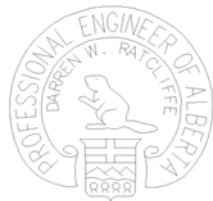


**CENTRAL REGION  
GEOHAZARD RISK ASSESMENT  
SITE INSPECTION FORM**

SITE NUMBER AND NAME <b>C28 H53:06</b>		HIGHWAY & KM 4 km west of Highway 2	PREVIOUS INSPECTION DATE May 23, 2003	INSPECTION DATE <b>May 12, 2004</b>
LEGAL DESCRIPTION NW 4-43-26-W4	NAD 83 COORDINATES* N 5839575 E 317020		RISK ASSESMENT PF: 9 CF: 1 TOTAL: <b>9</b>	

SUMMARY OF SITE INSTRUMENTATION:  None	INSPECTED BY:  
LAST READING DATE:	
PRIMARY SITE ISSUE: Ditch Erosion/Frost Heave	
APPROXIMATE DIMENSIONS: Ditch erosion length about 80 m, frost heave about 3 m wide across road	
DATE OF ANY REMEDIAL ACTION: Drains in 1980's, gravel in frost heave area in 1999	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Very narrow frost heave area on pavement (<2 m wide). Road patch about 20 m wide.		X
Slope Movement					
Erosion	X		Erosion on-going in ditches on both sides of the highway. The area about 80 m long to the southwest of the frost heave. Random fill (including rubble and cores) has been placed in the erosion ditch.		X
Seepage					
Culvert Distress					

<b>COMMENTS</b>
Refer to attached photos, figures and recommendations
*Coordinates of ditch erosion Frost Heave coordinates: N5839650, E317215

## **COMMENTS AND RECOMMENDATIONS**

### **Frost Heave**

In the 1980's, the slopes adjacent to the highway were re-graded and 150 mm dia. drains were installed under both ditches. No construction drawings could be located to assess the extent of the work.

The lateral drains were not effective in controlling the frost heave and in 1999 about 1 m depth of road embankment was excavated in a slot across the full width of the highway and replaced with compacted pitrun gravel. This has reduced the amount of frost heave, but not eliminated it completely. It is considered that a deeper excavation is required, possibly tied in to the existing lateral drain. This should be addressed in a future overlay project.

### **Ditch Erosion**

In the winter of 2002/03, a car slid off the highway and became entrapped in the ditch erosion to the southwest of the frost heave area. The total length of the erosion is about 80 m. It is recommended that the erosion area close to the highway edge over a length of about 25 m be remediated with a "Tri-Lock" block approach and delivered in a future overlay project.

The Tri-Lock system consists of two pre-cast concrete blocks: a lock block and a key block, placed on a filter fabric layer, to provide a three directional interlock to resist lateral movement. The articulating cellular concrete block system is a "flexible" concrete revetment that allows the blocks to traverse changes in terrain without disruption of the placement pattern and interlock feature. The voids or spaces in the Tri-Lock system are filled with topsoil and seeded to protect the filter fabric. The strength and evenness of the Tri-Lock system provides a safe surface for both vehicle and pedestrian traffic.

Each pair of "key" and "lock" blocks covers approximately 0.143 m<sup>2</sup>, including uncovered openings between the blocks. The system provides approximately 80% coverage of the area with blocks, leaving approximately 20% uncovered area at the ground surface.

Before placing the filter fabric, the subgrade must be suitably prepared and shaped to the required profile, as indicated on Figure 2. It must be graded smooth; with no depressed, void, soft or uncompacted areas; and is free from obstructions, such as tree roots, projecting stones or other foreign matter. In no case shall concrete revetment blocks be placed on a muddy or spongy subgrade. The contractor should fine grade the subgrade with bedding sand as required to remove local deviations.

The filter fabric shall be placed over the prepared subgrade and shall be smooth and free of tension, stress or wrinkles. The geotextile shall be lapped a minimum of 0.45 m at ends and sides of adjoining sheets. The extent of the geotextile shall be the same as that for the blocks.

