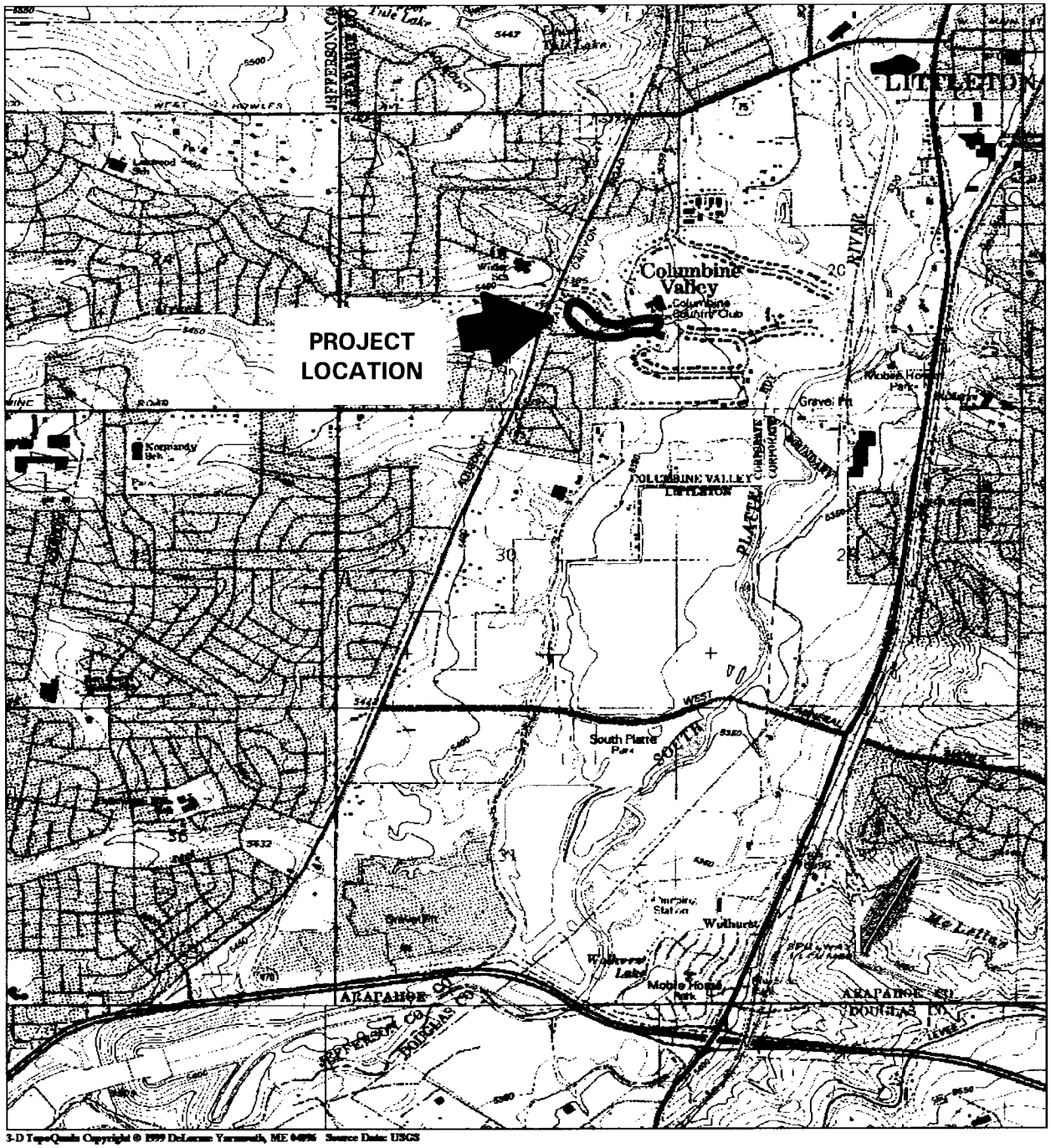

Smith Environmental, Inc.

