Wolverine Mine 2014 Tailings Facility Annual Inspection

Submitted to:

Wolverine Coal Partnership

Project Number: 341-8

Date:

November 4, 2014

Norwest Corporation

Suite 1830, 1066 W. Hastings Street
Vancouver, British Columbia V6E 3X2
Tel: (604) 602-8992
Fax: (604) 602-8951
Email: vancouver@norwestcorp.com

www.norwestcorp.com

Author:

Greg Lewsley, P. Eng.

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Table of Contents

List of Tables

List of Drawings

List of Figures

EXECUTIVE SUMMARY

The Wolverine Tailings Facility 2014 Annual Dam Safety Inspection is required as per Section 10.5.3 of the Health, Safety and Reclamation Code for Mines in British Columbia. The Wolverine Tailings Facility is classified as having high downstream consequences in the event of a dam breach event as defined in CDA Dam Safety Guidelines (CDA, 2007). Norwest completed the original permit design for the structure (Norwest, 2005 and 2007) and have been involved with its development since that time.

The mine was shut down on May 2014 and the tailings facility has been under care and maintenance since then. It is not known when the mine will re-open.

Background

The Wolverine Tailings Facility is comprised of a 1.4km long compacted fill dam that impounds slurry tailings deposited from spigot points along the dam crest line. Tailings are piped from the adjacent Wolverine process plant with clarified water recycled back from the impoundment. The tailings facility is located adjacent to the Wolverine Forest Service Road, BC Rail line and a natural gas pipeline operated by Shell Canada. These facilities are situated along and within 50m of the downstream eastern toe of the dam structure. The dam is comprised of an initial earth fill starter dyke completed in 2006, followed by continued downstream raises of Coarse Coal Reject (CCR) material until April 2012 to the design height of approximately 19m. Overburden exists beneath the dam footprint to a considerable depth (over 130m) and includes a thick compressible lower clay deposit.

2014 Inspection and Monitoring

The 2014 annual inspection was completed on October 1. There were no visual signs of instability or seepage related problems at this time. The dissipation of pore pressures in all the Lower and Middle piezometers continued throughout the year. The deepest piezometers (Lower) are showing a more delayed dissipation in pore pressures compared to the Middle piezometers due to the longer flow path of the deeper piezometers. Extensometer data shows 13cm of settlement from February 2013 to September 2014 and a total measured displacement of 62cm since monitoring began. The settlement is consistent with estimates in the 2007 design report. Displacement in the slope inclinometers has followed within expected rates.

Documentation

The latest version of the Operation, Maintenance, and Surveillance (OMS) Manual provided to Norwest is dated February 20, 2012. An Emergency Preparedness Plan (EPP) for the Perry Creek Mine was

provided to Norwest and is dated August 30, 2013. Both the OMS and the EPP require immediate updates in accordance with industry standards and regulatory requirements.

Recommendations

During care and maintenance period

1. Regular inspections (priority – ongoing weekly).
2. OMS (priority – within 1 month).
3. EPP (priority – within 1 month).
4. Installation of monitoring prisms (priority – 1 to 3 months).
5. Review seismic stability of the tailings dam to current CDA guidelines (priority – 1 to 3 months).
6. Downstream toe ditch buttress construction (priority – 3 to 6 months).
7. Reduce height of winter CCR Stockpile (priority – 3 to 6 months).
8. Continue with quarterly monitoring program (priority – ongoing).

Prior to resuming tailings discharge

1. Remove overbuilt portions of the tailings dam crest.
2. Completion of the northeast embankment to elevation 852m.
3. Installation of additional inclinometers.

1 INTRODUCTION

The Wolverine Coal Mine is regulated by British Columbia Ministry of Energy and Mines under Permit C-223. As part of the permit approval for the Wolverine Tailings Facility, there is a requirement to submit an annual Dam Safety Inspection report. This report has been prepared to meet this requirement.

The Wolverine Tailings Facility is comprised of a 1.4km long compacted fill dam that impounds slurry tailings deposited from spigot points along the dam crest line. Tailings are piped from the adjacent Wolverine process plant with clarified water recycled back from the impoundment. The tailings facility is classified as having high downstream consequences in the event of a dam breach event. This rating is due to the close proximity of the re-aligned Wolverine Forest Service Road, BC Rail line and a natural gas pipeline operated by Shell Canada. These facilities are situated along and within 50m of the downstream eastern toe of the dam structure.

Norwest has been involved in the design of the tailings dam since the conceptual design. Two Norwest design reports have been completed and submitted to WCP as part of the regulatory approval process:

- Permit Level Geotechnical Designs for the Tailings Facility and Coarse Coal Reject Pile, January, 2005. This report contains the design basis to construct the dam crest up to the 847m elevation.
- Mine Permit Amendment: Tailings and CCR Management Plan, April, 2007. This report provides additional foundation information and a revised design in support of raising the dam crest an additional 5 meters to the 852m elevation and increasing storage capacity.

The mine was shut down on May 2014 and the tailings facility was put under care and maintenance. The facility has not been used to deposit tailings or to reclaim water since that time. During Norwest's site visit, the tailings pond was visibly much smaller in comparison to the last annual inspection. Based on the latest topographic survey (August 2014) provided by WCP, the tailings pond was at an elevation of approximately 840.8m.

The starter dyke was completed in May 2006 prior to the start of commercial coal production in July 2007. The current dam crest is at the ultimate design elevation of approximately 852m with the exception of a low area on the north embankment which is constructed to a minimum elevation of 848m. The current as-built configuration of the dam based on the August 2014 ground survey provided by WCP is shown on Drawing 1. Overburden exists beneath the dam footprint to a considerable depth (over 130m) and includes a thick compressible lower clay deposit.

2 ASSESSMENT OF CURRENT CONDITIONS

Greg Lewsley, P.Eng., and Sean Ennis, P.Eng. visited the Wolverine Mine on October 1, 2014 and inspected the tailings facility accompanied by Walter Energy representative Amanda Wamsteeker. During the inspection, the entire length of the tailings dam was visually inspected for any signs of cracking or instability. The following sections discuss the observations for each of the key areas. Drawing 1 shows the as-built configuration of the tailings facility based on the August 2014 ground survey. Photos are presented in Appendix A.

2.1 Upstream Slope

There were no signs of cracking or instability observed and the upstream slope was in good condition (Photo 1). There were some minor erosional gullies along parts of the slope. Visual inspections should continue (particularly after heavy rainfall) along the upstream slope to ensure that the minor gullies do not develop further and propagate back into the crest.

2.2 Crest

There were no signs of cracking or instability observed (Photos 2 to 5). During operations, the crest area is used as a running surface for haul trucks to access the fill placement areas and is non-vegetated. There were no signs of ponded water or significant depressions at the time of the inspection.

2.3 Downstream Slope

There were no signs of cracking or instability observed. Placement of reclamation material has continued up most of the slope face since the last annual inspection (See Photos 6 to 8). This will help prevent the establishment of erosional gullies in the long term. Vegetation established on the northeastern slope has prevented the continuation of minor erosional gullies upslope (Photo 9). Erosional gullies observed on the northern abutment during the last annual inspection have since been remediated.

2.4 Toe Drain

The downstream toe drain ditch (Photos 10 to 12) is functioning as per design intentions and visibly clean water was observed flowing into the ditch. Culverts installed to allow water to discharge from the ditch into the Wolverine River were blocked off in 2012 due to environmental release restrictions. WCP recently obtained a conditional approval from the Ministry of Environment (in a letter dated September 25, 2014) to re-establish flow through the culverts. At the time of the inspection, water in the ditch was being pumped into an adjacent

settling pond (SP-12). Approximately 30 cm depth of water was ponding in the ditch at the northeastern corner (Photo 10), with the remainder of the ditch relatively dry (Photo 11). Site personnel have since reported that the culverts (Photos 10 and 12) have been unplugged (on October 3) and flow is now conveyed directly into the natural floodplain channels which drain into the Wolverine River.

2.5 Beach

The water level in the tailings facility was visibly low at the time of the inspection and the impoundment was mostly covered by beach (see Photo 13). Drawing 1 shows the approximate pond extent based on the August 2014 ground survey information. The tailings pond was approximately 840.8m based on the August 2014 survey. Regular water level measurements of the tailings pond should be taken to maintain a record over time.

