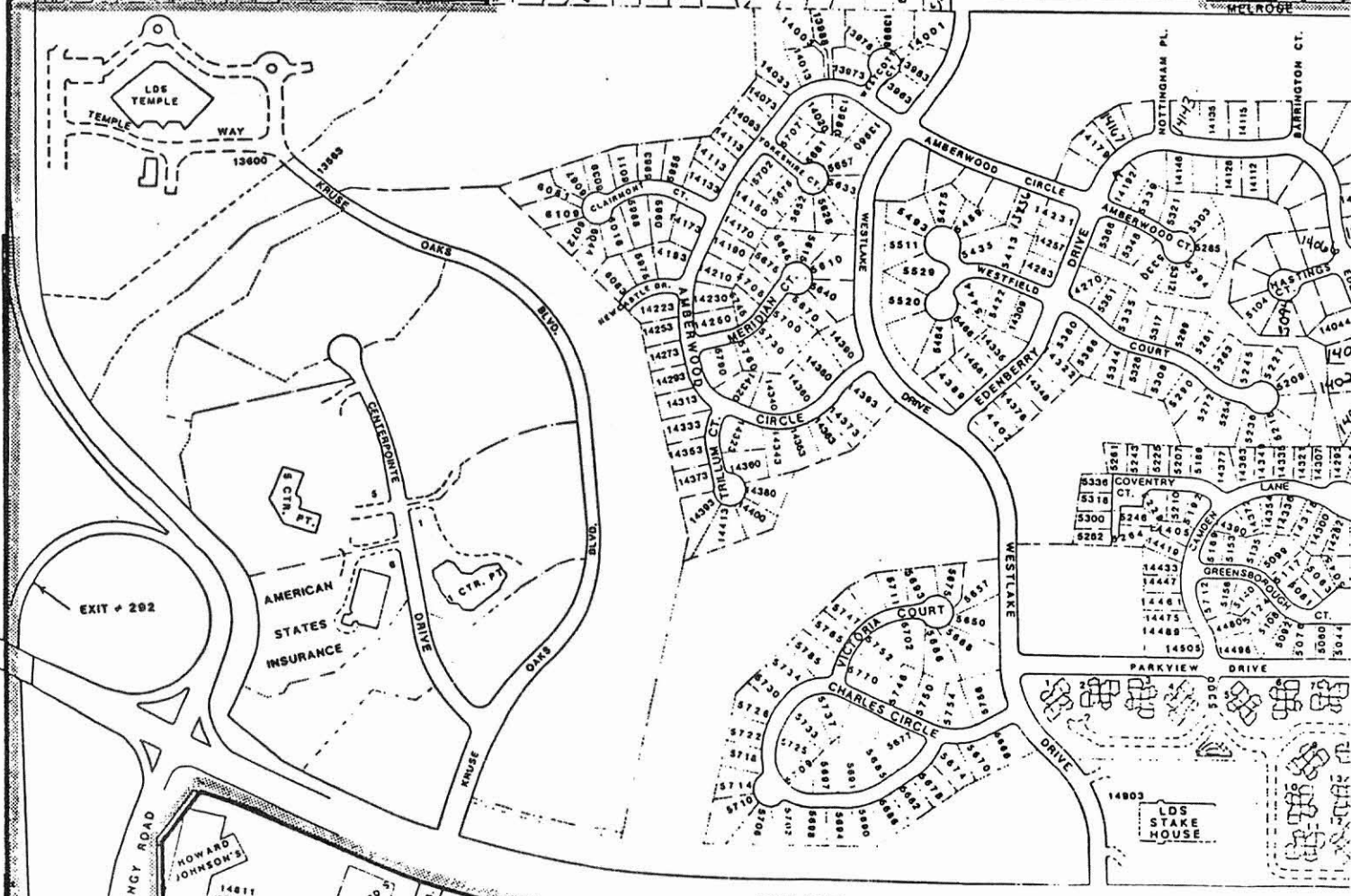
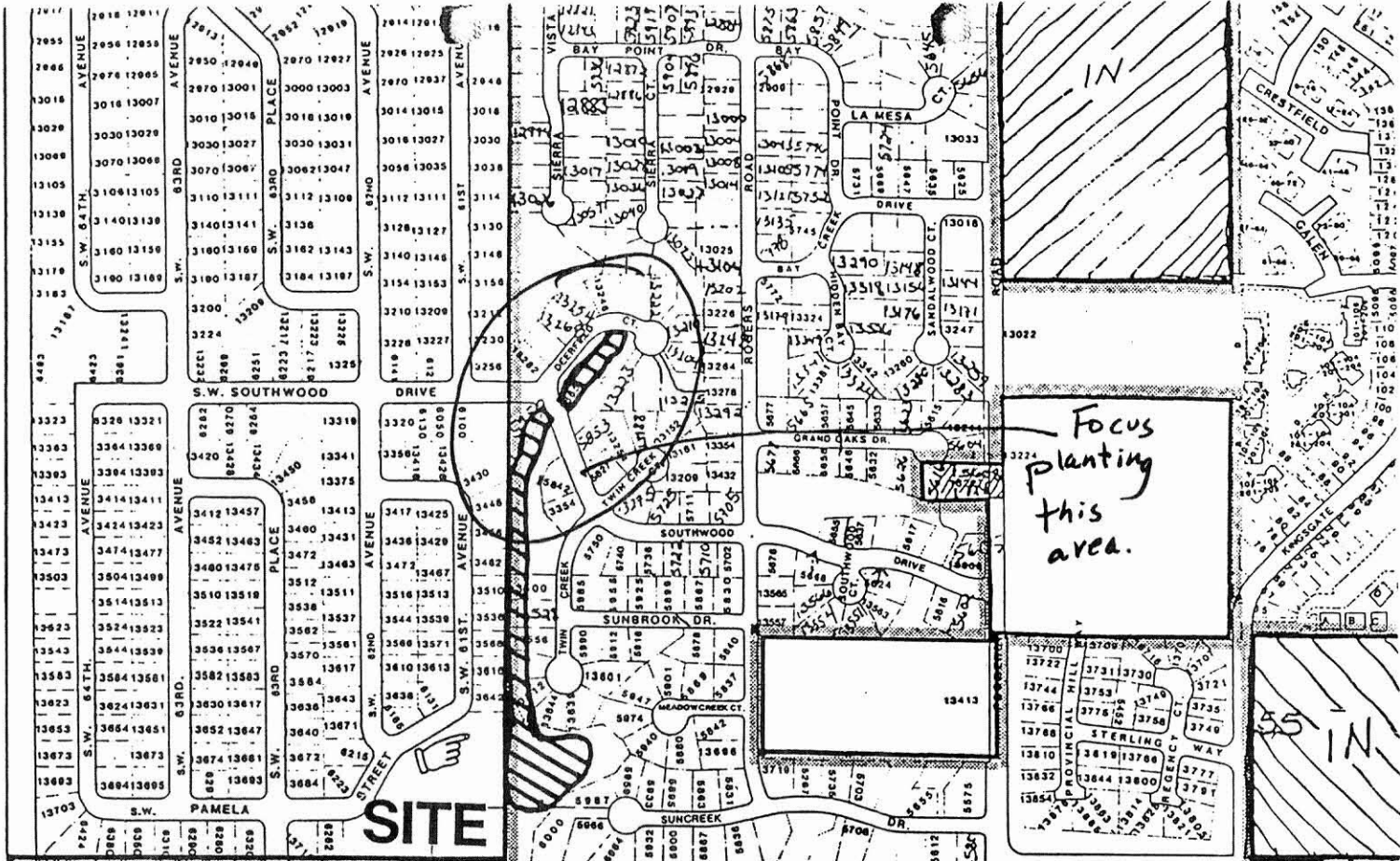
We had quite a bit of trouble with our legal department and then-city manager in getting City sign-off for the legal agreement. I would suggest to Metro that the drug program requirement and requirements that your jurisdiction follow other jurisdiction's bidding procedures be deleted if possible from future agreements. Also, please give grant recipients written confirmation as soon as possible to reduce unneeded project delays.