1001 West 120th Avenue, Suite 210
Westminster, CO 80234
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Dutch Creek Drainageway Improvements

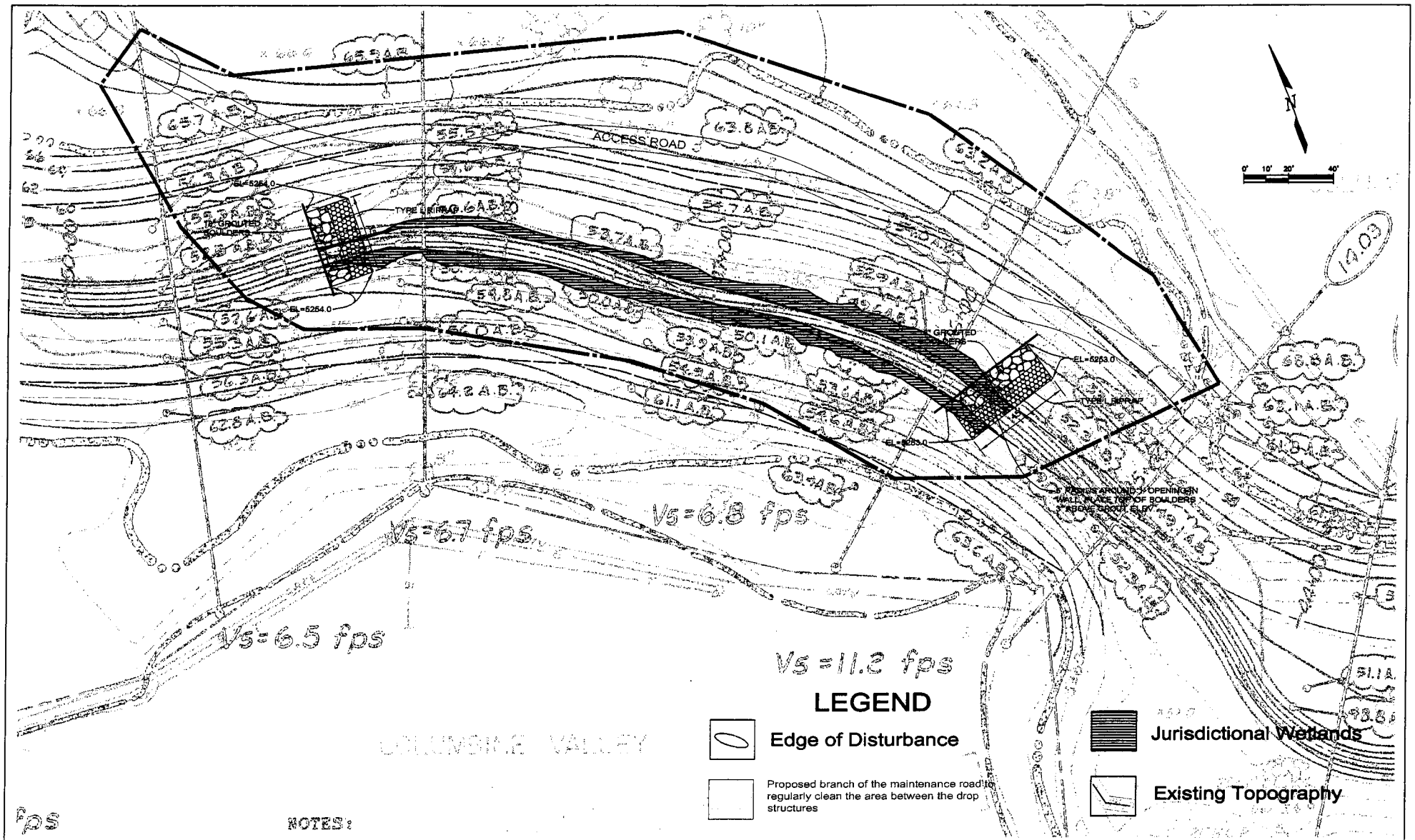
Littleton, CO Quadrangle

Scale: 1 inch = 2,345 ft (approx.)

