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THURBER

October 6, 2004 File: 15-16-190

Alberta Transportation
Bag 900, Box 29 Provincial Building
9621 - 96 Avenue
Peace River, AB T8H 1T4

Attention: Mr. Ed Szmata

CALL-OUT FOR MENNO SIMONS EROSION SITE (PH 14)
LOCATED 800 m SOUTH OF HWY 64, 6 KM WEST OF HWY 726
SW8-85-8-W6M

Dear Sir:

This report presents the results of a call-out for the above noted erosion site conducted by Mr. Barry Meays, P.Eng. of Thurber Engineering Ltd. on July 6, 2004. The request for the call-out was made by Mr. Ed Szmata of Alberta Transportation (AT) who was present during the visit, along with Ms. Amanda Russell of AT.

1. BACKGROUND

The background history of the site was discussed by phone with the area Aggregates Coordinator, Mr. Mike Lussier, with additional input provided by Mr. Szmata on the day of the call-out, and can be summarized as follows:

- A central access or deadhaul road enters the site from the west, roughly splitting the site in half in a north-south direction. The intention is to stabilize the area south of the central access road as part of the reclamation process, and abandon it on a permanent basis, as there is no requirement for future access. The area north of the access road is less critical, and AT does not require recommendations for rehabilitation for this area at this time.
- This entire area was used as a gravel pit in the past. Prior to excavating the gravel, the overburden was removed and stockpiled, likely with little differentiation or separating of the original topsoil and underlying clay or other existing subsoils.

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- In the early 1990's as part of the pit reclaim process subsequent to gravel depletion, this mixed overburden material was used to rebuild the pit slope south of the access road, with as much as 18 m (in height) of material replaced overtop the excavated area. To AT's knowledge, the overburden material placed on the pitwall slope did not receive compaction control, other than for construction equipment wheels/tracks during placement.
- On the south side of the access road, the remaining mixed overburden was left slightly beyond (to the west of) the original pit slope crest in a pile at the top of the original crest, and it would be preferred to leave this pile as is, if possible.
- Since the reclamation process, severe erosion and associated slumping has occurred in the reclaimed pit area south of the access road, transporting overburden material downslope. There is a concern that eroded sediment could enter the intermittent creek at the base of the slope. Therefore, some sort of permanent solution to control the erosion/slumping is required.

2. OBSERVATIONS

A plan view of the erosion site and an approximate cross-section of the main runoff channel at the south end of the site are provided on Figure 1. A May 2003 1:5000 scale airphoto was used for the background of the figure and site features were taken from AT's pit plan dated June 17, 2003 and updated/adjusted based on our July 6, 2004 site observations. Views of the slide area are also shown on Photographs #1to #4, attached.

The erosion and slumping was located south of the deadhaul access road in the east facing slope of an approximate 20 m high reclaimed gravel pit fill which extended adjacent to the west side of a creek. The embankment sloped down a horizontal distance in the order of 150 m to a relatively flat ledge about 20 m wide, which was located about 5 m vertically above the creek bed. A large overburden pile existed above the crest of the reclaimed pit wall to the west, which was approximately 130 m wide x 400 m long, and about 10 m high in the centre.

The overburden pile contained exposed shallow slumps and erosion rills/gullies up to 1 m deep through its sparse clover/grass covered surface. It possessed slopes of about 10^0 on the west side, and between about 13^0 to 15^0 on the east side. The soil exposed at surface appeared to contain a significant amount of topsoil/organics, but also contained a substantial clay/silt/sand content.

A flatter, treed area existed between the base of the overburden pile and the crest of the pit wall slope. The width of this flatter area typically varied between about 10 m to 20 m, although it was basically non-existant at the south end. The native ground surface along this area appeared to slope downwards from the north to the south.

Below the treed area, the reclaimed pit wall contained a 3 m high, intermittent exposed scarp along the crest. This scarp appeared to be predominantly in sandier soil, and was inclined at 35^0 to 50^0. Below the scarp, a disordered array of erosion gullies and slumps existed on the pitwall surface. In many areas the slumped material had moved downslope where noticeable toe rolls were evident. The exposed soil at surface was quite variable, consisting of a mixture of topsoil, organics, clay, silt and sand, which was exposed through a vegetative cover consisting of clover, grass and a few small trees/shrubs. The overall slope was measured to be in the order of about 20^0, from the crest to the toe of the lower plateau above the creek.