Overall, we enjoyed putting on the restoration event and the neighbors liked it as well. Maureen Smith from Fish & Wildlife was especially helpful - it's nice to have such thoughtful and helpful oversight. Kudos also to Mel Huie for juggling all those balls at once, and for Pat Lee for coming to our Council to present the giant check. We're looking forward to the second grant on this project for lower Ball Creek.

Figures:

1. Project Location Map
2. Project Site Map

metrobal.rpt



VICINITY

EXHIBIT

210-Byrdway, N. J.

1

BALL CREEK RESTORATION PLANTING II

SATURDAY, JUNE 27, 1992

9:00 a.m. to 12:00 noon



380 "A" AVENUE
POST OFFICE BOX 369
LAKE OSWEGO,
OREGON 97034
(503) 635-0213
FAX (503) 635-0269

Friends and neighbors of Ball Creek are invited to a second planting and blackberry whacking day on the morning of Saturday, June 27, 1992. Please dress appropriately and bring your pick-axes, shovels, wheelbarrows, buckets, and pruning shears. Also, don't forget to bring the kids - they'll have a lot of fun bringing buckets of water from the creek to water the new trees, and can help shovel on compost, too. Refreshments will be provided.

-sponsored by the City of Lake Oswego & the Lake Oswego Land Trust-

To: Friends and Neighbors of Ball Creek

ALICE L. SCHLENKER,
MAYOR

Please join us for a second planting and blackberry whacking day on Ball Creek to finish planting trees and plants left from our first gathering. We also need to spread a few piles of compost. Thanks to the efforts of people like you, the upper reach of the creek on Deerfield Court looks great! Now, we would like to put similar efforts onto the lower reach, between Southwood Drive and the little wetland off of Sun Creek Drive.

CHARLES C. (MIKE) ANDERSON,
COUNCILOR

DANIEL E. ANDERSON,
COUNCILOR

The purpose of the planting/weeding project is to help restore Ball Creek to a natural state - with tall, shady trees and a diversity of native shrubs that will attract wildlife. The new plants will also help stabilize the banks from erosion, which causes sedimentation in the creek and the wetland that degrades the water quality.

HEATHER CHRISMAN,
COUNCILOR

WILLIAM HOLSTEIN,
COUNCILOR

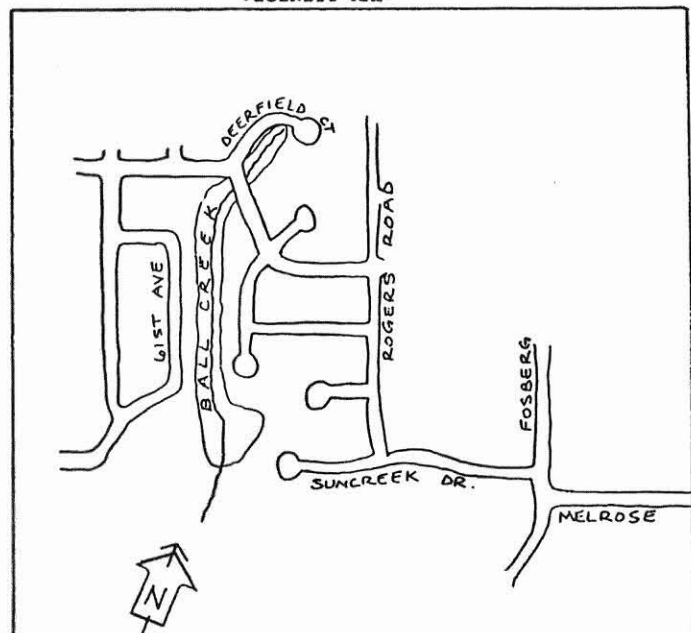
Your assistance is needed to help manage this public open space area. The City and the Land Trust would like to work with the neighbors on a specific stewardship plan for the creek this fall. Please share your ideas with us at the planting, and we will try to follow-up with a neighborhood meeting at a later time. For more information, call Catherine Clark, Associate Planner at 635-0293.

ED MARCOTTE,
COUNCILOR

Funding provided by the Metropolitan Greenspaces Program and the U.S. Dept. of Fish and Wildlife, and the Lake Oswego Surface Water Management Utility.

MARY PUSKAS,
COUNCILOR

VICINITY MAP



- B. Proclamation of November 7, 1992 as "Vietnam Veterans Day"
- C. Recognition of Ron Bessflug for receipt of "Building Official of the Year" award by the Oregon Building Officials Association.
- D. Presentation of a \$7,500 check for restoration of Ball Creek by Mel Huie, Metro

V. ITEMS REMOVED FROM THE CONSENT AGENDA

VI. CITIZEN COMMENT

The purpose of citizen comment is to allow citizens to present information or raise an issue regarding items not on the agenda. A time limit of five minutes per citizen shall apply. The Council may accept the information, answer the question if simple, or refer the matter to the appropriate City Department for review and response. If the matter is referred, the Council may direct the Department to respond in writing to the citizen or to present the response to the Council in the form of a Council report. In the latter case, the citizen shall be notified of the date on which the report will come before the Council. Citizen comment shall not exceed thirty (30) minutes unless the Council votes to suspend the rules.

VII. BUSINESS FROM THE COUNCIL

This agenda item provides an opportunity for Councilors to bring any item before the Council for consideration. Each Councilor will be given five minutes.

VIII. DEPARTMENT REPORTS

- A. HR 4-92, Recommendation to Clackamas County on the historic designation of the Luscher Farm at 991 Rosemont Road.
- B. Report of the Employee Opportunities Task Force.....

IX. ORDINANCES

First Reading by Title Only

- A. Ordinance 2070, a general ordinance of the City of Lake Oswego amending LOC Chapter 34 (Morals and Conduct) relating to solid waste collection receptacle display.