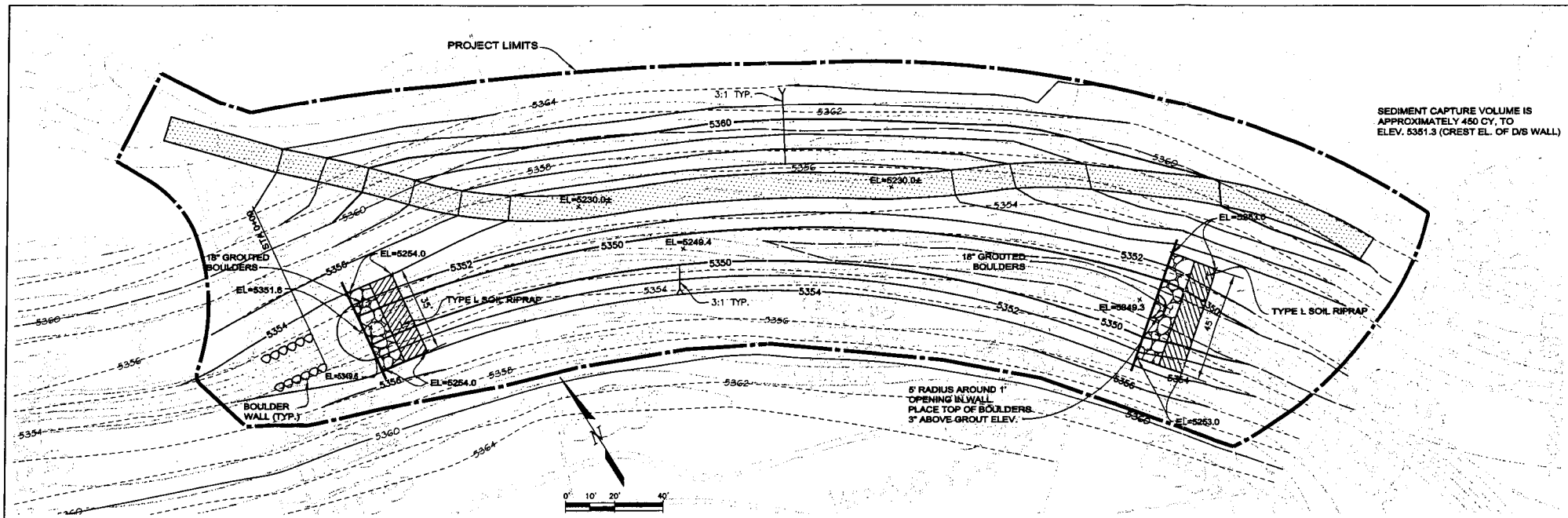
Figure 1 - Project Area

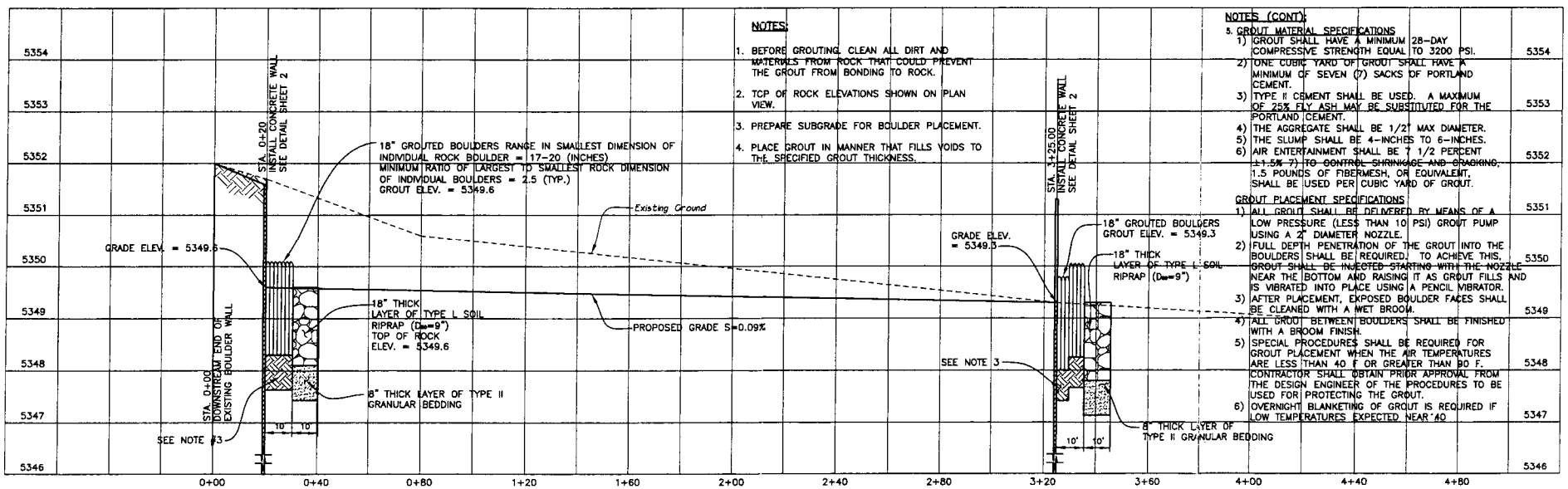
Prepared for Urban Drainage and Flood Control District

January 2003



BBM PLS	SMITH ENVIRONMENTAL INC. 1001 W. 120th Ave., Suite 210, Westminster, CO 80234 Phone: (720) 887-4928 Fax: (720) 887-4680	\\Projects\Urban Drainage\Dutch Creek\Attachment E.dwg	ARAPAHOE COUNTY City of Littleton	DUTCH CREEK DRAINAGEWAY IMPROVEMENTS AREA A - WETLAND IMPACTS - FIGURE 3 2002-56-3b





NOTES:

1. BEFORE GROUTING, CLEAN ALL DIRT AND MATERIALS FROM ROCK THAT COULD PREVENT THE GROUT FROM BONDING TO ROCK.
2. TOP OF ROCK ELEVATIONS SHOWN ON PLAN VIEW.
3. PREPARE SUBGRADE FOR BOULDER PLACEMENT.
4. PLACE GROUT IN MANNER THAT FILLS VOIDS TO THE SPECIFIED GROUT THICKNESS.