2.6 Temporary Winter CCR Stockpile

The temporary winter CCR stockpile (Photo 14), as illustrated in Drawing 1, is about 8m larger than originally envisioned at an elevation just over 860m. Design guidelines were provided to WCP personnel in December 2013. These design guidelines were as follows:

- Do not expand the winter CCR stockpile towards the dam.
- No further CCR is to be placed above the 852m elevation.
- The winter CCR stockpile maximum height should be limited to 852m.

Norwest understands from discussions with site personnel that the winter CCR stockpile is used whenever temperatures are below -15°C. The cold temperatures make it difficult to meet the lift compaction specifications in the permanent CCR stockpile. Efforts should be made as soon as possible to reduce the current height of the stockpile to 852m.

3 INSTRUMENTATION

Instrumentation monitoring data is currently collected and reviewed by Norwest Corporation at the end of each quarter for review and reporting purposes. The data presented in the following sections is current to Q3 2014.

There are nine existing instrumentation stations used to monitor the performance of the tailings dam as illustrated on Drawing 1. Three of the instrumentation stations are located along the centerline of the original starter dyke crest at Stations 4+00, 7+00, and 9+00 and each consists of three nested foundation piezometers. Similarly, there are three instrumentation stations along the ultimate dam crest, also consisting of three sets of nested foundation vibrating wire piezometers. One of the instrumentation stations located along the centerline of the ultimate dam crest (Station 7+00) also has a slope inclinometer and a magnetic extensometer which were destroyed due to settlement around the inclinometer casing in August 2012. The slope inclinometer and magnetic extensometer were replaced in February 2013. There are three slope inclinometers installed along the ultimate toe of the dam at Stations 4+00, 7+00, and 9+00.

3.1 Piezometers

The piezometer data has been collected on a regular basis (usually once or twice monthly) and shows that the piezometers are functioning as intended. There are a total of six piezometer stations used to monitor the foundation pore pressures in the foundation units of the tailings dam. At each station, there is one tip located within the bouldery gravel unit (shallow aquifer) and two tips in the lower clay unit. The cross-sections on Drawing 1 show the position of the piezometer tips with pore pressure values last read in September 2014. Figure 1 shows the data for each station plotted as pore pressure elevation versus time. A summary of the data and discussion follows:

- The piezometers in the bouldery gravel unit (labeled as Upper) are providing an indication of the shallow groundwater table beneath the tailings dam with the exception of TF-VP-012 which is no longer functional. The Upper piezometers vary between elevations of 832m and 833m and show an annual rise (1 to 2m) during May and June corresponding with the spring freshet. The groundwater level is about 8 to 9m below the pond water elevation (840.8m on August 14, 2014) indicating that the upper clay unit and upstream blanket continue to act as seepage barriers between the tailings pond and the underlying natural groundwater regime.
- The piezometers in the lower clay unit (labeled as Middle and Lower) clearly indicated a response to loading from the starter dyke in mid-2006 and subsequent CCR placement

which began in mid-2007. Since CCR placement ended mid-2012, the Middle and Lower piezometers have shown continued pore pressure dissipation (i.e. post-construction). The Middle piezometers are installed about 5m below the top of the lower clay unit and are currently showing an average b-bar[1] of approximately 0.17. The Lower piezometers are installed about 20m below the top of the lower clay unit and are currently showing an average b-bar of approximately 0.42. The Lower piezometers are showing higher response to dam raising than the Middle piezometers because the upwards drainage path is longer which delays consolidation.

- The Lower piezometers installed initially beneath the starter dyke (TF-VP-001, -004, -007) in the lower clay unit are measuring a piezometric surface that is averaging about 0.6m higher elevation than that of the current dam elevation above the piezometers. This is more than likely the three-dimensional effects of loading due to placement of CCR on the downstream side of the tailings dam where the fill placement is higher than immediately above the piezometer nest. The Lower piezometers are deeper than the Middle piezometers and are showing a more delayed dissipation in pore pressures due to a longer flow path.

During the inspection, it was noted that some piezometers were missing labels. Piezometer cables should be clearly labelled to avoid errors during data collection.

3.2 Slope Inclinometers

There is one slope inclinometer located on the crest of the dam at Station 7+00 and three slope inclinometers located at the downstream toe at Stations 4+00, 7+00, and 9+00 as shown in Drawing 1. Some damage was sustained to the top of TF-SI-006 during 2014 but readings were still able to be taken from the casing. The top portion of the casing should be repaired prior to 2015 in order to prevent debris from plugging the slope inclinometer casing.

Figures 2 and 3 show the data plot profiles from the slope inclinometers for directions perpendicular to the dam centerline and parallel to the centerline (A and B directions, respectively). Table 3.1 shows the 2013 and 2014 annualized lateral displacement rates along with total displacement (perpendicular and parallel to the dam centerline) that the slope inclinometers have experienced.

[1] B-bar, or excess pore pressure parameter, is calculated as the ratio between the change in pore pressure and the change in vertical stress as the dam is raised.

Table 3.1
Slope Inclinometer Data

Slope Indicator (SI)	Station	SI Direction Relative to Dam Centerline	Annual Displacement Rate (mm/year)		SI Total Displacement (mm)
			2013	2014	
TF-SI-002	4+00	Perpendicular	15	8	38
		Parallel	7	5	25
TF-SI-006	7+00	Perpendicular	No significant movement		
		Parallel	No significant movement		
TF-SI-005	7+00	Perpendicular	<1	4	14
		Parallel	No significant movement		6
TF-SI-004	9+00	Perpendicular	11	5	29
		Parallel	No significant movement		5

Inclinometers TF-SI-002, TF-SI-004 and TF-SI-005 showed continuous movement throughout the year. TF-SI-002 and TF-SI-004 have shown a reduced rate of movement in 2014 (compared to 2013). TF-SI-005 indicates a slight increase in the rate of movement since the last annual inspection. There has been no significant movement detected in TF-SI-006.

The movement observed in these slope inclinometers is an expected response due to undrained loading of the dam fill on the underlying lower clay unit. Shear stresses produced by the undrained loading are contributing to lateral straining as observed at the top of the lower clay unit. As consolidation continues and the excess pore pressure in the clay dissipates, more of the load is transferred to the soil skeleton and lateral strains should reduce over time (provided there are no further dam raises). Based on the data observed to date, it appears that the slope inclinometers TF-SI-002 and TF-SI-005 are beginning to show signs of a reduced rate of displacement.

Two conditions which may be contributing to the observed movement were identified during the 2013 annual inspection and are provided below:

- Standing water in the toe ditch (which raises pore pressures beneath the structure). This has now been addressed by the unplugging of outlet culverts on October 3, 2014.
- Overbuilt portions of the tailings dam from material placed during the 2011/2012 construction season. This issue requires attention and should be given priority as soon as construction equipment becomes available to reduce the dam crest to the design elevation of 852m.

In order to address these issues, Norwest also recommended placement of a minor toe buttress to increase the factor of safety of the tailings dam downstream slope. Design work for the toe buttress is currently underway and will be provided in a separate report in November 2014 along with construction drawings.

3.3 Extensometer

There is one magnetic extensometer (TF-EX-003) located on the crest of the dam at Station 7+00, which was installed in February 2013. This instrument replaced TF-EX-002 which was destroyed in 2012. Data from TF-EX-003 was collected three times during the year. The uppermost magnet of TF-EX-003 indicates that 13cm of total settlement has occurred from February 2013 to September 2014.

Table 3.2 shows a summary of the historical extensometer data, current magnetic extensometer data and total measured settlement. The historical extensometer data indicates that at least 49cm of total settlement has occurred up to 2012 (no data was collected in 2009). Therefore, a minimum of 62cm total measured settlement has occurred at the tailings dam since construction.

Table 3.2
Extensometer Data

Instrument	Dates	Displacement
Historical Extensometer	Tailings Dam Inception to 2008	12cm
No Readings	2009	No measurements
Historical Extensometer (TF-EX-002)	2010 to August 2012 (Instrument was destroyed in August 2012)	37cm
TF-EX-003	February 2013 to September 2014	13cm
Total Measured Displacement		**62cm**

Making an allowance of 10 cm settlement for the 2009 data gap (based on observed settlements rates so far), the total settlement of the tailings dam is estimated at approximately 72cm since 2006. This is within the predicted settlement range of 1.4m after 15 years based on design report estimates (Norwest, 2007).