DRAFT MASTER PLANT LIST

PLANT MATERIAL COMMON NAME

TREES AND SHRUBS

Alnus ruba	Red Alder
Amelanchier alnifolia	Serviceberry
Cornus stolonifera	Red-osier Dogwood
Mahonia nervosa	Oregon Grape (creeping)
Mahonia repens	Oregon Grape (long leaf)
Rosa nutkana	Nootka Rose
Sambucus cerulea	Blue Elderberry
Symphoricarpos albus	Snowberry
Vaccinium ovatum	Evergreen Huckleberry

GRASSES AND HERBACEOUS PERENNIALS

Beckmannia syzigachne	Slough grass
Deschampsia cespitosa	Tufted hair grass
Fescuta ruba	Red fescue
Elymus glaucus	Blue wild rye
Blechnum spicant	Deer fern
Polystichum monitum	Sword fern

PLANT COMMUNITY ZONES

A. Disturbed site ground cover.

A re-green mixture of grasses and live tree seed may be used in this ground layer community. In most cases this cover crop will be planted over with trees and shrubs from the master plant list. Where there is appropriate sunlight exposure and ground conditions, a live alder seed will be planted with the grass seed mix as stated in the treatment specs for zones 1 and 2. Applied plant species in this community include:

Alnus ruba	Red Alder (live seed)
Beckmannia syzigachne	Slough grass
Deschampsia cespitosa	Tufted hair grass
Fescuta ruba	Red fescue
Elymus glaucus	Blue wild rye

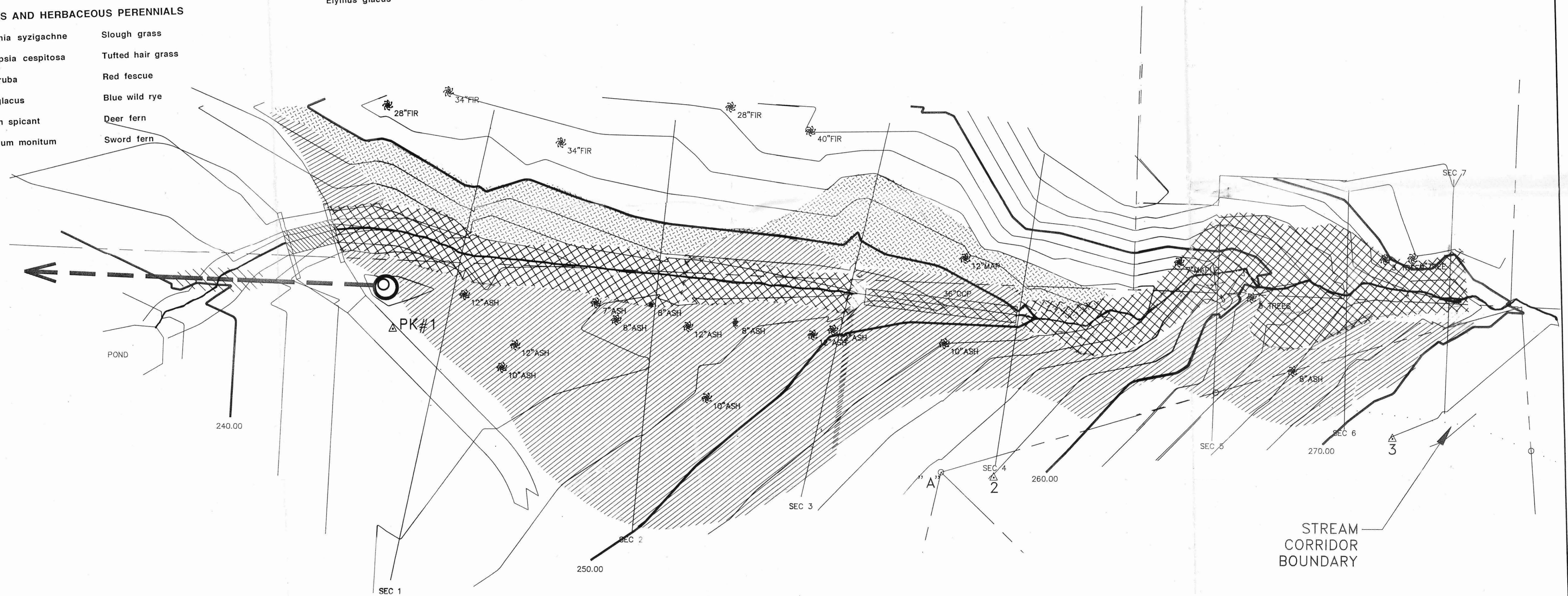
B. Riparian woodland and scrub.

This community can be accommodated, in part, over the entire site where the appropriate sunlight and ground conditions allow. Generally, these species can be planted over the biodegradable geotextile fabric. Plants in this community include:

Alnus ruba	Red Alder
Amelanchier alnifolia	Serviceberry
Cornus stolonifera	Red-osier Dogwood
Rosa nutkana	Nootka Rose
Sambucus cerulea	Blue Elderberry
Symphoricarpos albus	Snowberry

C. In lower light conditions, and on steeper slopes associated with the larger fir species existing on the site, this community can be planted as sunlight availability and ground conditions permit. Plants in this community include:

Blechnum spicant	Deer fern
Mahonia nervosa	Oregon Grape (creeping)
Mahonia repens	Oregon Grape (long leaf)
Polystichum monitum	Sword fern
Vaccinium ovatum	Evergreen Huckleberry



SCALE 1" = 10'
0 20 60 80

Ball Creek Stream Restoration project: Draft Revegetation / Treatment Plan

INTER-FLUVE, INC.
FISHERIES HYDROLOGY RESOURCE ENHANCEMENT



PAGE 1 OF 4
1020 Wasco Street, Suite 1
Hood River, Oregon 97031
(503) 386-9003

APPROVED BY: _____

DATE: _____



LAKE OSWEGO, OREGON

CITY OF LAKE OSWEGO
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
JERRY R. BAKER, P.E. CITY ENGINEER

7. WHAT WORKED/WHAT DIDN'T WORK/HELPFUL HINTS TO OTHERS

Worked...

- a) good developmnet of intra personal reactions
- b) cutting of black berries with machettes, long handled lopping shears
- c) spraying follage with Crossbow (not recommended for wetlands by USFWS) . Killed follage quickly, but not roots. Second application would have cone it. Used successfully a hand carried, low pressure, coarse spray.