NOTES (CONT):

5. GROUT MATERIAL SPECIFICATIONS
   1) GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH EQUAL TO 3200 PSI.
   2) ONE CUBIC YARD OF GROUT SHALL HAVE A MINIMUM OF SEVEN (7) SACKS OF PORTLAND CEMENT.
   3) TYPE II CEMENT SHALL BE USED. A MAXIMUM OF 25% FLY ASH MAY BE SUBSTITUTED FOR THE PORTLAND CEMENT.
   4) THE AGGREGATE SHALL BE 1/2" MAX DIAMETER.
   5) THE SLUMP SHALL BE 4-INCHES TO 6-INCHES.
   6) AIR ENTERTAINMENT SHALL BE 7 1/2 PERCENT ~~(±1.5% 7) TO CONTROL SHRINKAGE AND CRACKING,~~ 1.5 POUNDS OF FIBERMESH, OR EQUIVALENT, SHALL BE USED PER CUBIC YARD OF GROUT.

GROUT PLACEMENT SPECIFICATIONS

1) ALL GROUT SHALL BE DELIVERED BY MEANS OF A LOW PRESSURE (LESS THAN 10 PSI) GROUT PUMP USING A 2" DIAMETER NOZZLE.
2) FULL DEPTH PENETRATION OF THE GROUT INTO THE BOULDERS SHALL BE REQUIRED. TO ACHIEVE THIS, ~~GROUT SHALL BE INJECTED STARTING WITH THE NOZZLE~~ NEAR THE BOTTOM AND RAISING IT AS GROUT FILLS AND IS VIBRATED INTO PLACE USING A PENCIL VIBRATOR.
3) AFTER PLACEMENT, EXPOSED BOULDER FACES SHALL BE CLEANED WITH A WET BROOM.
4) ALL GROUT BETWEEN BOULDERS SHALL BE FINISHED WITH A BROOM FINISH.
5) SPECIAL PROCEDURES SHALL BE REQUIRED FOR GROUT PLACEMENT WHEN THE AIR TEMPERATURES ARE LESS THAN 40 F OR GREATER THAN 90 F. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE DESIGN ENGINEER OF THE PROCEDURES TO BE USED FOR PROTECTING THE GROUT.
6) OVERNIGHT BLANKETING OF GROUT IS REQUIRED IF LOW TEMPERATURES EXPECTED NEAR 40