Block installation shall begin from a straight-line oriented perpendicular to the direction of lay, and shall proceed toward an open area and not toward a point of fixity. Blocks shall be installed with the bottom side down. Blocks shall continue to be laid in straight-lines to maintain the interlock characteristic. To maintain straight-lines, no more than two rows of blocks shall be

**CENTRAL REGION  
GEOHAZARD RISK ASSESMENT  
SITE INSPECTION FORM**

started at a time. Backfilling of openings between blocks shall be completed no more than seven (7) days after placement of the filter to protect the geotextile from ultraviolet radiation. Backfill openings flush with the top surface of the blocks using topsoil.

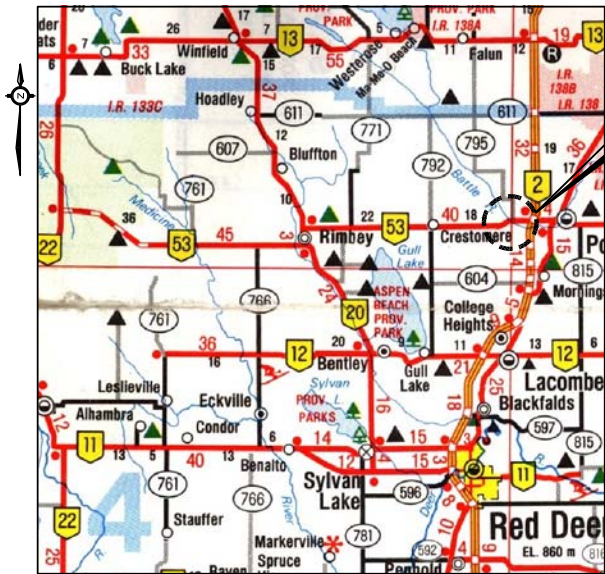
To reduce the velocity of flow at the end of the channel, rock riprap is to be provided. Alternatively, excess Tri-Lock blocks may be placed at the end to form an energy dissipater.

A recommended configuration for the ditch repair is shown on Figure 2. The approximate quantities for an 25 m length of ditch (about 40 m<sup>2</sup>) are as follows:

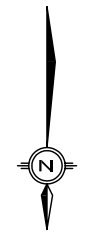
- 200 lock blocks (4" #4010)
- 150 key blocks (4" #4010)
- 40 m<sup>2</sup> filter fabric
- 2 m<sup>3</sup> bedding sand (if required)
- 1 m<sup>3</sup> topsoil

Quoted costs from the manufacturer are about \$75/m<sup>2</sup> for supply and install of the blocks. This equates to a cost of about \$3,000 for the blockwork. Allowing for the extra materials and site grading, the estimated cost of the project is about \$5,000.

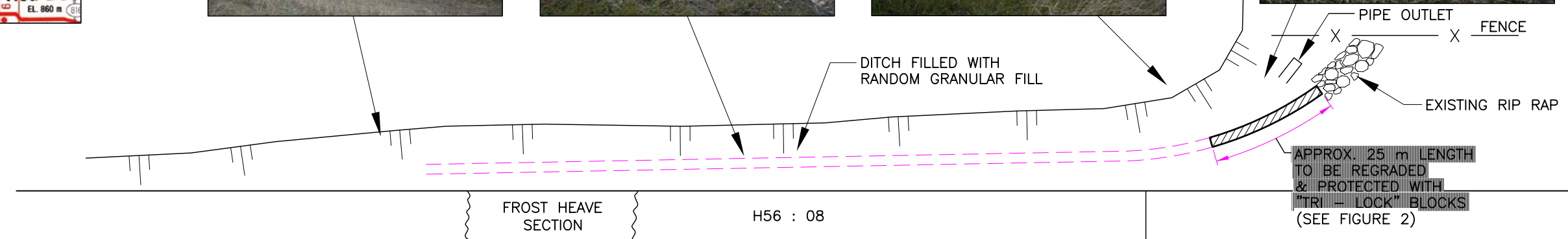




KEY MAP  
N.T.S.