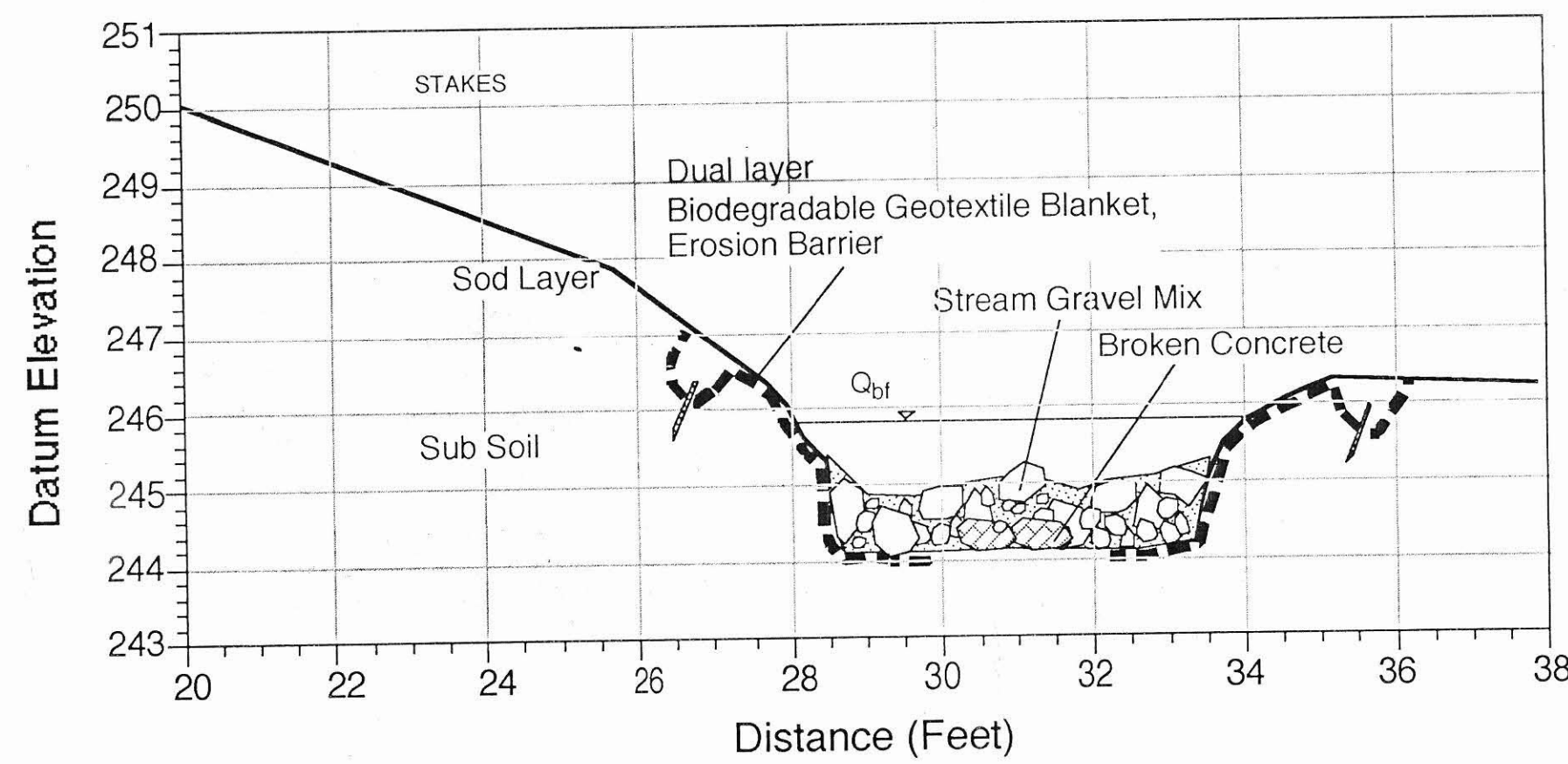
Didn't work...

- a) wheel borrows with inflated tires, punctured by throns
- b) some of the students at risk
- c) plantings and drought combination
- d) planting before black berries dug out- very difficult to remove later in and around the plantings
- e) spraying with Rodeo plus fertilizer in the fall; spraying cut stems with undiluted Rodeo (?) Will have to wait until spring '92 to see if it worked (?). Crossbow did not kill roots.
- f) ordering plants for late winter delivery with a mild winter. They came.. some in blossom and many leafed out (bare root)
- g) used too short of marking stakes. 2 footers not tall enough. new growth hides them. Also the color coded stakes were often removed and thrown in creek. Plants were trashed by persons using the stakes.
- h) Wapato (arrow leaf), wild rice, cattails won't grow in partial shade.

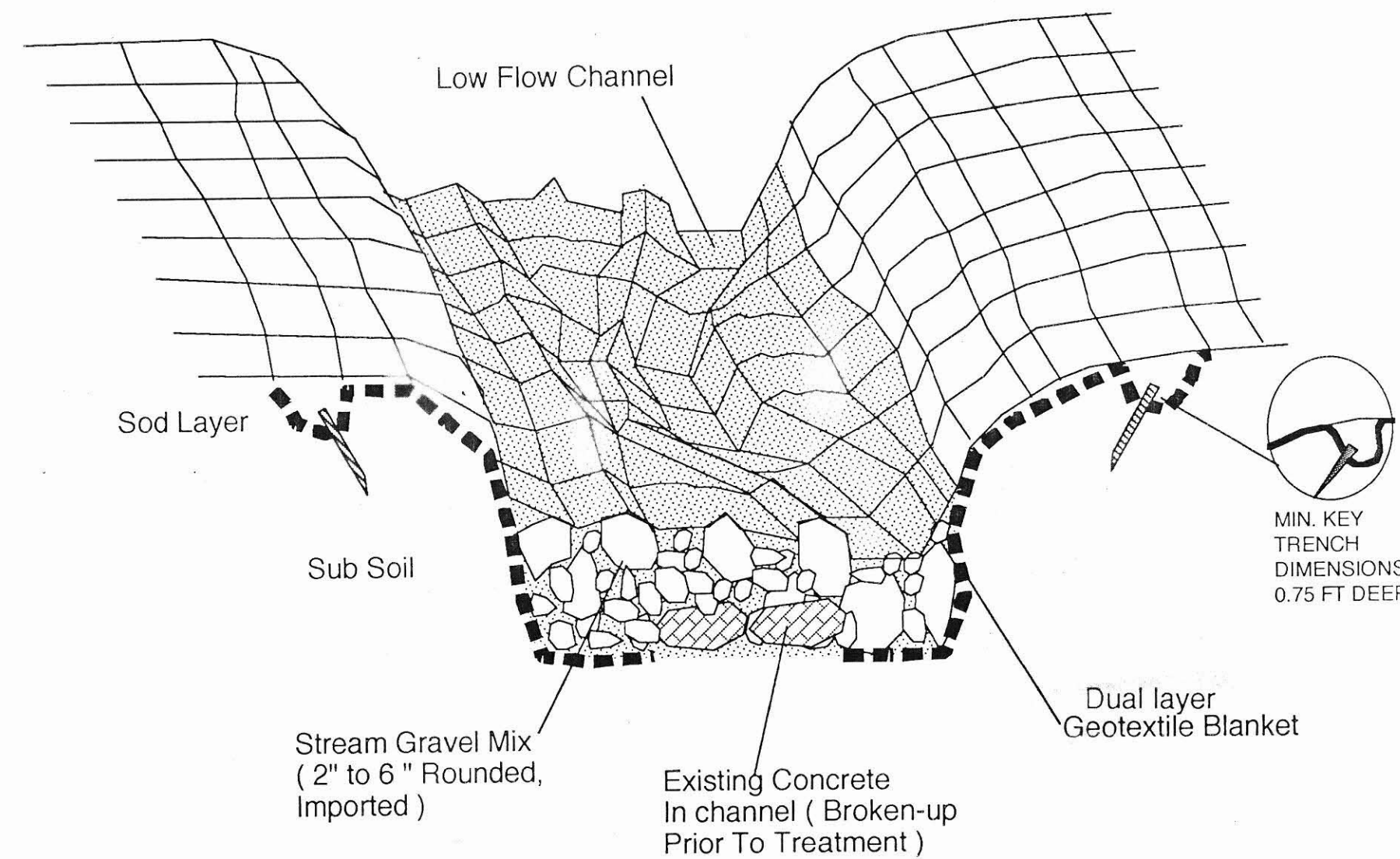
Hints.....

- a) REMOVE BLACK BERRY PLANTS AND ROOTS BEFORE PLANTING
- b) stake, color code, every plank with at least 3 feet of stake above ground. Then when other vegetation grows up, you can find your plantings.
- c) ALWAYS plant plants in same pattern in relation to stake. i.e. creek side of the stake
- d) set photo-sites first. Record compass bearings for photo's at each site. Have prints and slides made. Keep a video record. (This will mean having a photo person around often. Proj. director can't work, direct, and make photo record too.)
- e) Put into grant request administrative costs, own labor costs, cost of time to leave regular job, and concentrate of project job. (As a teacher, I found it next to impossible to plan, administer, and direct the work of the students and volunteers. Personel in the School District offered to do part of it, but had trouble following through.)
- f) meet with grounds people. walk them around the site. show them stakes and plantings. EXPLAIN so they don't lawn mow them out when they get in a hurry.