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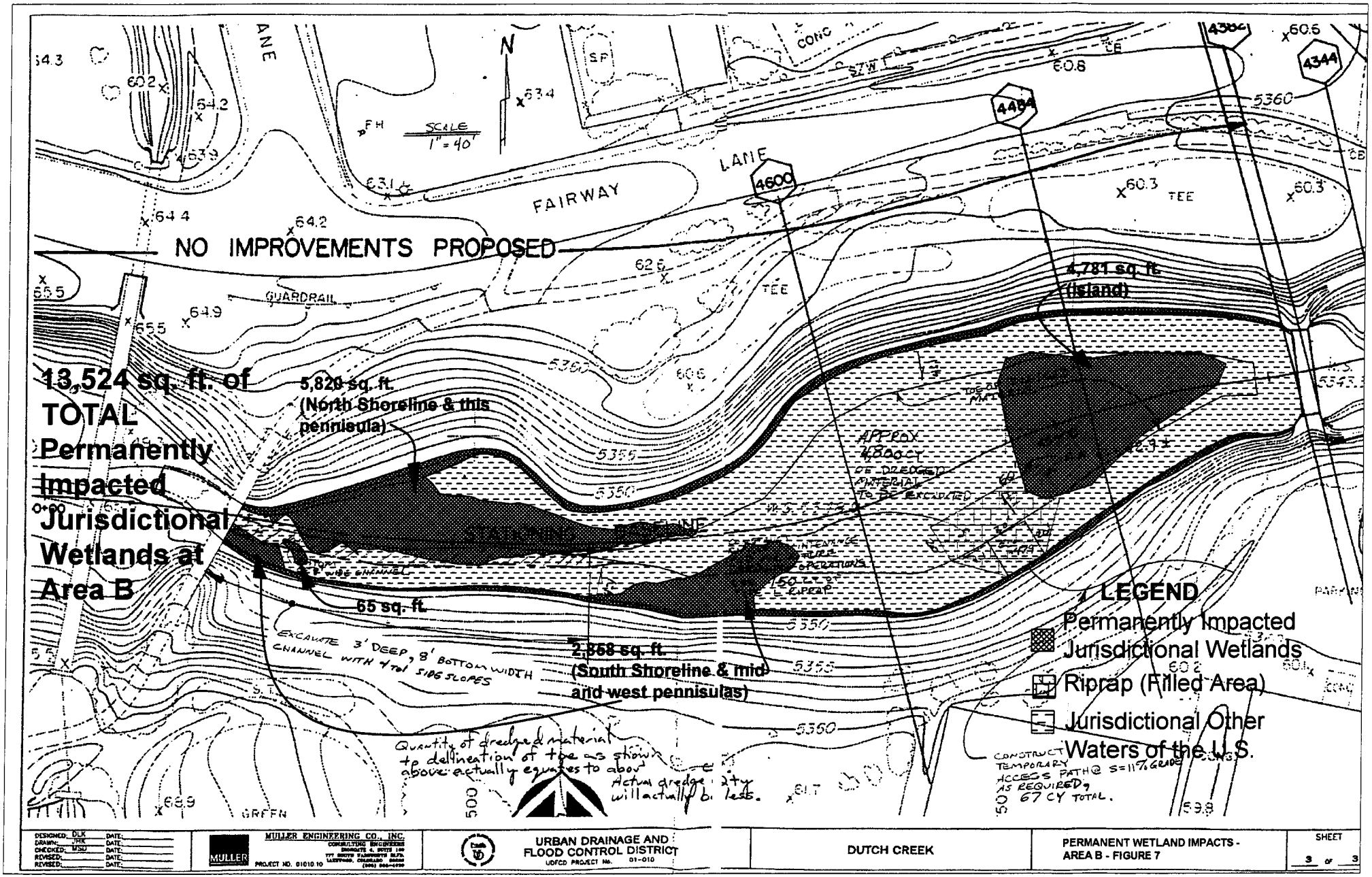
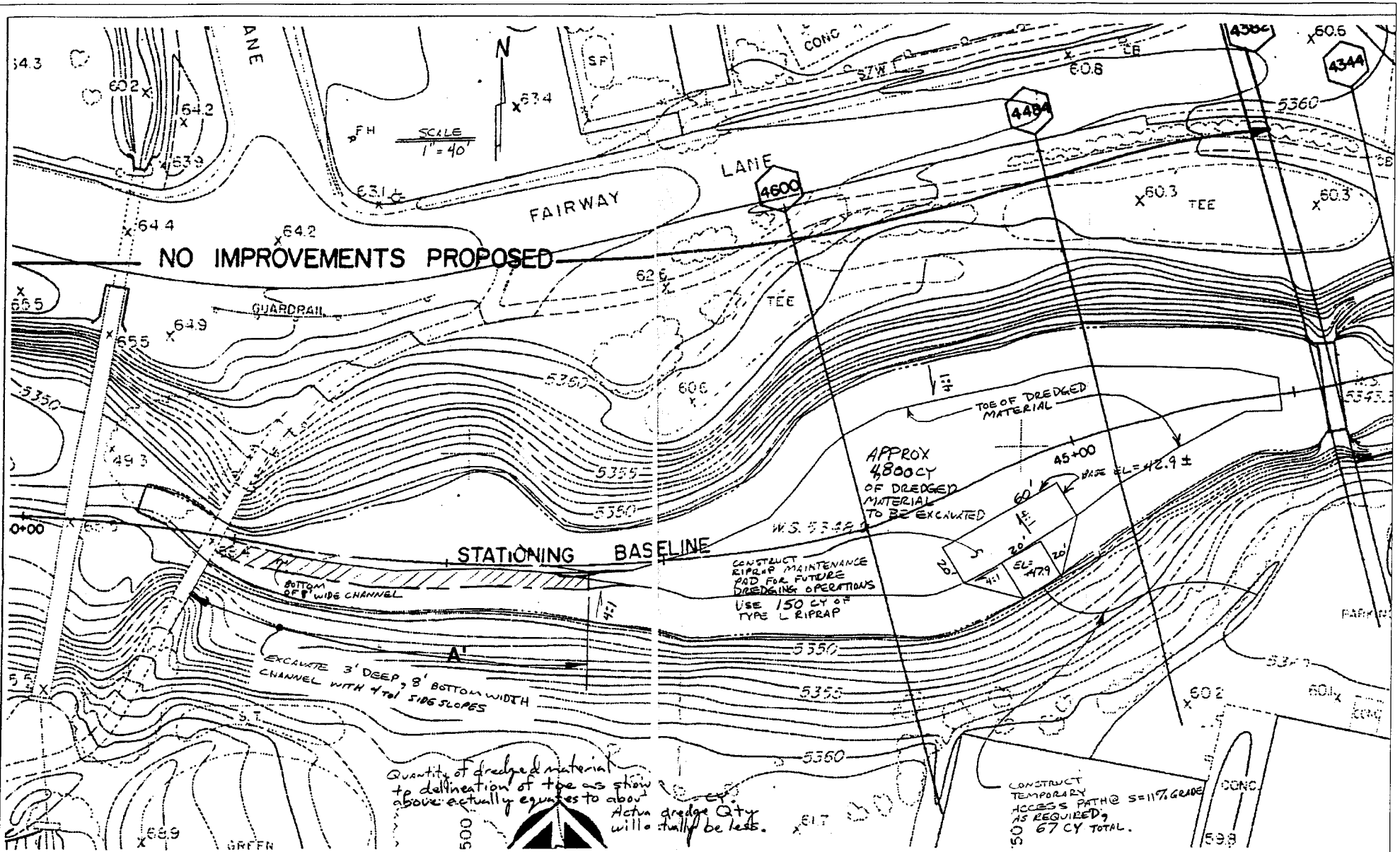
DRAWN: MAM DATE:	PROJECT NO. 01010.10	UDFCD PROJECT No. 01-010	FIGURE 6 PLAN AND PROFILE
CHECKED: DATE:			SHEET 1 OF 3
REVISED: DATE:			
REVISED: DATE:			

