

GEOHAZARD ASSESSMENT PROGRAM

PEACE RIVER / HIGH LEVEL AREA

2011 CALLOUT INSPECTION



Site Number	Location	Name	Hwy	km
PH45	North of Manning, AB	Meikle River (Pile Wall)	35:08	Approx. 27.5
Legal Description		UTM Co-ordinates		
SW1/4 7-94-22-5		11V N 6333081	E 467581	

	Date	PF	CF	Total
Previous Inspection:	June 6, 2011	10	4	40
Current Inspection:	June 30, 2011	11	4	44
Road AADT:	1060		Year:	2010
Inspected By:	(Don Proudfoot, Thurber Engineering) (Ed Szmata, John Bruce, Alberta Transportation)and (Hubert, LaPrairie)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	Slope movement and erosion affecting highway and sideslope		
Dimensions:	Pile wall length = 115 m (approximately)		
Date of any remediation:	2010 and 2011		
Maintenance:	Sink holes along pile wall were backfilled with sand three times in 2011 and five times in 2010. The erosion around the drain pipe was not backfilled.	Worsened?	
Observations	Description	Yes	No
<input checked="" type="checkbox"/> Pavement Distress	Crack widths ranging from 3 mm to 15 mm and crack drops up to 3 mm noted along previous backscarp location. There was a dip in the highway shoulder along 20 m of the wall	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	North slide cracks and graben more pronounced, about 1.3 m scarp.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Severe erosion around drain pipe and under the concrete apron.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Coming out from below the pile wall and from the pile wall subdrains.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Voids appeared along the wall during recent heavy rainfall. The joint in the concrete cap beam widened.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Instrumentation:			
Three slope inclinometers (SI-49, -50 and -51) were installed within the pile wall and remain operational. Pile head movement of 60 mm to 120 mm has been recorded in the slope inclinometers. The rate of movement measured in spring 2010 was 3 mm/year to 8 mm/year.			

Assessment (Refer to Figure PH45-1):

- Three voids appeared along the wall during the recent heavy rainfall.
- The void at the north side is encroaching into the roadway.
- The continued movement of the slope has resulted in the development and worsened the voids along the cap beam, which allows roadway surface runoff to seep down along the inside face of the wall and erode the granular fill beneath the pavement and cap beam, leading to the development of the sinkholes.
- Voids ranging from 150 mm to 650 mm were recorded underneath the cap beam as a result of recent rains.
- The erosion hole around the down drain pipe has worsened.
- Settlement under the drainage concrete apron has also worsened, and the apron is tilting and cracking. The drainage grate is plugged with sand.

Recommendations:

In the short term the site should be regularly inspected. Immediate maintenance is required to fill any voids that develop along the cap beam and to maintain a smooth even road surface for traffic safety.

In the short term, the void underneath the pile cap should be backfilled. A more robust plan was discussed on site which should be applied to the length of the pile wall and consists of the following:

- The loose material and debris underneath the pile cap should be removed and a flat ground surface should be provided below the pile cap, which should extend from the piles edge towards the outside, slightly beyond the pile cap.
- Permanent formwork consisting of treated timber planks constrained laterally by H-Piles pushed into the ground should be placed vertically, extending slightly above the bottom of the pile cap. Non-woven geotextile should be placed over the ground surface under the void and pulled up and stapled to the inside of the timber formwork.
- Extend 100 mm diameter PVC pipes through the timber lagging to promote drainage through the cap beam.
- A highly fluid mix of fillcrete can be poured through the gap left between the face of the pile cap and the formwork.
- After the void underneath the pile cap has been backfilled, the sinkholes in front of the pile wall may be over excavated and backfilled, using again a highly fluid mix of fillcrete.
- A stainless steel flashing should be connected to the cap beam and timber lagging to cover the top of the lagging wall.
- Consideration may be given to saw cutting the asphalt concrete and refurbishing the base for the pavement. This may require closing the southbound lane for construction. A ballpark cost for this work is \$100,000.

As the erosion underneath the drainage pipe is encroaching the highway, consideration should be given in backfilling the erosion hole around the drain pipe. The drain pipe should be removed to allow the erosion gullies in the slope to be filled with compacted clay fill and then re-installed with the drain depressed more relative to the road than in its current location. The slope repair should be top soiled and seeded and low flow soil covering should be placed over the repaired slope to reduce the potential of future surface erosion. The sand plugging the grate should be removed and the grate cleaned to promote drainage. The cracks in concrete apron should be repaired. The voids underneath the concrete apron should be filled with fillcrete. The ballpark cost for this work is \$35,000.