3.4 Monitoring Data Interpretation

Pore pressures in the lower clay unit piezometers are continuing to dissipate since the last raise of the tailings dam in the 2011/2012 construction season. The deepest (Lower) piezometers are showing a more delayed dissipation in pore pressures compared to the Middle piezometers due

to the longer flow path of the deeper piezometers which delays consolidation. The extensometer has indicated 13cm of settlement from February 2013 to September 2014 and a total measured displacement of 62cm. The settlement is consistent with estimates made in the 2007 design report. TF-SI-002 and TF-SI-004 appear to show reduced rates of lateral movement during the year in comparison to last year. TF-SI-005 indicates a slight increase in the rate of movement since the last annual inspection.

Upon reviewing all the monitoring data collected to date, the movement observed in the slope inclinometers and the extensometer is continuing in response to the loading of the tailings dam on the clay foundation. As expected, shear stress from the undrained loading is resulting in lateral straining which is evidenced in the inclinometer data along the dam toe. In order to improve understanding of this relationship, Norwest proposed the following during last year's annual inspection:

- Install survey prisms along the center line of the tailings dam at each slope inclinometer location to supplement the extensometer data.
- Increase monitoring coverage through the installation of two additional inclinometers at both the eastern (Section 3+00) and western (Section 11+00) corners of the tailings dam.

To date, this work has not yet been undertaken. Survey prisms should be installed prior to 2015 to confirm rates of movement/settlement along the dam crest as observed in the existing instruments. The additional inclinometers should be installed prior to resuming tailings discharge into the impoundment. Regular monitoring of the existing instruments should also continue, particularly after heavy rainfall and during the spring freshet. Site personnel should continue to visually inspect upstream slopes, crest areas, downstream slopes and the toe ditch on a weekly basis.

As part of the 2014 toe buttress design (currently ongoing), a numerical model for a critical section of the tailings dam was developed to analyze the stress-strain behaviour of the fill and foundation materials. The numerical model incorporates the loading history of the tailings dam with the placement of the starter dyke through to the current dam crest elevation of 852m. Preliminary results indicate confirm that the structure should deform both vertically and laterally, as expected, with similar displacements to extensometer and inclinometer measurements in the field. Further details will be presented in the upcoming toe buttress design report, which will be provided to WCP in November.

4 LEGISLATIVE REQUIREMENTS

The Health, Safety and Reclamation Code for Mines in British Columbia (2008) requires major impoundments with a high consequence rating, as defined by Canadian Dam Association (CDA) Dam Safety Guidelines, to have a current Operation, Maintenance, Surveillance (OMS) manual and Emergency Preparedness Plan (EPP).

4.1 OMS Manual

WCP personnel provided Norwest with the current version of the OMS manual for the tailings facility, which was last updated February 20, 2012. The current manual does not meet the requirements for an OMS manual as outlined in Section 3 of the CDA Dam Safety Guidelines, a copy of which was provided to WCP in last year's annual inspection report. The OMS manual should also be consistent with the Mining Association of Canada's guidelines: Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities (Mining Association of Canada, 2011).

4.2 Emergency Preparedness Plan

An Emergency Preparedness Plan (EPP) for the Perry Creek Mine (Rev 4, August 2013) was provided to Norwest. This EPP did not clearly define the emergency response process specific to the tailings facility. The EPP should be updated to specifically cover the tailings facility area in accordance regulatory requirements (British Columbia Ministry of Energy and Mines, CDA Dam Safety Guidelines).

4.3 Independent Review

An independent review is due for the Wolverine Tailings Facility in 2014, based on the CDA Dam Safety Guidelines for impoundments with high consequence rating. Norwest was informed by WCP management that Tetra-tech EBA was selected to complete the independent review. Norwest have provided supporting documentation to the review consultant (Chris Johns P.Eng., Tetra-Tech EBA, Kelowna).

4.4 Seismic Stability Review

The CDA have recently released a mining dams bulletin (October 2014) which includes guidelines on the recommended earthquake return period for a mining dam. A review of the dam seismic stability should be conducted based on the new guidelines.

5 WATER BALANCE, FREEBOARD AND REMAINING CAPACITY

5.1 Water Balance

A water balance was not provided to Norwest for the tailings facility. Since the plant is currently not in operation, tailings water has not been discharged into the impoundment (nor recycled) since May 2014. This has caused the water level in the impoundment to decrease significantly since then. Based on a comparison between the August 2013 LiDAR survey and the August 2014 ground survey, the relative water volume in the impoundment was estimated to have decreased by approximately 130,000m^3, based on an assumed beach below water slope of 1%.

5.2 Freeboard

The design freeboard of the tailings facility is 2m (from the water pond to the crest of the dam). The northern abutment is currently built to an elevation of 848m and the tailings pond elevation is 840.8m (as of August 2014) which equates to over 7m of freeboard. An additional 4m of freeboard will be gained with the completion of the northern abutment to the design elevation of 852m.

5.3 Remaining Capacity

Using the August 2014 ground based survey and an assumed final beach slope of 1%, the remaining ultimate tailings capacity is estimated to be 1,732,000m^3, assuming completion of the northern abutment to the 852m. This abutment will require a design for the tie in to natural ground using on the original specification outlined in the Mine Permit Amendment: Tailings and CCR Management Plan, April 2007. The remaining capacity of the current as-built dam (i.e. based on the lowest crest elevation of 848m at the northern abutment) is 592,000m^3.

6 ITEMS THAT REQUIRE ATTENTION

Based on the monitoring data and observations made over 2014, items that require follow-up actions related to the tailings facility are discussed below.

6.1 During Care and Maintenance Period

1. Regular inspections (priority – ongoing weekly). Regular inspections including pond water management is critical to the stability of the tailings impoundment. Site personnel should continue to visually inspect upstream slopes, crest areas, downstream slopes and the toe ditch on a weekly basis. (Note - Norwest can provide a template to WCP for use in dam inspections.) Continued monitoring particularly after heavy rainfall and during the spring freshet should remain a priority. Monthly records of the tailings pond water level should be maintained. Piezometer cables should be clearly labelled to avoid data collection errors.

2. OMS (priority – within 1 month). Update and expand the current OMS manual to meet regulatory requirements and CDA guidelines.

3. EPP (priority – within 1 month). Create an EPP that to meet regulatory requirements and CDA guidelines.

4. Installation of monitoring prisms (priority – 1 to 3 months). Installation of monitoring prisms along the dam centerline will provide additional settlement data.

5. Review seismic stability of the tailings dam to current CDA guidelines (priority – 1 to 3 months). The CDA have recently released a mining dams bulletin (October 2014) which includes guidelines on the recommended earthquake return period for a mining dam. A review of the dam seismic stability should be conducted based on the new guidelines.

6. Downstream toe ditch buttress construction (priority – 3 to 6 months). Norwest are currently completing the buttress design.

7. Reduce height of Winter CCR Stockpile (priority – 3 to 6 months). The stockpile should be reduced to the maximum recommended elevation of 852m.

8. Continue with quarterly monitoring program (priority – ongoing). Norwest recommends a continuation of the current monitoring regime, which includes quarterly readings by qualified geotechnical personnel.

6.2 Prior to Resuming Tailings Discharge

1. Remove overbuilt portions of the tailings dam crest. Reduce overbuild to the permitted design crest elevation of 852m (approximate Stations 5+00 to 11+00).

2. Completion of the northeast embankment to elevation 852m. Overbuild material removed between Stations 5+00 to 11+00 can be used to fill area up to the design elevation of 852m. A foundation inspection will be required by the Engineer of Record to tie the embankment into the abutment at the design elevation, according to specification outlined in the Mine Permit Amendment: Tailings and CCR Management Plan (Norwest, 2007). Quality assurance / quality control procedures should also be followed to ensure fill compaction requirements are met.

3. Installation of additional instrumentation. Install two more inclinometers at each corner of the tailings dam (Stations 3+00 and 11+00). Adverse changes in the rates of movement or pore pressure conditions may necessitate these additional inclinometers to be installed sooner.