At the southern edge of the pitwall fill, a fairly prominent runoff channel had formed, which originated from the base of the overburden pile and extended down to the creek. It is anticipated that this channel carries the bulk of the runoff originating from the overburden pile and flatter treed area in-between it and the top of the rebuilt pit wall. A cross-section taken near the upper portion of the slope across this channel is shown on Figure 1, and shows that it possessed a double legged bottom. The south leg of the channel was gravely, while the northern leg appeared to be based in clay and was in a "V" shape. The area between the legs contained random and disordered topsoil slumps. This channel contained a slope of about 11^0 in it's upper reach from the base of the overburden pile to the crest of the original slope, and approached about 12^0 to 20^0 below this. The very bottom of the channel from the base of the pitwall fill to the creek, exposed a clean, fine, sandy gravel, which sloped down at about 30^0, and was in a "V" shape about 2 to 3 m deep.

The 20 m wide ledge between the base of the pitwall slope and creek appeared to have a gravelly surface. There was no evidence of the overburden soil mixture containing topsoil being washed into the creek at the time of the site visit. A shallow berm existed above the creek bank which may be preventing widespread overburden runoff into the creek, however there were about four (4) locations observed where runoff/sediment could possibly infiltrate the creek, at two locations near the south end and at two lower areas of the berm further north.

3. PRELIMINARY ASSESSMENT

The overburden material placed on and used to reclaim the pit consisted of a mixture of topsoil and native subsoil materials. It was placed without significant compaction control. The current slope appears to be sitting as steep as 20^0 overall, but likely has not flattened to a stable configuration as of yet, as ongoing erosion and associated slumping continue. Similarly, the existing overburden pile located west of and above the pit wall fill was sitting at between 10^0 to 15^0, and is also experiencing erosion and shallow slumping. These slopes will continue to erode, slump, and transport material downslope until such time as a stable configuration is reached and a vegetative cover is established.

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A stable slope angle for material that contains a significant organic content and that was placed without significant compaction control could be as flat as 10^0. In the meantime, sediment deposition will likely enter the creek at the base of the slope unless adequate runoff/sediment control is established.

4. RISK LEVEL

Based on AT's criteria, the risk level for this site has been assessed as follows:

Risk (20) = Probability Factor (10) * Consequence Factor (2)

A Probability Factor of 10 is considered appropriate since this is an active erosion area with a moderate, ongoing rate of erosion. A Consequence Factor of 2 is considered appropriate since the slumping pit wall and overburden pile are of moderate height but more importantly there is silt that could or is being deposited into the creek. A higher Consequence Factor would apply if the creek was not intermittent.

5. RECOMMENDATIONS

One of the issues that needs to be address is the ongoing runoff from the overburden pile that is eroding the reclaimed pit slope. This could be addressed by constructing a runoff interceptor ditch in the flat area between the overburden pile and pit slope crest. Since the ground surface actually drains from north to south, it would make sense to drain the interceptor ditch into the main runoff channel located at the south end of the site. The interceptor ditch will need to be lined, possibly with high flow soil covering and the main runoff channel will need to be recontoured and armored, possibly with heavy rip rap or gabion mattress. A silt fence (assuming some routine maintenance can be implemented), or possibly a more resistant structure such as rock berm or gabion wall based into the existing soil, should be installed on the west side of this channel to reduce soil infill and sedimentation in the ditch. A sedimentation pond may be required at the base of the slope at the downstream end of the channel(s) on the ledge in front of (the west side of) the creek to catch/retain sediment that would otherwise run into the creek. The interceptor ditch, runoff channel and sedimentation pond designs should be further assessed during the detailed design with input from a hydraulic engineer.

Potential silt migration from the lower ledge area into the creek also needs to be addressed. The berm along the top of the creek bank could be regarded where required, an/or consideration could be given to construction of a swale in front of the berm, as a second line of defense to drain surface water into the proposed stilling pond at the outlet of the runoff channel.

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As a minimum, it is recommended that the existing pitwall slope face be recontoured by filling in the erosion rills/gullies to reduce the potential for concentrated flow and future erosion that could destabilize the slope. Material from the existing overburden pile could be used for this purpose, which should also be recontoured in a similar manner. During the regrading process, zones containing higher topsoil content should be separated and deposited at the finished surface of the gully fills to the extent practicable, to promote future vegetation growth. Subsequent to grading/recontouring, these slope faces should be re-seeded with the appropriate seedlings (including possible water resistant species such as willows).