In the medium term the shallow slide downslope of the anchored gabion wall should be subexcavated and the slope rebuilt with compacted clay and protected from erosion with topsoil and low flow soil covering. Subdrains should be installed in any zones of seepage encountered during repairing of the slump and the existing subdrain outlet pipe should be repaired and extended out to a new gravel splash pad. If completed in conjunction with the down drain repairs, this work could cost in the order of \$25,000.

Fix the joint at the concrete wall using quick set grout.

In the long term, it is recommended that additional tie-backs be installed over the eastern part of the wall to better anchor the pile wall and stop the on-going movements before the wall breaks. A few test holes will need to be drilled to investigate subsurface conditions and pile / soil interaction analyses be required to develop the tie-back system design.



Photo 1 – View of pile wall looking northwest, showing the drainage inlet (Plugged with Sand).



Photo 2 – Downslope view of drainage pipe, showing erosion around it.



Photo 3 – Voids Underneath Cap Beam, Looking Southeast



Photo 4 – Developed Piping holes in front of pile wall, looking northwest.

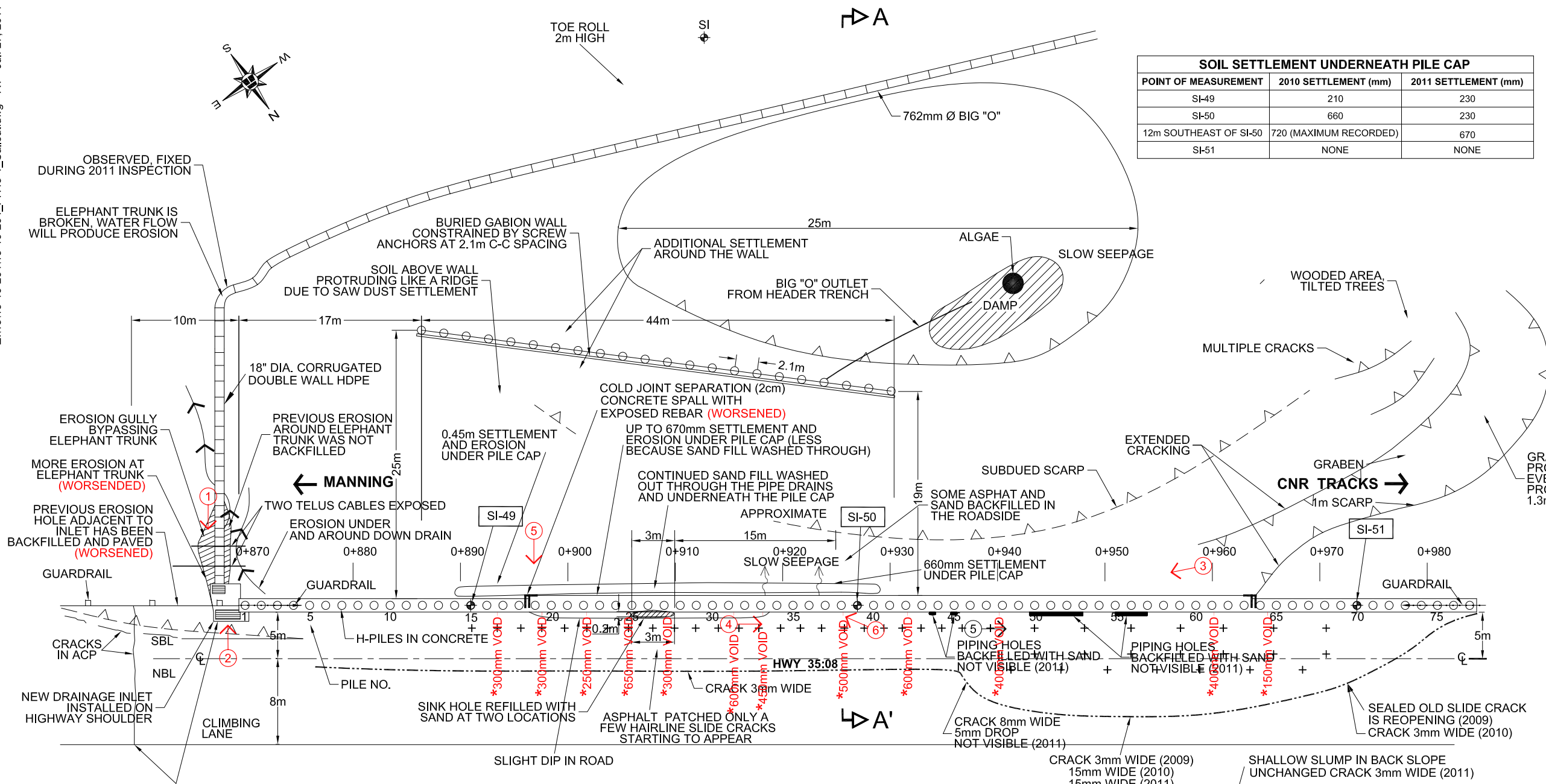


Photo 5 – Concrete joint Worsened.