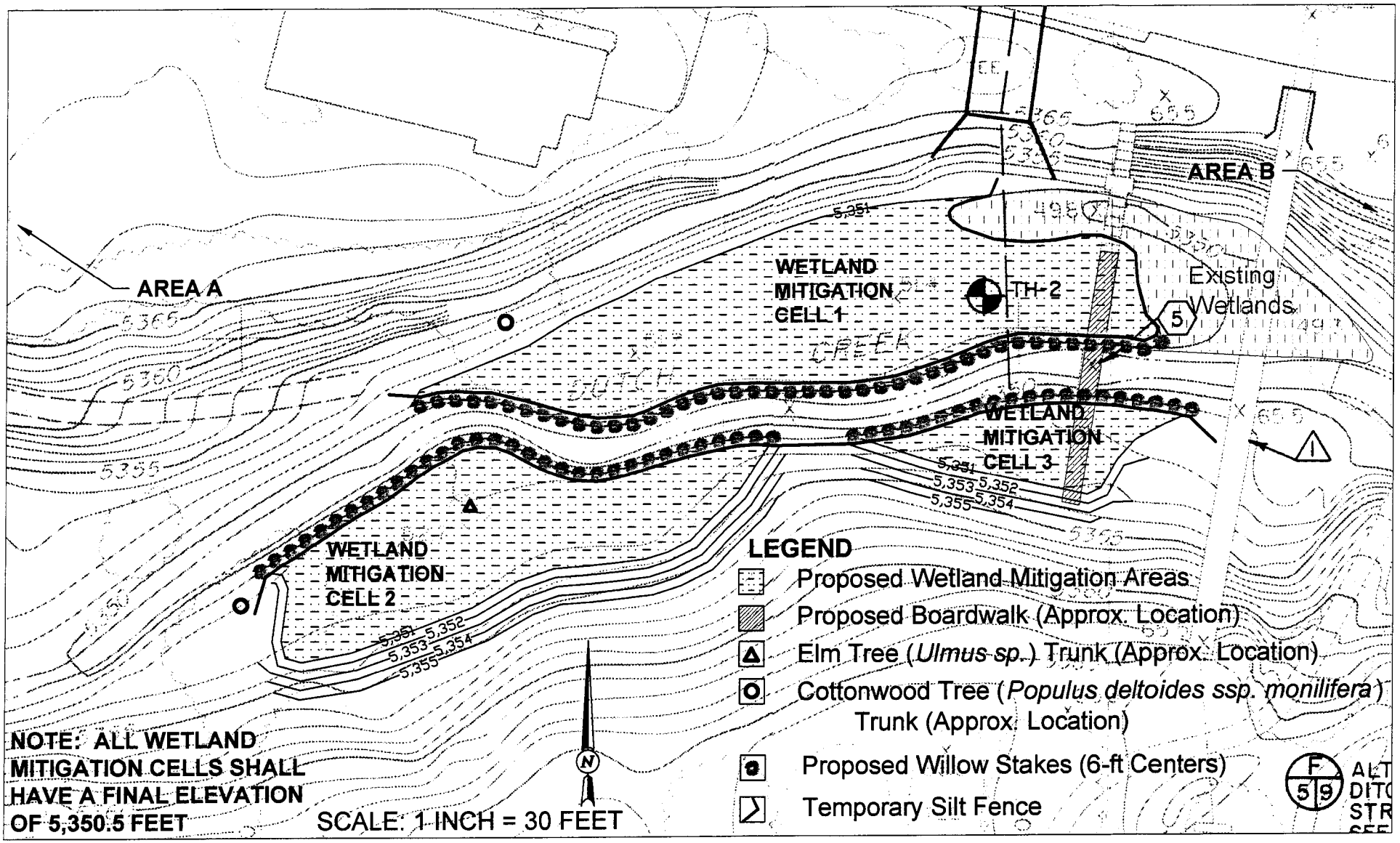
NAME: P:\01-010\10 Dutch Creek\CAD Dwgs\01010-10-PLAN3.dwg DATE: FEB 04, 2003 TIME: 8:36 AM