Prior to regrading, a more detailed examination of the existing overburden pile slopes should be made. It may be necessary to flatten the slopes of the overburden pile to improve the stability of this pile. The reserve boundary may have to be extended to the west to allow for flattening of the pile which would involve some tree clearing.

There are other potential variations of the above concepts that can be determined during final design, or perhaps some of the above listed proposed project components could be eliminated.

Ball park construction costs for the above measures could vary from about $200,000 to $500,000, depending on the extent of design measures implemented.

6. ADDITIONAL INVESTIGATION AND DESIGN

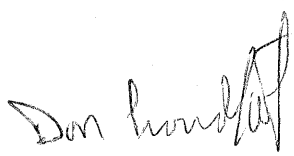
It is recommended that a detailed survey of this site be carried out to provide sufficient information about the site topography for design of the remedial measures (including the length and grades for lined channels) and any potential drainage improvements. The survey requirement could consist of some basic GPS ground surveying that includes specific interior and perimeter tie-downs, which could be consolidated with an airphoto contouring plan, that should provide sufficient detail yet be more cost effective. A hydrology study should also be performed to evaluate the runoff quantities contributing to flow volumes, and also to provide input into potential channel designs (which would be dependent on volumes/gradients). A geotechnical investigation (consisting of a number of shallow hand auger test holes along the proposed lined drainage channel routes), some laboratory testing consisting of grain size distributions, and channel design analyses are recommended to determine the required details of the above options and to provide the most cost effective design. It is recommended that this work be carried out through the winter months (fieldwork before freezing) so that a design can be in place to expedite repairs in 2005.

Continued...

7. CLOSURE

We trust that the above information is sufficient for your present requirements. However if you have any questions or require any additional input please do not hesitate to call us.

Yours very truly,
Thurber Engineering Ltd.
Don Proudfoot, P.Eng.
Review Principal