Treatment Type 2 Typical X-Section



Treatment Type 2 Typical Isometric



OUTER FABRIC SPECIFICATIONS

MATERIALS:
BonTerra® CF9 high strength geotextile mat or equivalent.

COMPOSITION:
100% high strength coir (coconut) fiber

PHYSICAL PROPERTIES:

Thickness:	ASTM D1777	0.30 in.
Flexibility:	ASTM D1388	89270 x 39360 mg.-cm.
Tensile Strength		
Yarn		
Wet:	ASTM D4595	49 lb./ft.
Dry:	ASTM D4595	55 lb./ft.
Fabric (dry):	ASTM D4595	1648 x 670 lb./ft.
Elongation		
Yarn		
Wet:	ASTM D4595	35%
Dry:	ASTM D4595	29%
Fabric (dry):	ASTM D4595	42% x 32%
Weight:	ASTM D3776	26 oz./SY
Water Velocity:	Observed	16 ft./sec.
Open Area:	Measured	39%
Roll Length:	Measured	165 ft.
Roll Width:	Measured	13.1 ft.

INNER FABRIC SPECIFICATIONS

MATERIALS:
BonTerra® C2 erosion control geotextile mat or equivalent.

COMPOSITION:

Fill: 100% coconut fiber

Netting: Both sides; heavyweight, UVI treated polypropylene, approximately 3 lb./1,000 SF.

Thread: UVI-treated polypropylene, black, minimum 1,000 denier.

PHYSICAL PROPERTIES:

Thickness:	ASTM D1777	0.25 in.
Flexibility:	ASTM D1388	6260 x 16790 mg.-cm.
Tensile Strength:	ASTM D4595	230 x 138 lb./ft.
Elongation:	ASTM D4595	32% x 22%
Weight:	ASTM D3776	9.6 oz./SY
Water Velocity:	Observed	16 ft./sec.
Open Area:	Measured	39%
Roll Length:	Measured	90 ft.
Roll Width:	Measured	7.5 ft.

DRAFT GENERAL NOTES ON CONSTRUCTION TREATMENT 2

- Where possible, treatment 2 banks shall be sloped from stream bed elevation back to a stable angle of repose. This angle may vary from 2.5 to 1 to 4 to 1 depending on the site conditions encountered. In some instances where mature trees are hindering the sloping of the banks the angle may exceed 2.5 to 1.
- In some treatment 2 sections, it will be required to break up or entirely remove an existing concrete channel liner before proceeding with any bank stabilization measures.
- Once banks have been sloped and in some case, the concrete liner has been broken up or removed, a dual layer of biodegradable geotextile fabric shall be placed as depicted in Isometric and X-section of treatment 2. The toe of this dual fabric layer shall be placed at the subgrade level of the channel and extend as far as possible across the channel. In some cases it may be possible to span the entire width of the channel and sloped banks a single fabric section.
- Follow planting and fabric stapling instructions.
- The rough grade of the channel and bank area shall be finished with the imported stream gravel and cobble. This material shall be placed on top of the dual fabric layer.
- The stream gravel and cobble shall be placed in such a manner that will allow for in-channel sinuosity, low elevation bar formation, and formation of thalweg. (refer to isometric depiction of treatment 2).

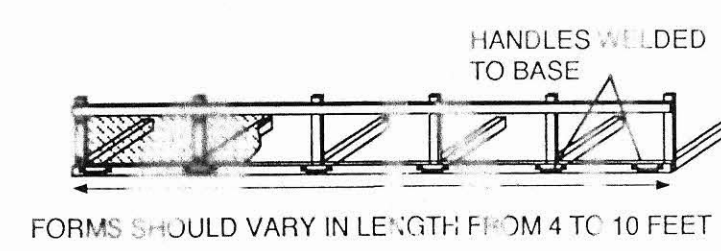
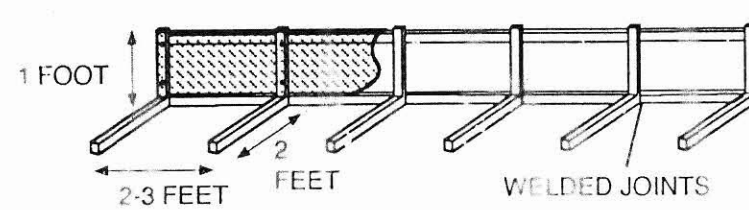
DRAFT GENERAL NOTES ON PLANTING TREATMENT 2

- As in treatment 1, much of the same planting details can apply to treatment 2. To facilitate planting, 3 zones have been identified relative to the normal water surface elevation. The 3 planting zones are defined as follows:
 - Zone 1 is located from 0 to 2 vertical feet above normal water surface elevation.
 - Zone 2 is located from approximately 2 vertical feet above normal water surface elevation to the top of the streambank, or 5 vertical feet above normal water surface elevation, whichever is less.
 - Zone 3 is located above the point from the top of the streambank, or vertical 5 feet above normal water surface elevation, whichever is less.
- The planting density within the 1st and 2nd Zones should be doubled on the outside of bends with an angle of more than 45°, and should extend upstream and downstream of the bend apex.
- Shrub cuttings will be placed through geotextile fabric and gravel backfill during construction. Vegetative plugs will be placed within the backfill prior to the final organic geotextile wrap layer. In this way, the integrity of the fabric will not be compromised by the planting method. Shrub and tree bare root stock will be planted after the geotextile fabric is installed.
- In addition to plug plantings, grass and forb stock will be planted by seed. The seed mix should be incorporated into the bank stability treatments during construction along with the appropriate re-green mixture at no less than 120 live seed per square foot.
- Grasses and forbs and in some cases alder seed, where ground disturbance is evident, should be planted at a total combined rate of 30 pounds pure live seed per acre. Grasses should be planted at a combined rate of 20 pounds per acre (0.46 pounds per 1,000 square feet). If hand broadcast, a minimum of 120 live seed per square foot shall be planted. Forbs should be planted at a combined rate of 10 pounds per acre (0.23 pounds per 1,000 square feet). For both grasses and forbs, the percent composition should be divided among species depending on the available sunlight and ground conditions.
- Shrub cuttings should be a minimum of 3 feet long and a maximum of 5 feet. They should be 1/2 to 1 inch in diameter. Cuttings should extend no less than 6 inches from the face of the backfill and no more than 12 inches, and placed so that the growth direction is oriented toward the center of the stream and angled 45° downstream. Cuttings also should be placed at intervals less than 0.5 feet.
- Trees and shrubs should be planted as bare root stock. The planting densities depend on the planting zone, available sunlight and ground conditions: for shrubs, plant on 1, 2 and 3 foot centers in Zones 1, 2 and 3, respectively; for trees, plant on 1, 4 and 6 foot centers in Zones 1, 2 and 3, respectively.