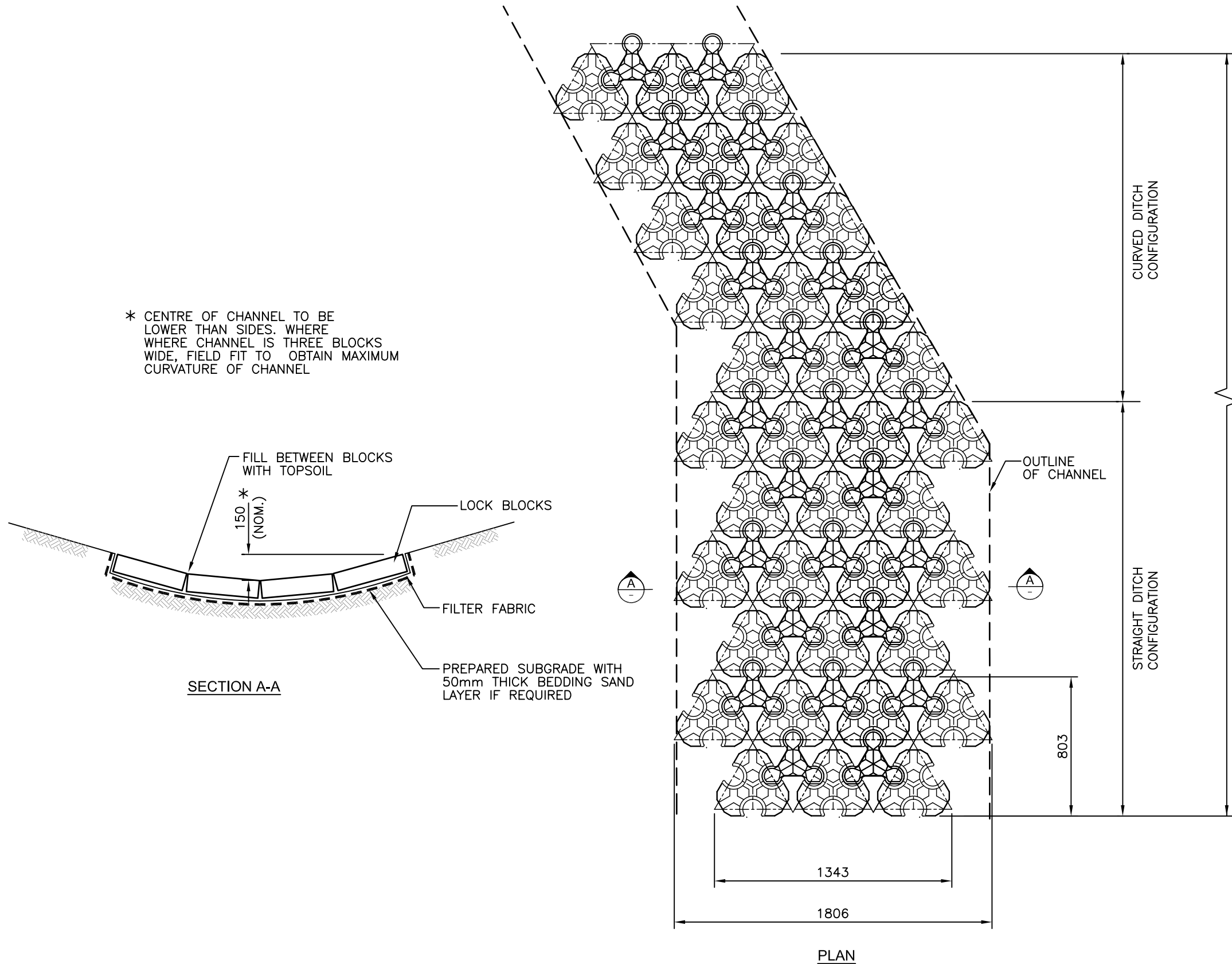
BATTLE RIVER



NOTES

1. PHOTOS TAKEN MAY 12, 2004.

PERMIT	SEAL		DESIGNED BY	APPROVED BY	CONSULTANT			PROJECT			
			DWR					CENTRAL REGION			
			DRAWN BY	CHECKED BY				TITLE			
			MD					GEOHAZARD RISK ASSESSMENT			
			SCALE					SITE C28 : H53:06			
			APPROX. 1:1000					SITE PLAN			
								DATE	SHEET	DRAWING No.	REV.
								MAY 2004	1 of 2	FIGURE 1	A
		MARK	DESCRIPTION OF REVISIONS	DATE	DWN.	ENG.					