DESIGNED: DLK DATE: DRAWN: JHK DATE: CHECKED: MSD DATE: REVISED: DATE: REVISED: DATE:	MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS PROJECT NO. 01010.10	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT UDFCD PROJECT No. 01-010	DUTCH CREEK	PERMANENT WETLAND IMPACTS - AREA B - FIGURE 7	SHEET 3 of 3



DESIGNED: DLK DATE: DRAWN: JHK DATE: CHECKED: MSU DATE: REVISED: DATE: REVISED: DATE:	MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS 777 NORTH WADSWORTH BLVD. LAKEWOOD, COLORADO 80226 (303) 980-0900 PROJECT NO. 01010 10	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT UDFCD PROJECT No. 01-0	DUTCH CREEK	DREDGING PLAN - AREA B - FIGURE 8	SHEET 3 OF 3



BBM PLS	SMITH ENVIRONMENTAL INC. 1001 W. 120th Ave., Suite 210, Westminster, CO 80234 Phone: (720) 887-4928 Fax: (720) 887-4680	ARAPAHOE COUNTY City of Littleton	DUTCH CREEK DRAINAGEWAY IMPROVEMENTS PROPOSED WETLAND MITIGATION SITES-AREA C-FIGURE 9	2002-56-3b

STEP 1
SOIL REMOVAL & REPLACEMENT

1. Wetland mitigation cells (See Figure 9) shall be created that have a final elevation of 5,350.5 ft.
2. Salvage 12 inches of topsoil in the mitigation cells and stockpile in the cells.
3. Remove 6 to 24 inches of subsoil to achieve a temporary cell elevation of 5,349.5 ft.
4. Replace the stockpiled topsoil to bring the elevation of the mitigation cells to 5,350.5 ft.

STEP 2
NATIVE SEEDING

Wetland mitigation cells will be seeded with a native seed mixture. Seed labels shall conform to current state and federal regulations. All seed bag labels shall be saved and provided to the Construction Manager on-site.

Seeding Application: Drill seed to depths of 0.25 in. - 0.5 in. in areas accessible to a drill. Seed mix and rates are shown in the table below. If drilled, the seed discs shall be set 6 in. apart. Where drill seeding is not feasible, broadcast seed at double the seeding rates and rake seed 0.25 in. into the soil.

SEED MIXTURE AND SPECIES COMMON NAME	SCIENTIFIC NAME	LBS PLS/ACRE
Foul Mannagrass	Glyceria striata	1.1
Colorado Rush	Juncus confusus	0.3
Softstem Bulrush	Schoenoplectus lacustris ssp. creber	2.0
Prairie Cordgrass	Spartina pectinata	2.0
Baltic rush	Juncus arcticus ssp. ater	0.5
Three-square bulrush	Schoenplectus pungens	4.0
Small-wing sedge	Carex microptera	1.4
Nebraska sedge	Carex nebrascensis	1.0
Creeping Spikerush	Eleocharis macrostachya	1.0
Water sedge	Carex aquatilis	1.5
Emory's sedge	Carex emoryi	0.4
Soft rush	Juncus effusus	0.2
TOTAL		15.4

STEP 3
EROSION CONTROL

Mulching shall be completed after seeding in all three wetland mitigation cells. Apply 1.5 tons/ac. of certified weed-free hay or straw and mechanically crimp into the topsoil. Provide additional anchoring of the hay or straw by applying an organic mulch tackifier where mulch has been applied. Apply tackifier at a rate of 300 lbs. of powder, 225 lbs. of fiber and 800 gal. of water per acre.