Barry Meays, P.Eng.
Project Engineer

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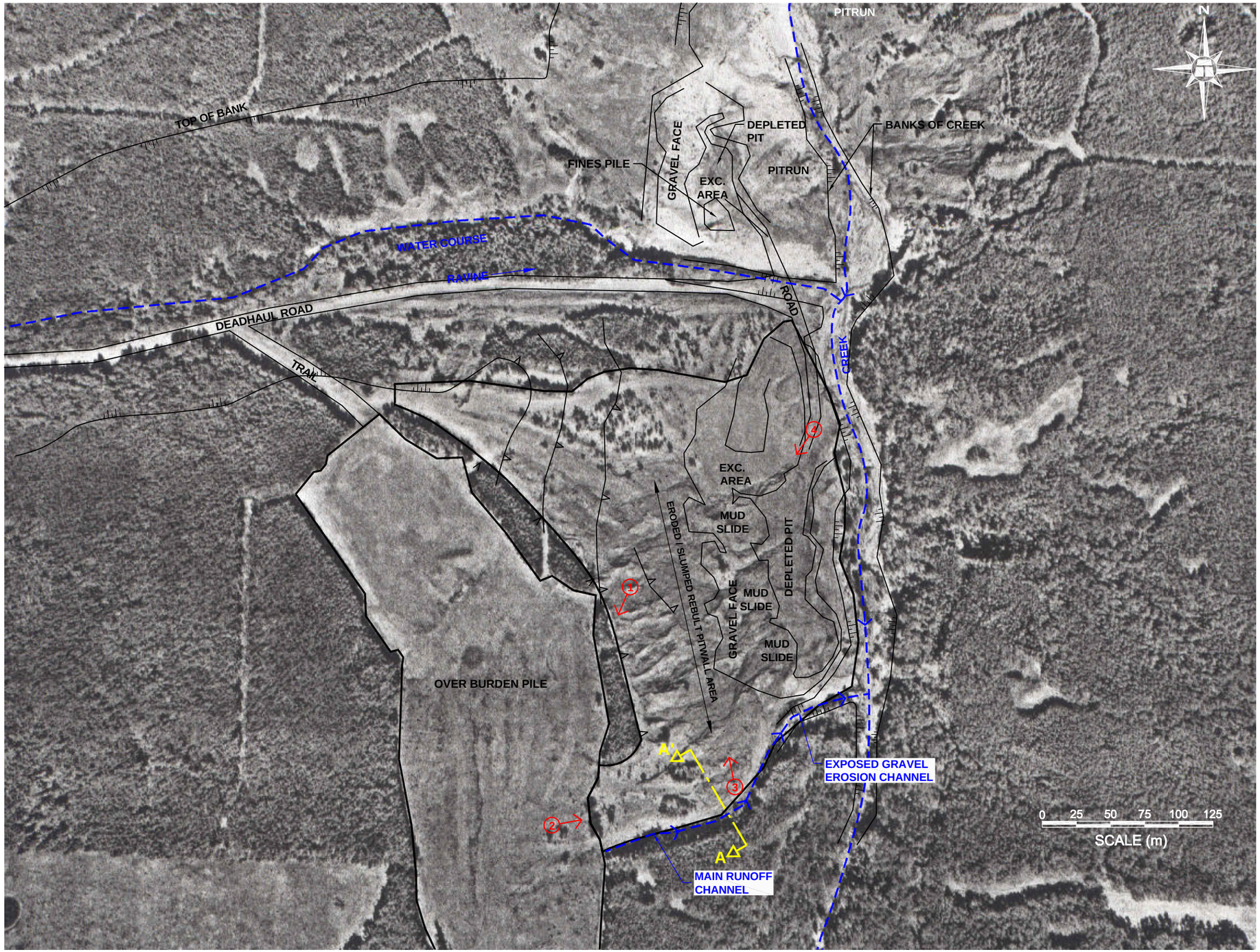
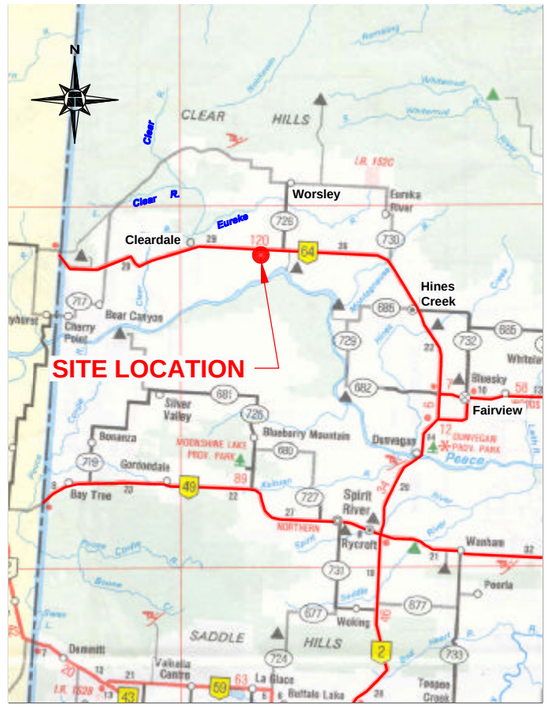
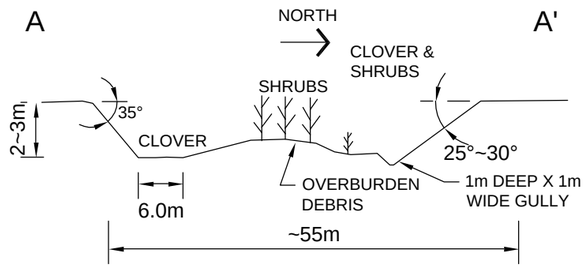




KEY MAP

1:1,500,000



CROSS-SECTION A-A'

N.T.S.

MENNO SIMONS EROSION SITE

(SW 8-85-8-W6M)

1:3000

FIGURE 1 SITE PLAN & CROSS-SECTION A-A'

PH14-MENNO SIMONS EROSION SITE

JULY 6, 2004 CALL OUT

THURBER PROJECT #15-16-190

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PHOTO 1 LOOKING SOUTH TO WEST ALONG UPPER PORTION OF REBUILT PIT SLOPE FROM APPROXIMATE CENTER OF STUDY AREA

HWY 64 - MENNO SIMONS EROSION SITE (PH14)

SELECTED PHOTOGRAPHS

DATE: JULY 7, 2004

THURBER PROJECT #15-16-192

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PHOTO 2 LOOKING EAST ALONG SOUTH EDGE OF REBUILT PIT WALL AT MAIN DRAINAGE CHANNEL FROM ABOUT 1/2 WAY UP THE OVERBURDEN PILE

PHOTO 3 LOOKING EAST ALONG REBUILT PITWALL SLOPE FROM ABOUT MIDSLOPE AT THE SOUTH END

PHOTO 4 LOOKING SOUTHWEST AT OLD PIT FACE FROM LEDGE ABOVE THE CREEK