NOTES

- BEFORE PLACING THE FILTER FABRIC, THE SUBGRADE MUST BE SUITABLY PREPARED AND SHAPED TO THE REQUIRED PROFILE. IT MUST BE GRADED SMOOTH; WITH NO DEPRESSED, VOID, SOFT OR UNCOMPACTED AREAS; AND IS FREE FROM OBSTRUCTIONS, SUCH AS TREE ROOTS, PROJECTING STONES OR OTHER FOREIGN MATTER. IN NO CASE SHALL CONCRETE REVETMENT BLOCKS BE PLACED ON A MUDDY OR SPONGY SUBGRADE. THE CONTRACTOR SHOULD FINE GRADE THE SUBGRADE WITH BEDDING SAND AS REQUIRED TO REMOVE LOCAL DEVIATIONS.
- THE FILTER FABRIC SHALL BE PLACED OVER THE PREPARED SUBGRADE AND SHALL BE SMOOTH AND FREE OF TENSION, STRESS OR WRINKLES. THE GEOTEXTILE SHALL BE LAPPED A MINIMUM OF 0.45 M AT ENDS AND SIDES OF ADJOINING SHEETS. THE EXTENT OF THE GEOTEXTILE SHALL BE THE SAME AS THAT FOR THE BLOCKS.
- BLOCK INSTALLATION SHALL BEGIN FROM A STRAIGHT-LINE ORIENTED PERPENDICULAR TO THE DIRECTION OF LAY, AND SHALL PROCEED TOWARD AN OPEN AREA AND NOT TOWARD A POINT OF FIXITY. BLOCKS SHALL BE INSTALLED WITH THE BOTTOM SIDE DOWN. BLOCKS SHALL CONTINUE TO BE LAID IN STRAIGHT-LINES TO MAINTAIN THE INTERLOCK CHARACTERISTIC. TO MAINTAIN STRAIGHT-LINES, NO MORE THAN TWO ROWS OF BLOCKS SHALL BE STARTED AT A TIME. BACKFILLING OF OPENINGS BETWEEN BLOCKS SHALL BE COMPLETED NO MORE THAN SEVEN (7) DAYS AFTER PLACEMENT OF THE FILTER TO PROTECT THE GEOTEXTILE FROM ULTRAVIOLET RADIATION. BACKFILL OPENINGS FLUSH WITH THE TOP SURFACE OF THE BLOCKS USING TOPSOIL.
- EXISTING RIPRAP AT END OF EXISTING CHANNEL TO BE FIELD FITTED TO SUIT NEW CHANNEL.

PERMIT	SEAL	DESIGNED BY DWR	APPROVED BY	CONSULTANT	PROJECT CENTRAL REGION
		DRAWN BY MD	CHECKED BY		TITLE GEOHAZARD RISK ASSESSMENT
		SCALE 1:25 0 250 500 mm			
		MAY 2004 INSPECTION	MAY 04 M.D. D.W.R.		DATE MAY 2004
		MARK	DESCRIPTION OF REVISIONS		SHEET 2 of 2
			DATE		DRAWING No. FIGURE 2
			DWN.		REV. A
			ENG.		





Frost heave area looking south



Frost heave area looking north











Looking west along south ditch



Looking east along south ditch





Looking east along south ditch



Close-up of ditch infill material (1)





Close-up of ditch infill material (2)



Looking west





Looking east at west end of erosion channel



Looking west at end of riprap channel and exposed drain outlet north of fenceline





Drain outlet



Riprap channel north of fenceline





Looking east at west end of north ditch.