A soil retention blanket shall be applied in all three wetland mitigation cells (See Figure 9). The strip of blanket shall be 6-8 ft wide and shall straddle the shoulder of the bank. Apply soil retention blanket - straw content 70 % and coconut fiber content in 30 % - accordance with manufacturer's recommendations.

STEP 4
INSTALLATION OF LIVE WILLOW STAKE BUNDLES (in Area C only)

Willow stakes shall be planted along the Dutch Creek bank to create two different wetland plant communities. Punch holes in the soil retention blanket to plant the willow stakes.

MATERIALS

Live willow cuttings shall be cut from branches about ½" to 1" in diameter from living plant material. All side branches shall be trimmed. Cuttings shall be about 4 ft in length and tied in bundles of 4. Cuttings may be taken from any willow species.

CUTTING

Willow cuttings shall be pruned from live willow plants east of the project area, near the confluence of Dutch Creek and the South Platte River. Willow cuttings shall be cut from branches with smooth undamaged bark. Do not use branches with thick, cracked bark because these will not re-sprout effectively. Cuts shall be clean, without stripping the bark or splitting the wood. Cuts shall be made at a slight angle to identify the root end of the cutting and to allow rapid regeneration of the donor live willow. No more than 50 percent of each donor live willow plant shall be harvested and no more than 50 percent of plants at the harvest site shall be used as donors. Donor live willow plants shall be selected at random at the harvest site to avoid creating large areas of cut plants. Each cutting shall be trimmed of all side branches and the top shall be cut off so that the cutting is four ft in length. The harvesting site shall be left clean and free of debris. Large unused material shall be cut into two-foot lengths and evenly distributed around the site.

TRANSPORTATION

All cut plant material shall arrive on the job site within eight (8) hours of cutting. Plants shall be stored in containers with water at least one foot deep. The containers shall be continuously shaded and protected from the wind. Cuttings shall be protected from drying at all times. During transportation, the bundles of cuttings shall be placed in containers with water at least one (1) foot deep and transported in an orderly fashion to prevent dessication. Upon arrival at the construction site, cuttings shall be inspected for acceptability. Only healthy, undamaged material shall be used.

INSTALLATION

Willow bundles shall be installed on 6-ft centers. A total of approximately 95 live willow stake bundles shall be planted (43 in Wetland Mitigation Cell 1, 32 - Cell 2, and 20 - Cell 3). Willows shall not be planted in a row; they must maintain a natural look of randomness. A steel rod or similar device shall be used to create pilot holes in the ground for the cuttings. The root-end of the bundles of cuttings shall be dipped 3" into a waterbase latex paint to avoid dessication. The root-end of the bundles of cuttings shall be tamped into the pilot hole to a depth of two feet, or until the root-end of the cutting meets groundwater, whichever is deeper. The top of the bundle shall protrude no more than two feet. Dead blow hammers or rubber mallets shall be used to tamp in the cuttings and shall be used in such a manner that they do not cause the wood to split. In cases where the top of the bundle extends more than two (2) feet above the ground, the top shall be neatly trimmed to a height of two feet. Soil shall be placed in any spaces around the cuttings and tamped into place to remove any air pockets.

PROJECT TOTALS:

CDOT PAY ITEM	DESCRIPTION	QUANTITY	UNIT
208	EROSION BALES (WEED FREE)**		each
208	SILT FENCE		m
208	EROSION CONTROL SUPERVISOR	1	ls
212	SEEDING (NATIVE)		ha
213	MULCHING (WEED FREE HAY)		ha
213	MULCH TACKIFIER		kg
214	SHRUB PLANTING		
	-Salix sp.	95	each
	TOPSOILING		yds^3
700	EROSION CONTROL		fa

NOTES:

TEMPORARILY DISTURBED AREAS LEFT BARE AFTER WORK COMPLETED DURING THE GROWING SEASON SHALL BE SEEDED WITH AN UPLAND SEED MIX AND SHALL RECEIVE MULCH AND TACKIFIER.