6.3 Items Addressed Since Previous Annual Inspection

1. Toe ditch drainage. This has now been addressed by the opening of outlet culverts on October 3, 2014.

2. Erosional gullies on northern abutment. These have been addressed and there is no evidence of any erosion of concern.

3. Independent dam safety review. An independent review is currently underway and is scheduled for submission this year.

7 CLOSURE

All geotechnical information and results contained herein has been reviewed and interpreted by Greg Lewsley, P.Eng. and Sean Ennis, P.Eng., with Richard Dawson P.Eng. providing senior review.

As mutual protection to Wolverine Coal Partnership, the public and ourselves, this report, figures and drawings are submitted for exclusive use of Wolverine Coal Partnership. We specifically disclaim any responsibility for losses or damages incurred through the use of our work for a purpose other than as described in the report. This report should not be reproduced in whole or in part without our express written permission, other than as required in relation to the 2014 Annual Tailings Facility Inspection.

Yours sincerely,

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G. LEWSLEY # 35357

4 Nov 2014

Greg Lewsley, P.Eng.
Geotechnical Engineer

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA S. ENNIS

Sean Ennis, P.Eng.
Vice President, Mining

8 REFERENCES

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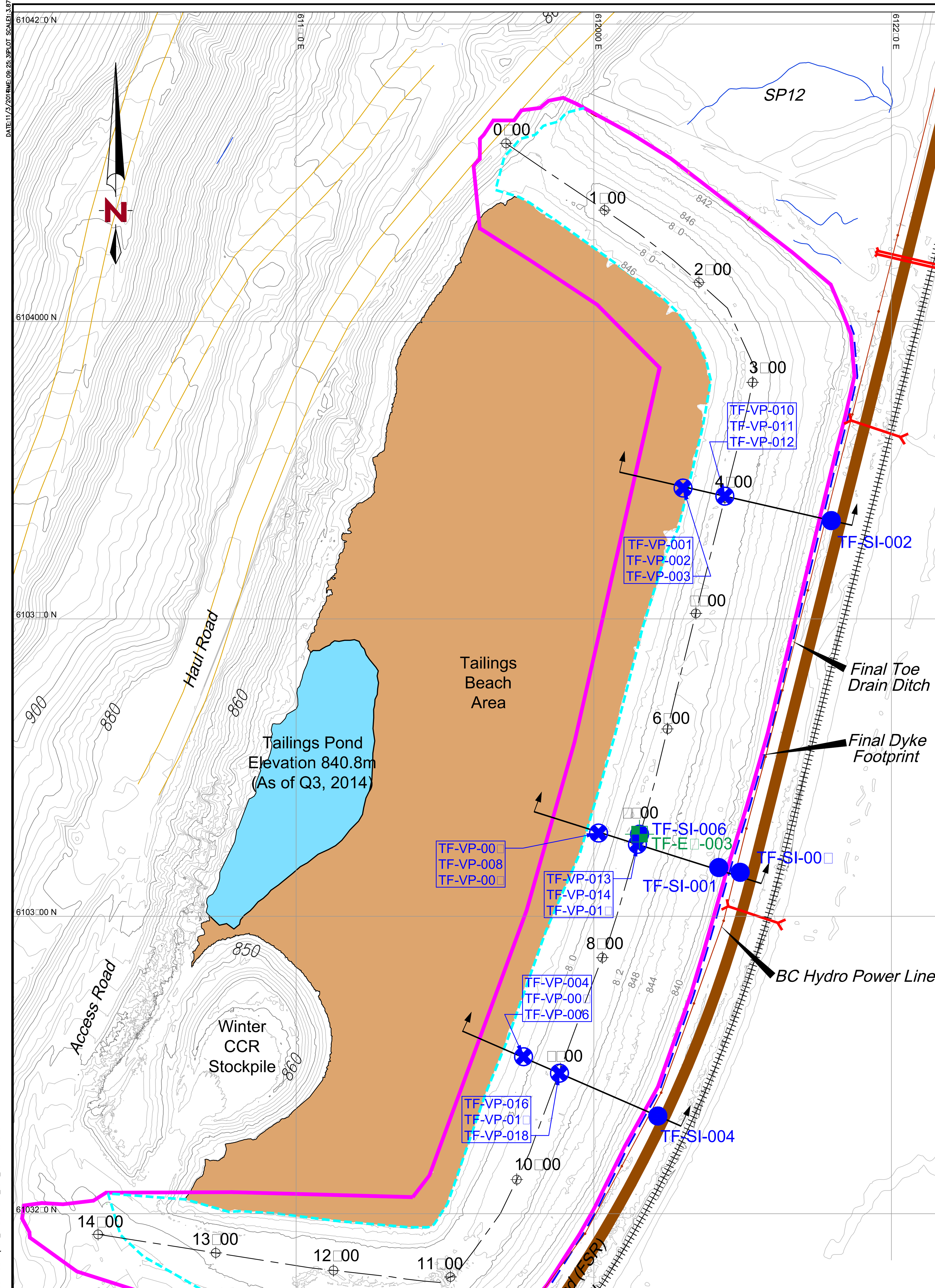
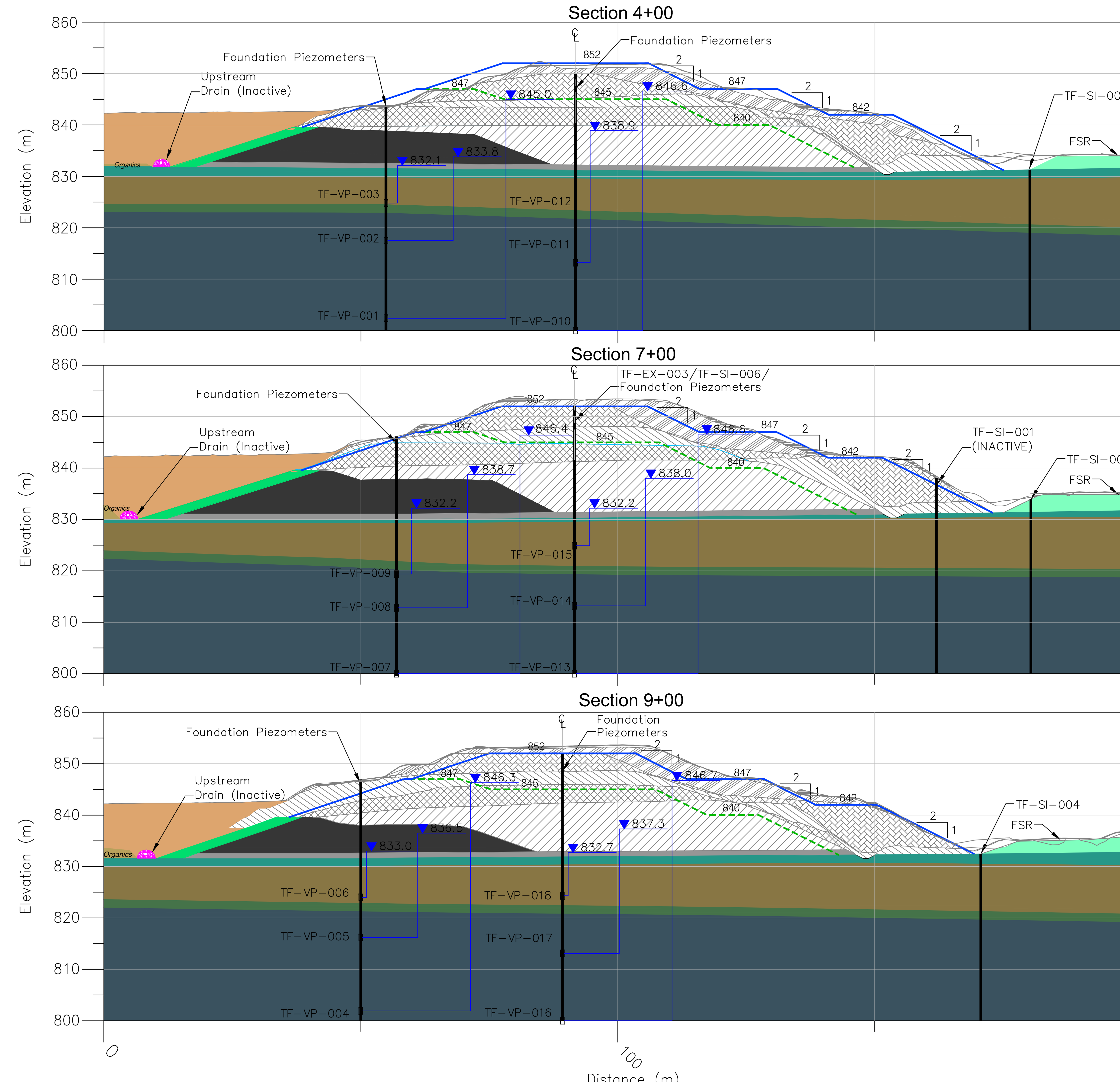


TOPOGRAPHIC SURVEY DATA AS OF AUGUST 2014
PROVIDED BY WOLVERINE COAL PARTNERSHIP.