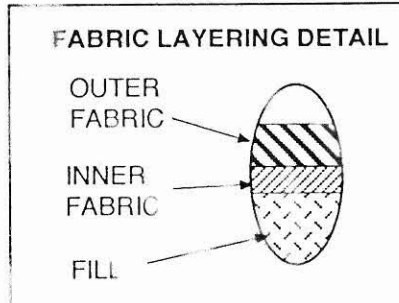
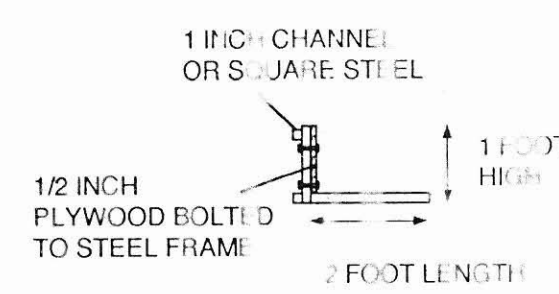
REVETMENT CONSTRUCTION FORM

ISOMETRIC



FILL TYPE	
	TOPSOIL MIX
	BACKFILL MIX
	GRAVEL MIX

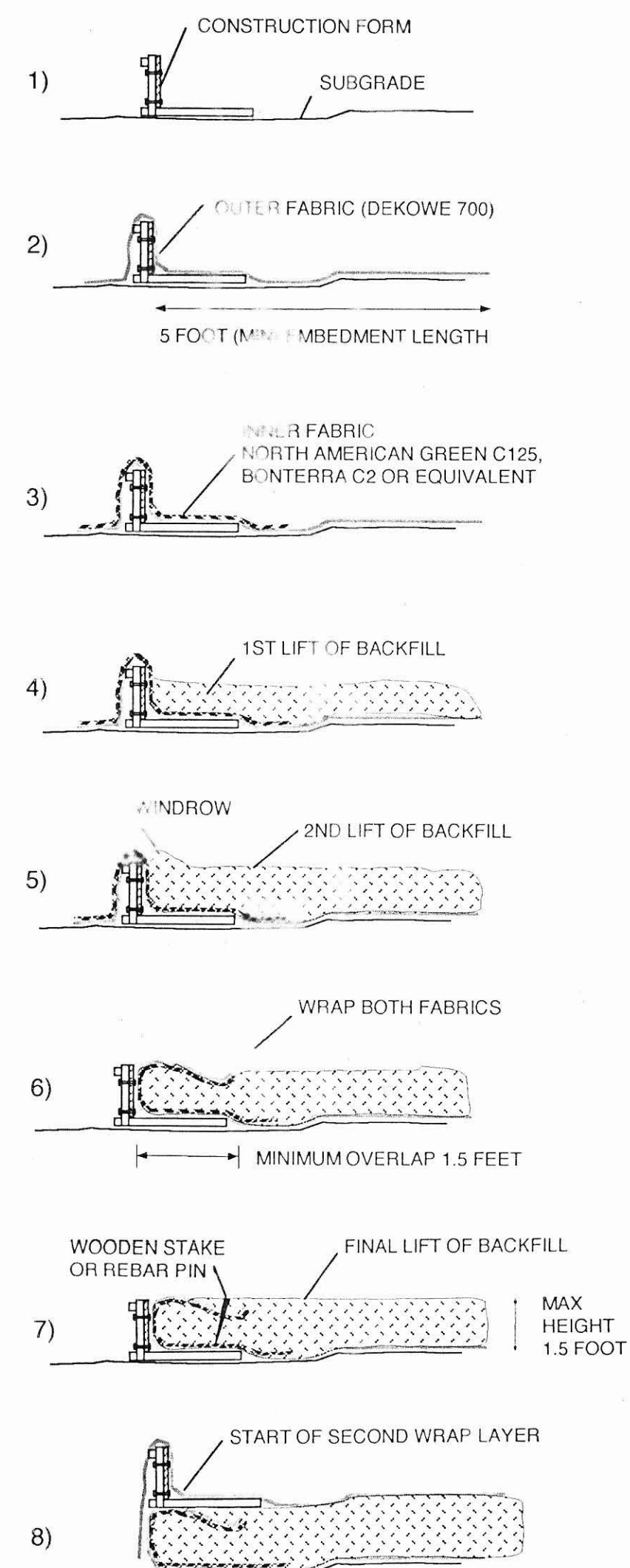
SECTION



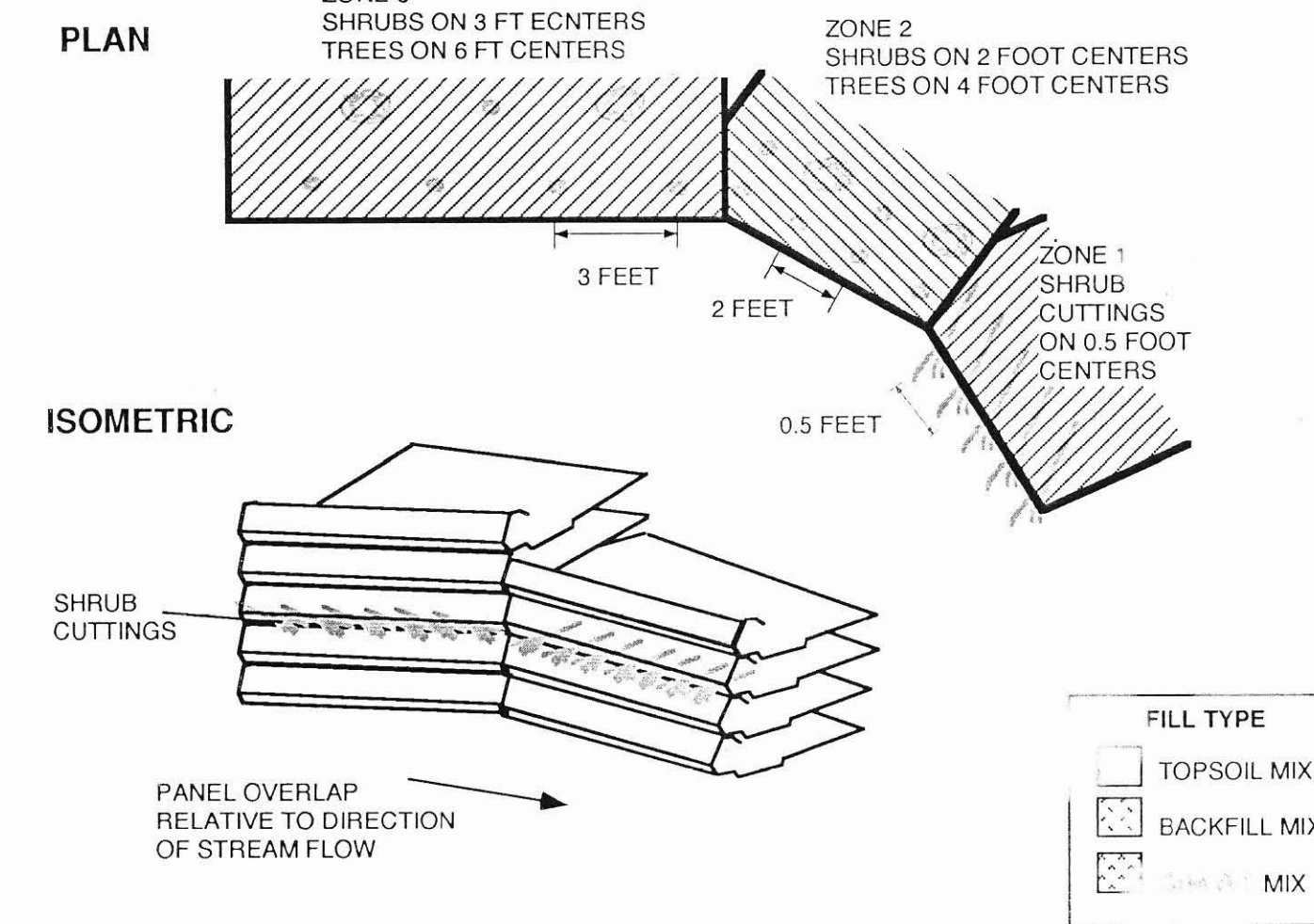
GENERAL NOTES ON INSTALLATION OF GEOTEXTILE REVETMENT

- 1) A form slightly higher than the wrap layer height is placed on the ground surface. The form is constructed out of lengths of square iron pipe welded at 90 degree angles off of a rectangular frame of similar material. A piece of 1/2 inch plywood is attached to the frame with bolts or equivalent. A 90 degree angle should be attached to the plywood every 2 to 3 feet or as needed. Several forms from 4 to 10 feet in length should be constructed in order to cope with the varying stream bank angles.
- 2) The outer fabric is unrolled and positioned so that 5 feet extends as an embedment length. An appropriate amount of fabric should remain folded over the top of the form hanging loose.
- 3) The inner fabric is unrolled and positioned so that about 2 to 3 feet extends as an embedment length. An appropriate amount of fabric should remain folded over the top of the form hanging loose with the first fabric layer.
- 4) Fill is placed on the fabric. Refer to specifications for material type. The backfill is leveled to approximately 1/2 of its lift height and compacted to a 90% compaction rate, or as specified.
- 5) A windrow is placed to extend about 1 foot from the form.
- 6) The loose ends of both fabrics are folded over the fill windrow and staked as per specifications.
- 7) The remaining fill material is placed and compacted to a 90% compaction rate, or as specified. A shallow key trench should be left for the next layer when placing multiple lifts.
- 8) The wooden form is removed from the front of the completed wrap and reset to repeat steps 1 through 7.

CONSTRUCTION SEQUENCE



PLANTING DETAILS



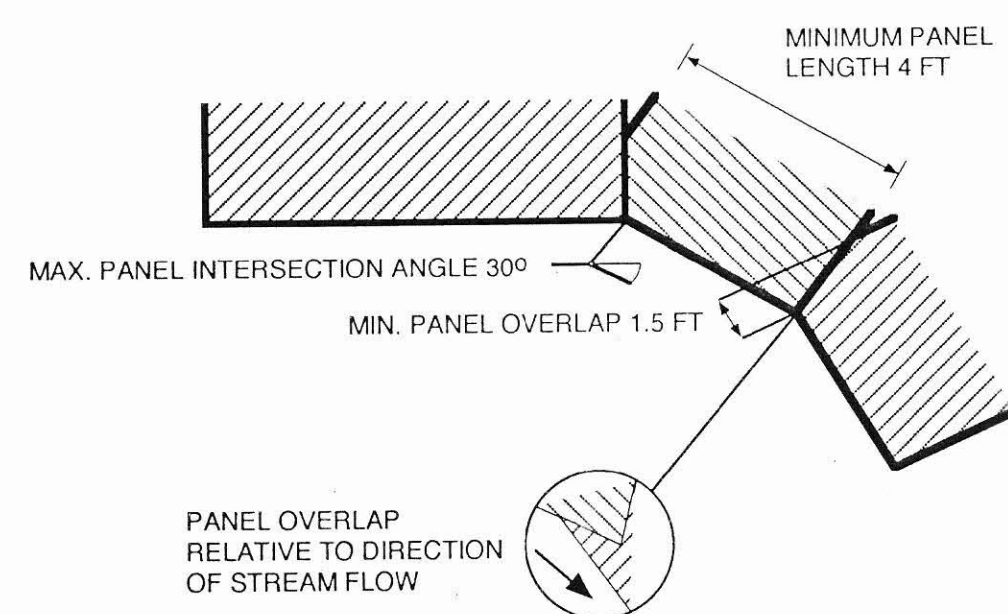
FILL TYPE	
	TOPSOIL MIX
	BACKFILL MIX
	GRAVEL MIX

GENERAL NOTES ON PLANTING:

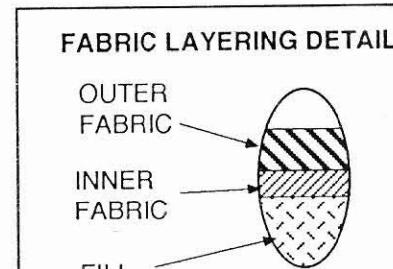
- 1) Use appropriate grass, forb, shrub and tree species suited to local climatic conditions, proximity to stream channels and capable of producing dense root systems at maturity.
- 2) To facilitate planting, 3 zones have been identified relative to the normal water surface elevation. The 3 planting zones are defined as follows:
 - Zone 1 is located from 0 to 2 vertical feet above normal water surface elevation.