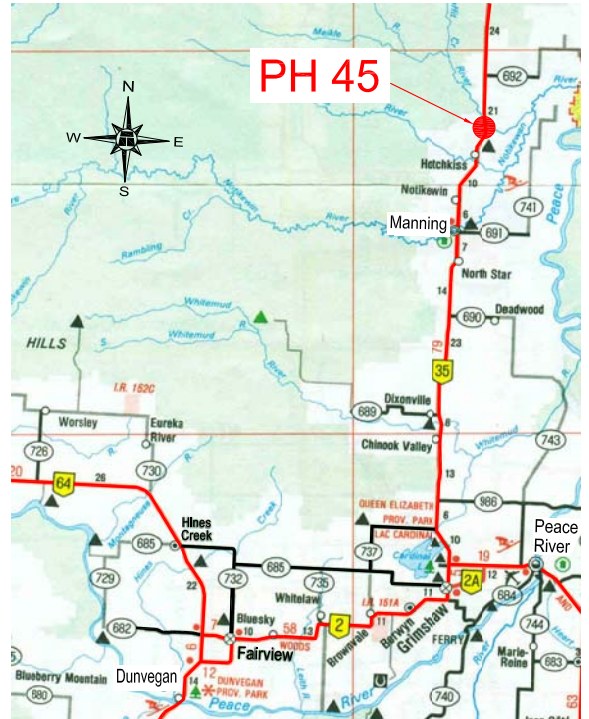


Photo 6 – Void underneath the pile cap showing sand washed out from the front of the pile cap.

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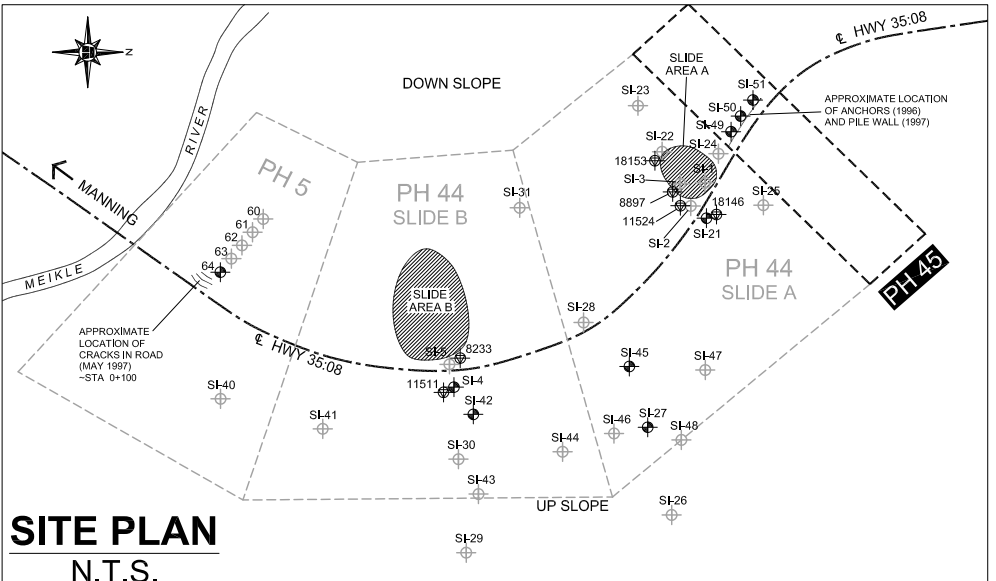
SOIL SETTLEMENT UNDERNEATH PILE CAP		
POINT OF MEASUREMENT	2010 SETTLEMENT (mm)	2011 SETTLEMENT (mm)
SI-49	210	230
SI-50	660	230
12m SOUTHEAST OF SI-50	720 (MAXIMUM RECORDED)	670
SI-51	NONE	NONE



SITE MAP
N.T.S.

- LEGEND:**
- SLIDE BACKSCARP
 - SLOPE INCLINOMETER (currently using)
 - SLOPE INCLINOMETER (not in use)
 - PIEZOMETER (not in use)
 - CONCRETE PILES
 - ANCHORS
 - PILE CAP BEAM
 - PHOTO AND DIRECTION
 - DIP IN PAVEMENT

SITE SKETCH PLAN
N.T.S.



SITE PLAN
N.T.S.

- NOTES:**
1. FEATURE LOCATIONS ARE APPROXIMATE
 2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
 3. JUNE 2011 (CALLOUT) OBSERVATIONS SHOWN IN RED
- *VOID MEASUREMENTS UNDER CAP BEAM SHOWN IN RED