SCALE 1:2500
SCALE INDICATED IS BASED ON A 22"□34" PRINT FORMAT

LEGEND

- FOUNDATION PIEZOMETERS
- SLOPE INCLINOMETER
- E□TENSOMETER
- 0□00 CHAINAGE STATION
- AS-BUILT DAM
- TOE DRAIN DITCH
- REVISED PERMIT APPLICATION FOOTPRINT □8□2□ □
- CULVERT
- POWERLINE



Tailings Facility - Instrumentation Details

Station	Borehole	Easting	Northing	Ground Elevation (m)	SI #	SI Depth (m)	VWP #	Tip Elevation	Extensometer #	Comments
4+00	NW-1265-CPT	612075	6103860	838.8			**TF-VP-003**	824.8		Uppermost tip in Bouldery Gravel, Lower tips in Lower Clay
							TF-VP-002	817.5		
							TF-VP-001	802.4		
	NW-1711-BH	612110	6103852	843.7			**TF-VP-012**	825.2		Uppermost tip in Bouldery Gravel, Lower tips in Lower Clay
							TF-VP-011	813.2		
							TF-VP-010	798.1		
	NW-1712-BH	612191	6103841	834.0	**TF-SI-002**	129.0				SI anchored in Till
7+00	NW-1791-BH	612123	6103537	834.0	**TF-SI-005**	138.0				SI anchored in Till
	NW-1272-CPT	612004	6103570	832.8			**TF-VP-009**	819.4		Uppermost tip in Boulder Gravel, Lower tips in Lower Clay
							TF-VP-008	812.8		
							TF-VP-007	798.5		
	NW-1713-BH	612037	6103560	846.5			**TF-VP-015**	824.9		Uppermost tip in Boulder Gravel, Lower tips in Lower Clay
							TF-VP-014	813.2		
							TF-VP-013	797.4		
	NW-1714-BH	612038	6103569	846.5	**TF-SI-006**	122.0			**TF-EX-003**	SI anchored in Till
9+00	NW-1271-CPT	611941	6013382	838.3			**TF-VP-006**	824.0		Uppermost tip in Boulder Gravel, Lower tips in Lower Clay
							TF-VP-005	816.2		
							TF-VP-004	801.9		
	NW-1715BH	611971	6013368	847.1			**TF-VP-018**	824.3		Uppermost tip in Boulder Gravel, Lower tips in Lower Clay
							TF-VP-017	813.1		
							TF-VP-016	798.3		
	NW-1716-BH	612049	6013364	834.3	**TF-SI-004**	128.0				SI anchored in Till

LEGEND

- PERMIT TAILINGS DY□E □84□□ □
- REVISED PERMIT APPLICATION □8□2□ □
- STARTER DY□E
- UPSTREAM BLAN□ET
- ROC□FILL PAD
- UPPER CLAY
- BOULDERY GRAVEL
- SAND□SILT
- LOWER CLAY
- TAILINGS
- 84□2 PIEZOMETRIC ELEVATIONS □AS OF □3 MONITORING□
- CCR □200□-2008□
- CCR □200□□
- CCR □2010□
- CCR □2011□
- CCR □2012□
- CCR □2013□
- CCR □2014□

SCALE 1:500
SCALE INDICATED IS BASED ON A 22"□34" PRINT FORMAT

SCALE INDICATED IS BASED ON A 22"□34" FORMAT PRINT

REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2014-11-03	ISSUED FOR ANNUAL INSPECTION REPORT	□M	GL	GL	SE

WALTER ENERGY™

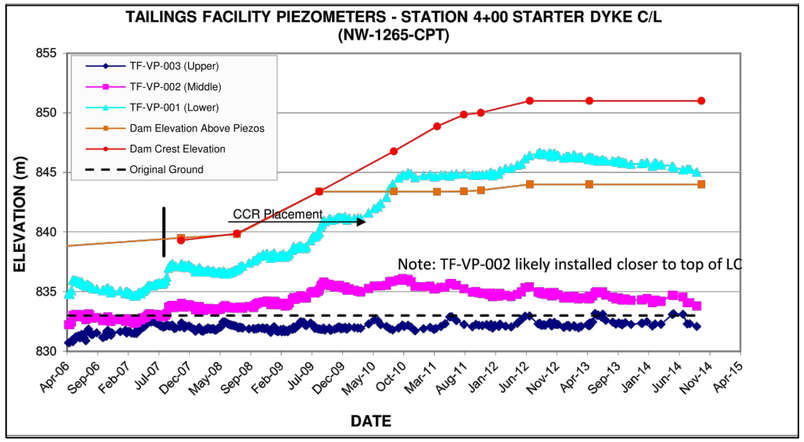
WOLVERINE COAL PARTNERSHIP
WOLVERINE PROJECT

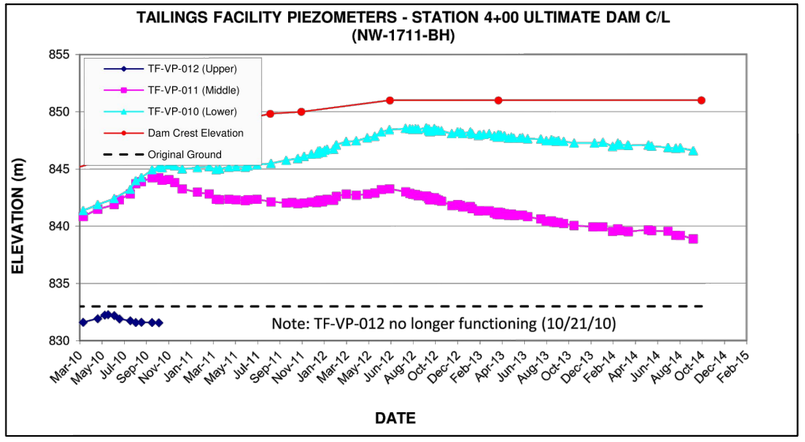
SCALE:	AS SHOWN
DATE:	2014-11-03
CO-ORD. SYS.:	UTM NAD83-10
DRW'N BY:	SC
DSG'N BY:	GL
REV'D BY:	GL
APP'D BY:	SE