 - Zone 2 is located from approximately 2 vertical feet above normal water surface elevation to the top of the streambank, or 5 vertical feet above normal water surface elevation, whichever is less.
 - Zone 3 is located above the point from the top of the streambank, or vertical 5 feet above normal water surface elevation, whichever is less.
- 3) The planting density within the 1st and 2nd Zones should be doubled on the outside of bends with an angle of more than 45°, and should extend upstream and downstream of the bend apex.
- 4) Shrub cuttings will be placed between wrap layers as revetment walls are being constructed. Shrub and tree bare root stock will be planted in fabric retaining walls after the walls are constructed. Forbs should be planted at a combined rate of 10 pounds per acre (0.23 pounds per 1,000 square feet). For both grasses and forbs, the percent composition should be divided among species.
- 5) All grass and forb stock will be planted by seed so they can be incorporated into the bank stability treatments during construction.
- 6) Grasses and forbs should be planted at a total combined rate of 30 pounds pure live seed per acre. Grasses should be planted at a combined rate of 20 pounds per acre (0.46 pounds per 1,000 square feet). Forbs should be planted at a combined rate of 10 pounds per acre (0.23 pounds per 1,000 square feet).
- 7) Shrub cuttings (rather than bare root stock) should be planted between layers. Cuttings should be a minimum of 3 feet long and a maximum of 5 feet. They should be 1/2 to 1 inch in diameter. Cuttings should extend no less than 6 inches from the face of the retaining wall and no more than 12 inches, and placed so that the growth direction is oriented toward the center of the stream and angled 45° downstream. Cuttings also should be placed at intervals less than 0.5 feet.
- 8) Trees and shrubs should be planted as bare root stock on non-vertical revetment walls and flat slopes. The planting densities depend on the planting zone: for shrubs, plant on 1, 2 and 3 foot centers in Zones 1, 2 and 3, respectively; for trees, plant on 1, 4 and 6 foot centers in Zones 1, 2 and 3, respectively.
- 9) Fertilizer will be placed during construction of the wrap layers to encourage root growth and eventual structural integrity.
- 10) Fertilizer should be placed as discrete bands in the middle of the backfill layers for each retaining wall wrap.
- 11) Fertilizer should be applied at a rate of 500 pounds per acre (11.5 pounds per 1,000 square feet) of 10-20-10, unless soil testing indicates that a different rate or composition is preferable. Phosphorous and potassium generally encourage healthy growth of herbaceous species.