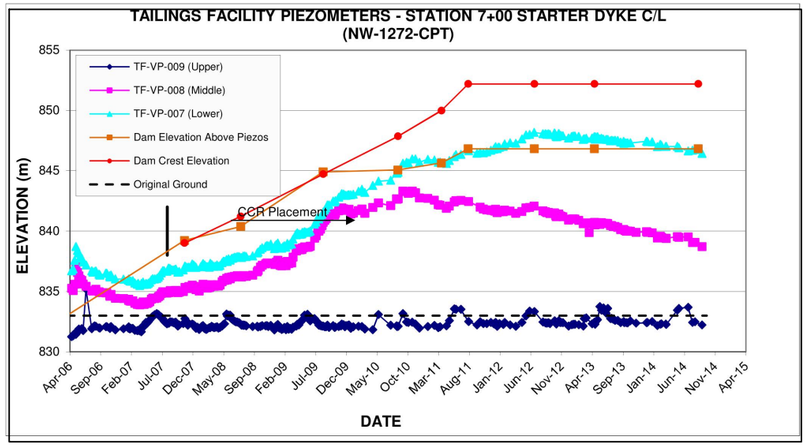
DRAWING 1
TAILINGS FACILITY
AS-BUILT AUGUST 2014

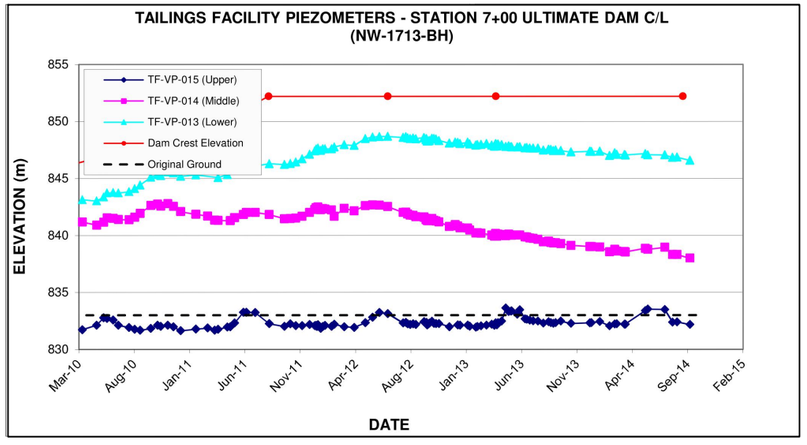
NORWEST

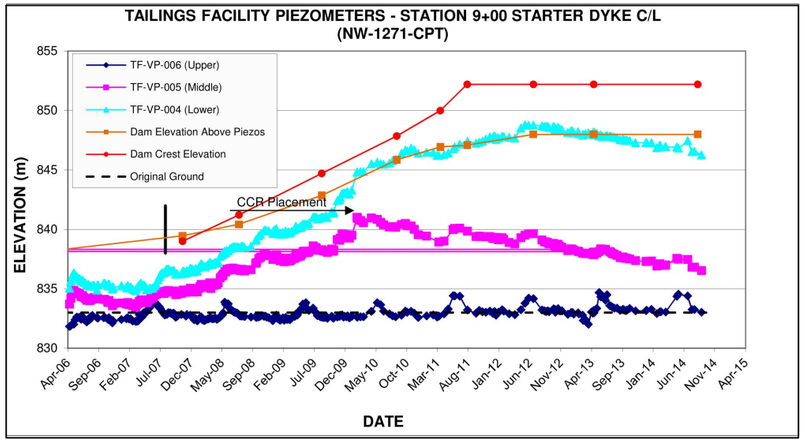
PROJECT NO.:	DWG. NO.:	REV.:
341-8	1	0

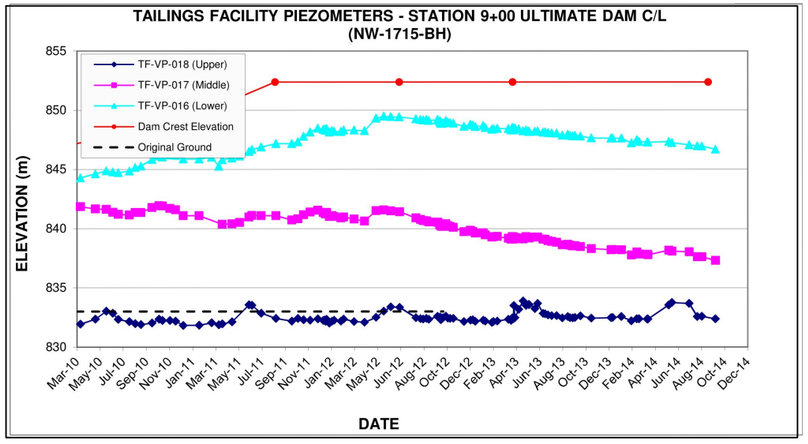












REV.	DATE	DESCRIPTION	DWN	DSG	CHK	APR
0	2014-10-16	ISSUED FOR ANNUAL INSPECTION REPORT	SC	GL	GL	SE

WALTER ENERGY

WOLVERINE COAL PARTNERSHIP

WOLVERINE PROJECT

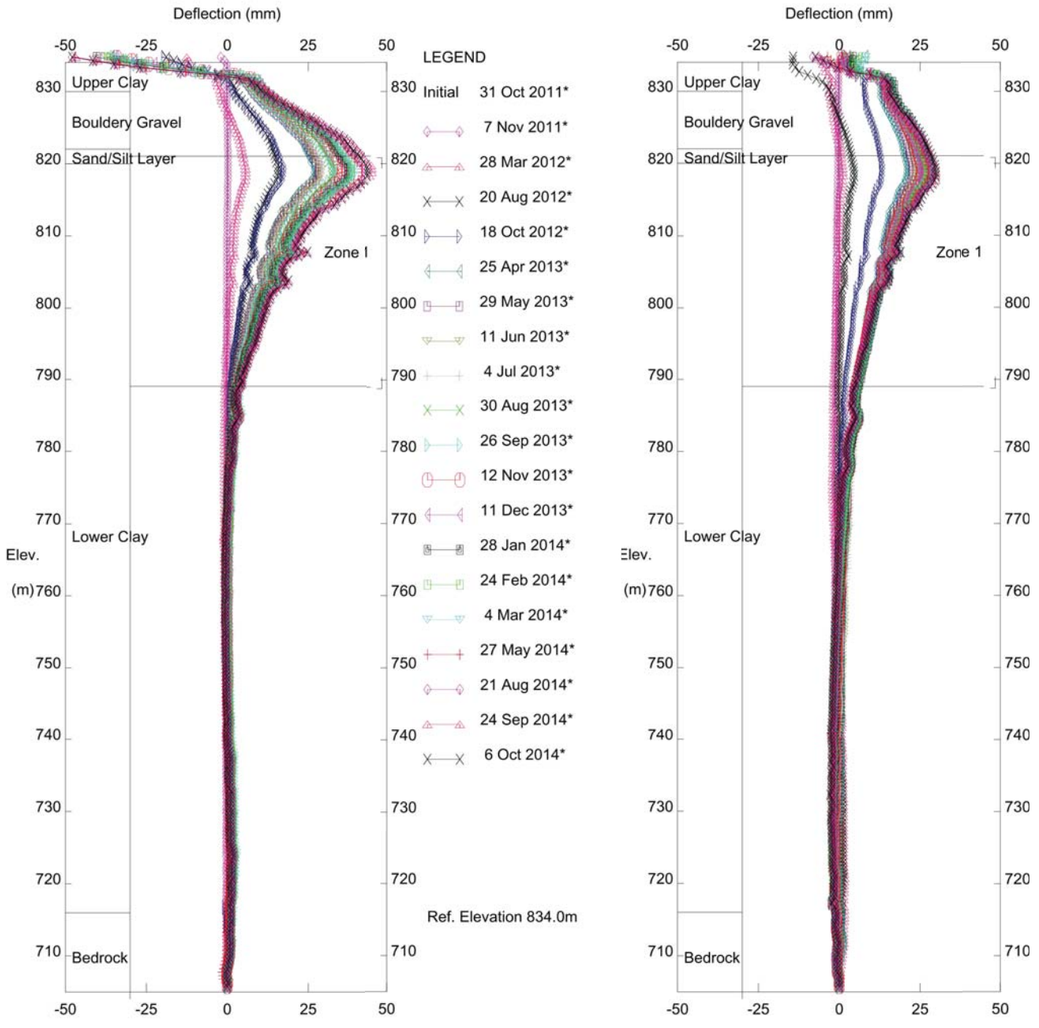
SCALE:	AS SHOWN
DATE:	2014-10-16
CO-ORD. SYS.:	UTM NAD83-10
DRW'N BY:	SC
DSG'N BY:	GL
REV'D BY:	GL
APP'D BY:	SE

FIGURE 1
TAILINGS FACILITY
FOUNDATION PIEZOMETER DATA

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
341-8	1	0

Norwest Corporation - Vancouver, BC



Cumulative Deflection

Direction A

Perpendicular to Dam Crest

Cumulative Deflection

Direction B

Parallel to Dam Crest

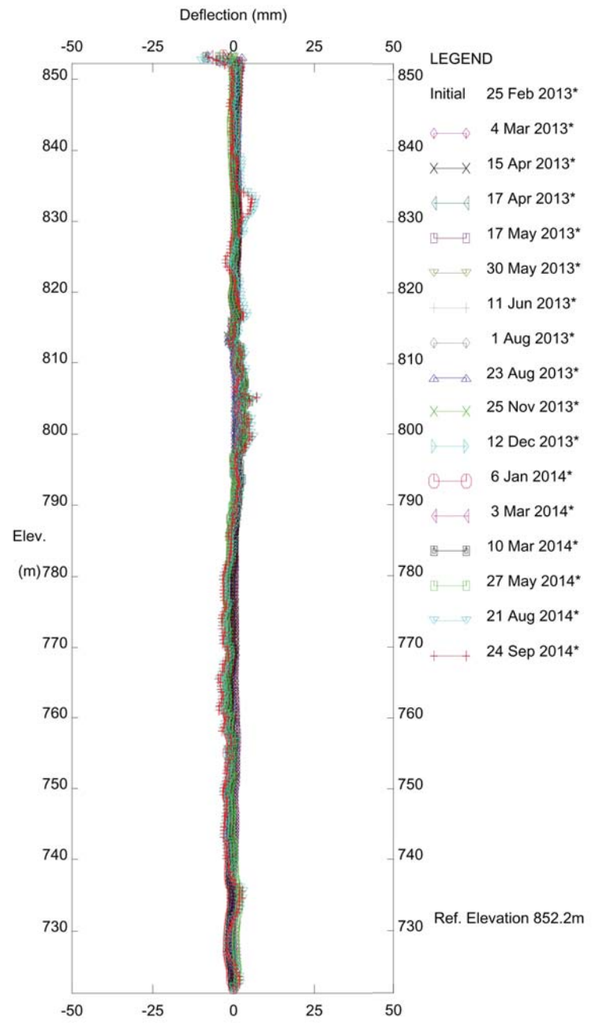
Tailings Facility, Inclinometer TF-SI-002

Walter Energy

Wolverine

Sets marked * include zero shift and/or rotation corrections.

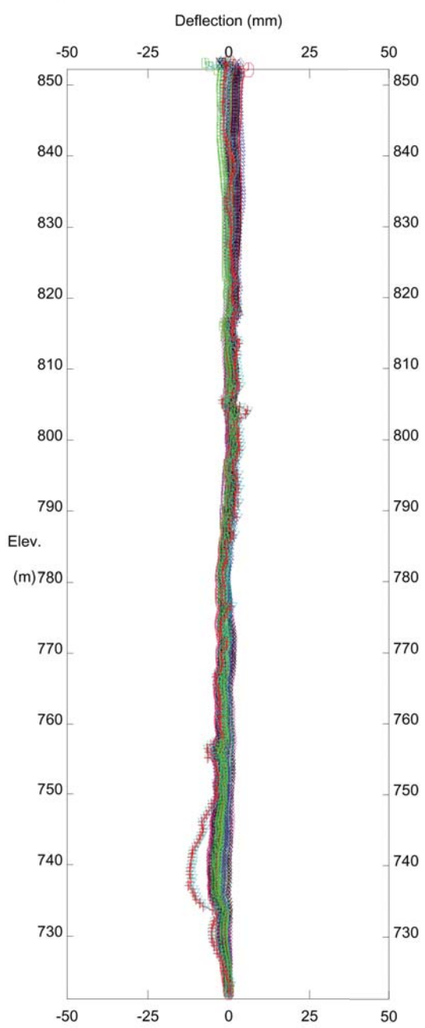
Norwest Corp - Vancouver BC



Cumulative Deflection

Direction A

Perpendicular to Dam Crest



Cumulative Deflection

Direction B

Parallel to Dam Crest

Tailings Facility, Inclinometer TF_SI_006

Walter Energy

Sets marked * include zero shift and/or rotation corrections.

REV.	DATE	DESCRIPTION	KM DWN	GL DSG	GL CHK	SE APR
0	2014-11-03	ISSUED FOR ANNUAL INSPECTION REPORT				

WALTER ENERGY

WOLVERINE COAL PARTNERSHIP

WOLVERINE PROJECT

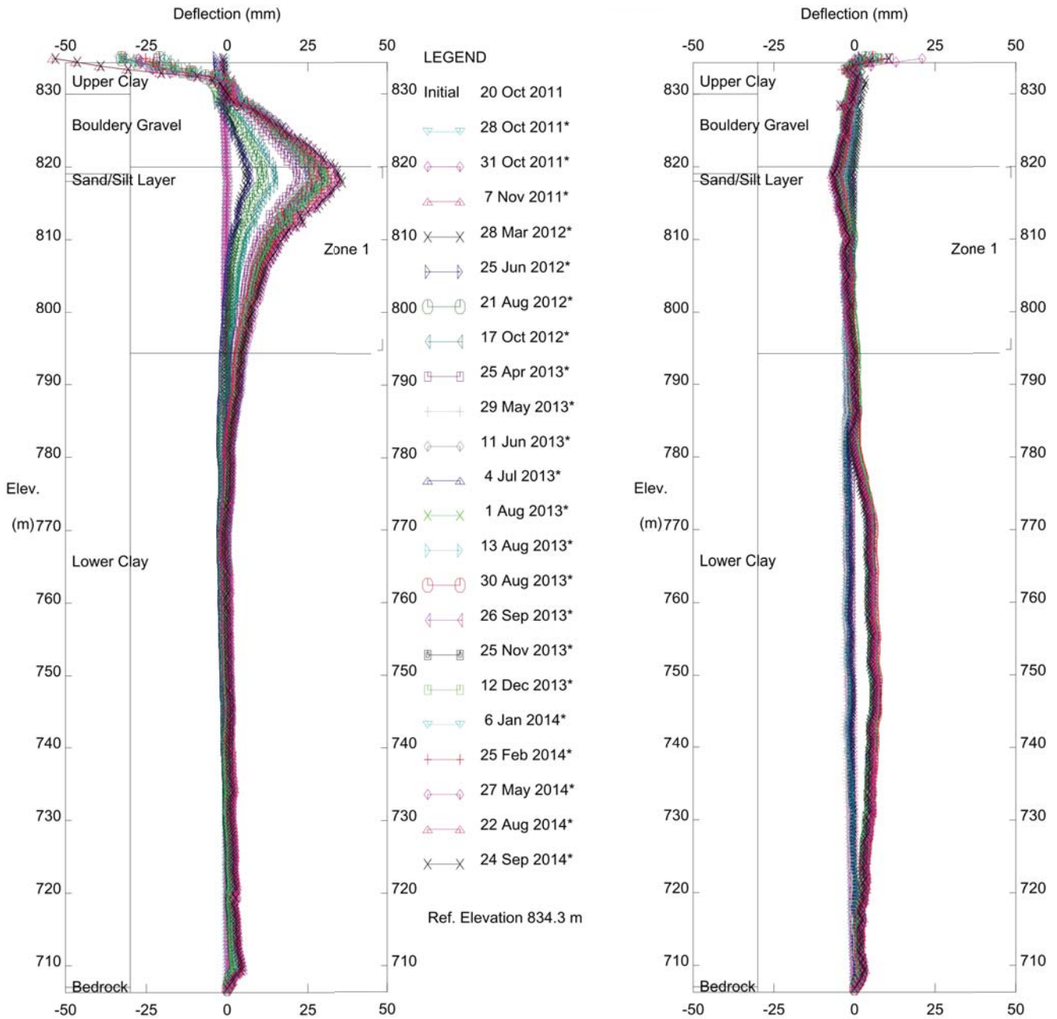
SCALE:	AS SHOWN
DATE:	2014-11-03
CO-ORD. SYS.:	UTM NAD83-10
DRW'N BY:	SC
DSG'N BY:	GL
REV'D BY:	GL
APP'D BY:	SE