GEOTEXTILE REVETMENT TREATMENT TYPE 1

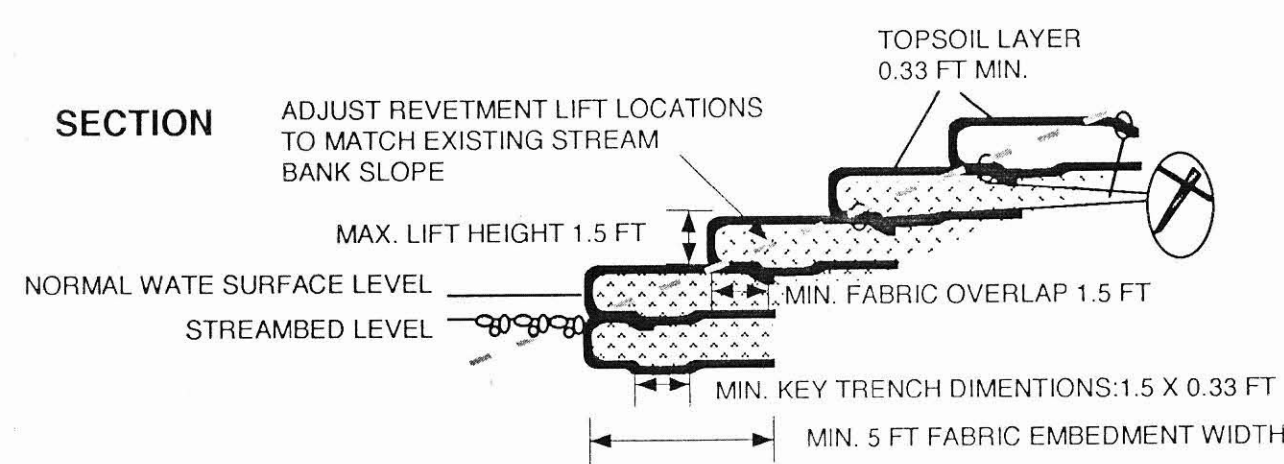
PLAN VIEW



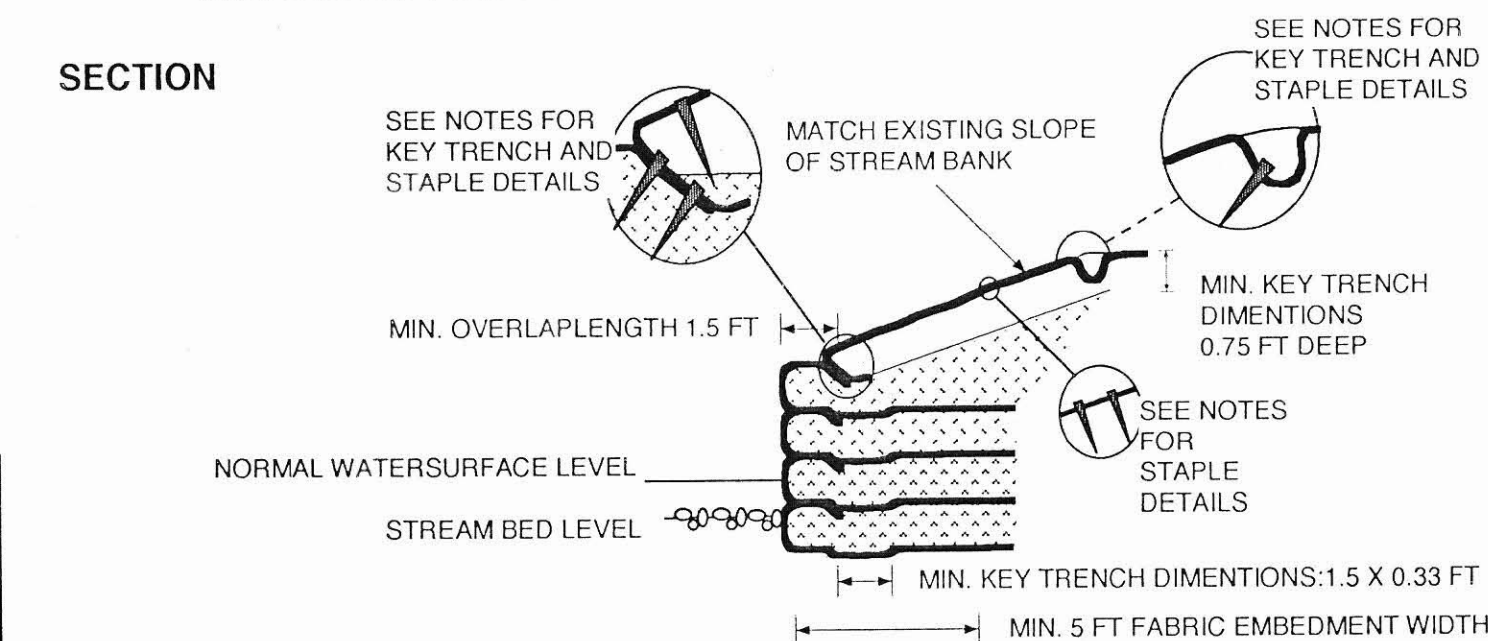
FILL TYPE	
	TOPSOIL MIX
	BACKFILL MIX
	GRAVEL MIX



TREATMENT FOR VARIABLE SLOPES



TREATMENT FOR VERTICAL SLOPES



GENERAL NOTES ON INSTALLATION OF GEOTEXTILE REVETMENT:

- 1) Bring rough grade in stream channel and bank area to minus 1 foot of finished stream channel elevation. Grade should be roughly level.
- 2) Install base course of fabric retaining wall to specified dimensions. Top of lowest wrap layer should be placed at finished stream bed level.
- 3) Install base course of retaining wall in adjacent upstream panel to provide fabric overlap of 1.5 feet (minimum).
- 4) Install second course of retaining wall. To provide fabric overlap in sequential upstream panels, install courses of upstream retaining walls in stages. Adjacent panels should be installed so that at any time during construction, no panel is higher than 1 course above an adjacent panel.
- 5) Install remaining courses of retaining wall to match pre-construction grade of stream banks.
- 6) Lowest 2 wrap layers should be comprised of stream bed material.
- 7) Remaining wrap layers (except in some cases of top layer; see note 8) should be comprised of backfill mix.
- 8) The top 6 inches of surface layer should be comprised of topsoil mix. Grade to match original contours.
- 9) Fertilizer should be placed at the middle of each wrap layer during placement of fill material (see Vegetation section).
- 10) Provide penetrations in retaining walls to accommodate existing storm drain lines.
- 11) Fabric should consist of 2 layers: exposed layer DeKoWe® 700; inner layer C125® or C2®. Fabric should be installed smooth with no unnecessary folds or wrinkles.
- 12) All fabric should be secured as specified by manufacturer.
- 13) All wrap layers should be constructed with a key trench 1.5 feet wide and 3 inches deep, located about 1 foot from face of retaining wall layer.
- 14) All fabric retaining walls should match existing stream bank location, configuration and grade.
- 15) All fabric retaining walls should be planted with grasses, shrubs and trees to provide long-term bank stability. Planting of grass and forb seed should occur within wrap layers as each is installed. Placement of shrub cuttings should occur between placement of each vertical wrap layer. Planting of bare root shrubs and trees should occur following completion of the retaining wall.