FIGURE 2
TAILINGS FACILITY
SLOPE INCLINOMETER DEFLECTION DATA

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
341-8	2	0

Norwest Corp - Vancouver BC



Cumulative Deflection

Direction A

Perpendicular to Dam Crest

Cumulative Deflection

Direction B

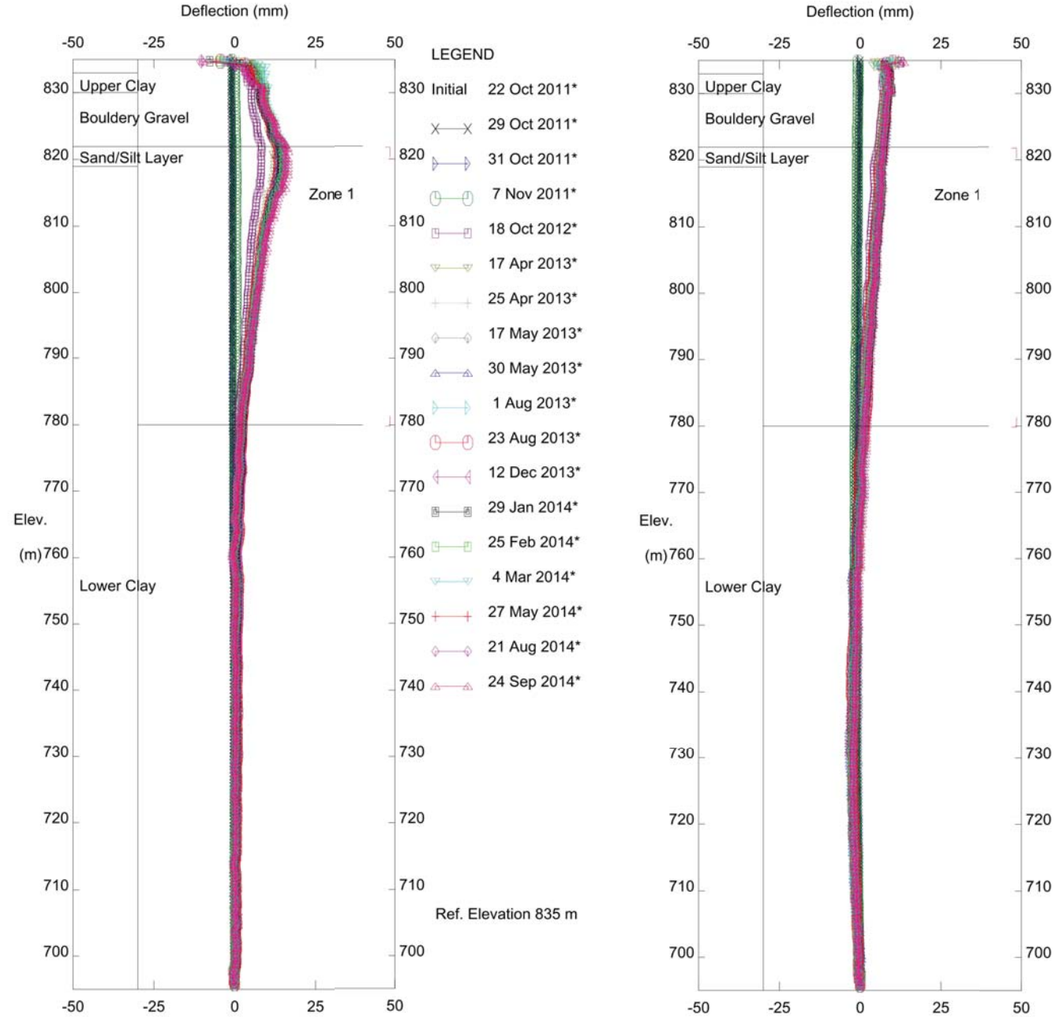
Parallel to Dam Crest

Tailings Facility, Inclinometer TF-SI-004

Western Canadian Coal

Sets marked * include zero shift and/or rotation corrections.

Norwest Corp - Vancouver BC



Cumulative Deflection

Direction A

Perpendicular to Dam Crest

Cumulative Deflection

Direction B

Parallel to Dam Crest

Tailings Facility, Inclinometer TF-SI-005

Western Canadian Coal

Sets marked * include zero shift and/or rotation corrections.

REV.	DATE	DESCRIPTION	KM DWN	GL DSG	GL CHK	SE APR
0	2014-11-03	ISSUED FOR ANNUAL INSPECTION REPORT				

WALTER ENERGY

WOLVERINE COAL PARTNERSHIP

WOLVERINE PROJECT

SCALE:	AS SHOWN
DATE:	2014-11-03
CO-ORD. SYS.:	UTM NAD83-10
DRW'N BY:	SC
DSG'N BY:	GL
REV'D BY:	GL
APP'D BY:	SE

FIGURE 3
TAILINGS FACILITY
SLOPE INCLINOMETER DEFLECTION DATA

NORWEST

PROJECT NO.:	FIG. NO.:	REV.:
341-8	3	0

Appendix A
Photos

Photo 1: Upstream slope of the main embankment (looking southwest).

Photo 2: Crest area of the south embankment (looking east).

Photo 3: Crest area of the main embankment (looking northeast).

Photo 4: Crest area of the main embankment (looking southwest).

Photo 5: Crest area of the northern embankment (looking southeast).

Photo 6: Reclamation material placed on the southern embankment downstream slope (looking east).

Photo 7: Reclamation on the main embankment downstream slope (looking northeast)

Photo 8: Reclamation on the northeastern embankment downstream slope (looking southeast)

Photo 9: **Reclamation on the northeastern embankment downstream slope. Further erosion has been minimized due to the presence of established vegetation.**

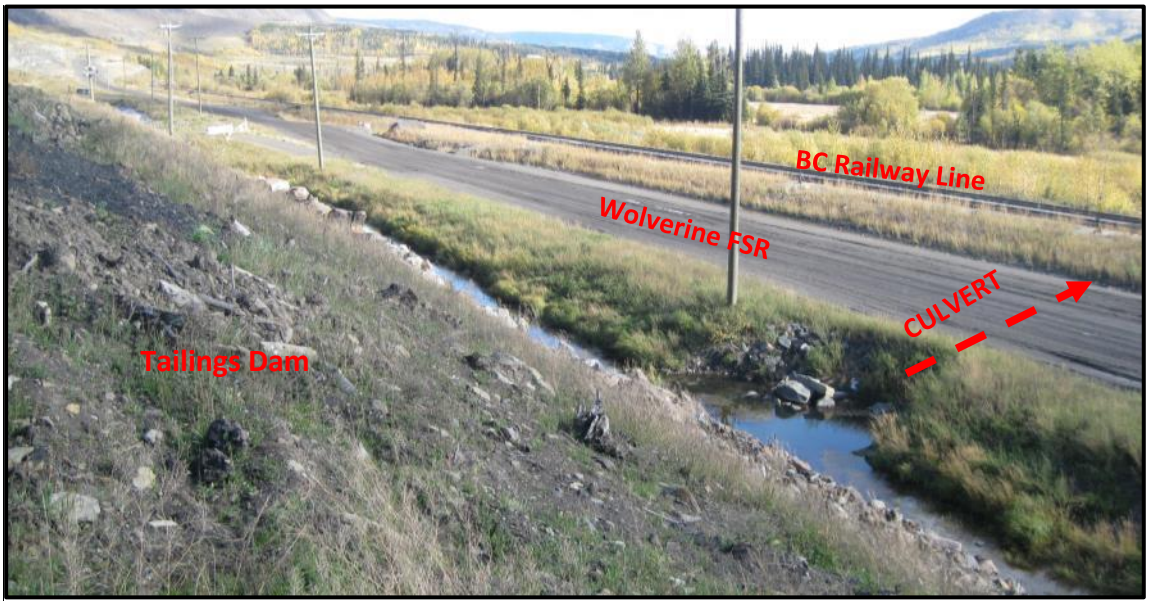


Photo 10: **Toe drain ditch at approx. Station 3+00 (looking northeast). Water ponding between approx. Stations 3+00 and 4+50 due to plugged culverts at time of inspection. Culverts have since been opened up.**

Photo 11: **Toe drain ditch between Stations 4+00 and 5+00 (looking south). Ditch is generally dry from this point heading south.**

Photo 12: **Toe drain ditch at approx. Station 7+00 (looking northeast). Minor flow (< 0.5 l/s, clear) observed coming from the toe drain and directly into the culvert.**

Photo 13: Tailings beach with edge of pond on far left (looking north).

Photo 14: Winter CCR Temporary Stockpile (looking southwest) with tailings pond on right side.