

Government of Yukon  
Energy Mines and Resources  
Assessment and Abandoned Mines



**Implementation of Immediate Actions at the Former Clinton Creek  
Asbestos Mine Site**



January 18, 2014

Erik Nyland, P.Eng.

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## Introduction

Boreal Engineering Ltd. (BEL) was contracted by Assessment and Abandoned Mines (AAM) to implement immediate actions at the former Clinton Creek asbestos mine site. These works were completed during the 2013 summer season.

## Project Purpose and Objective

During the Performance Monitoring Program completed in August 2012, several items/areas of concern were identified and direction was provided that access to the site should be closed until these were addressed. The consultant, Associated Engineering, provided a list of immediate actions that should be undertaken prior to allowing government personnel and contractors access to the site. This project was required in order to ensure that human health and safety is protected and so that various works can continue at the site (i.e. provide workers with safe access to the site for monitoring, care and maintenance and remedial works). The purpose of the work was to address those immediate actions provided by the consultant in order to mitigate several specific safety hazards at the site (i.e. as identified in the 2012 technical memo titled *Inspections at the Clinton Creek Site during August 6 to 8, 2012*).

## Scope of Work

The scope of work included:

1. Repair of sections of site roads;
2. Closure of various sections of site roads through the installation of barricades;
3. Scaling of rocks above sections of site roads;
4. Installation of warning signage;
5. Construction and installation of a log-boom at the outlet of Hudgeon Lake; and
6. Removal of beaver dams and brushing within the high-water mark on Wolverine Creek.

## Work Summary

### Health and Safety

BEL was responsible for on-site health and safety, although the Health and Safety Plan was developed by the owner with input from BEL.

### Personnel

Personnel used for this project, and their roles in the project were as follows;

- Erik Nyland, P.Eng, Project Manager and Project Engineer
- Craig Bibby, Safety and First Aid, Labourer
- Ian Nyland, Labourer and Equipment Operator/Truck Driver
- Heiko Nyland, Labourer

### Equipment

Equipment utilised over the course of the project included:

- Kenworth truck and low-bed trailer
- Emergency transport vehicle
- Dodge pickup with slip tank
- Travel trailer camp



- Kawasaki Mule RTV
- 226B Cat skid steer loader
- KX080-4 Kubota excavator

## Tools

Tools required for the tasks included:

- Gas powered cement mixer
- Gas powered generator
- Plate packer
- Electric hammer drill with concrete bits
- Chain saws (2)
- Hand tools including axes, shovels, wrenches etc.
- Chains, slings and tie downs
- Water Pump and hose
- Slide hammer for signs

## Principal Work

The following is a summary of how the scope of work was achieved:

### 1. Repair of sections of site roads

Road repairs throughout the site were completed under the supervision of BEL as well as the AAM representatives, Brett Hartshorne and Erik Pit. Gammie Trucking of Dawson provided a Hitachi ZX200 LC5 excavator and operator to carry out the work. The preliminary reconnaissance trip revealed that the site access road from the Forty Mile River Bridge to site had previously been repaired so it was not necessary to spend time and budget addressing that portion of the road. The excavator was used to address sections of the access road which were susceptible to or affected by landslides, to modify the crossing at Clinton Creek to allow access with the truck and low-bed, and it was further used to repair eroded sections of the road.

### 2. Closure of various sections of site roads through the installation of barricades

Those roads identified to be closed were blocked with the use of “lock-block” gates secured by a 12.5 mm chain and locked with padlocks. The lock-blocks were placed with the excavator. Upon placement, the blocks were drilled for installation of Hilti mechanical expanding anchors to hold the gate/sign posts. Berms and boulders were also installed at secondary access points to certain locations.

A swinging gate was installed at the location approved by the engineer and the AAM representative near the confluence of Wolverine Creek and Clinton Creek (i.e. the site entrance). This gate was secured by a lock that is keyed alike all of the other locks. Both the gate post and the tie post were installed per the design using concrete in the post holes. After construction, this gate was tampered with and taken off the hinge post; repairs will be completed by BEL later in the fall, 2013. See Appendix A for locations of gate and barricades.

### 3. Scaling of rocks above sections of site roads

On the waste rock pile, an erosion gully had exposed a large rock above the road which poses a threat to the travelling public. This rock was removed with the use of the excavator and was rolled to a location

below the road. After the removal operation was completed the road was cleaned and the rock placed to one side away from the travelled portion of the road. The work was completed by the excavator.

#### **4. Installation of warning signage**

Total of 24 signs were installed at site including:

- a. 1 of *'No Access Beyond this Point'*
- b. 2 of *'No Vehicle Access Beyond This Point'*
- c. 2 of *'Slide Hazard Do Not Stop For 300 m'*
- d. 2 of *'Slide Hazard Next 3 km'*
- e. 10 of *'Road Closed'*
- f. 4 of *'Soft Shoulder'*
- g. 1 information sign provided by AAM
- h. 2 Staff Gauges

Further to this, two more signs supplied by AAM were removed from the junction of the Clinton Creek Road and the Yukon River Fish Camp Road and re-installed at the junction of the Clinton Creek Road and the Top of the World Highway. The signs had inadvertently been installed in the wrong location. See Appendix A for locations of warning signage.

#### **5. Construction and installation of a log-boom at the outlet of Hudgeon Lake:**

The log boom was constructed as per the drawings developed previously by BEL. The two HDPE pipes required for the log-boom were delivered to site using the BEL truck and low-bed trailer. The end caps and abutment anchors for the log-booms were manufactured by Mobile Maintenance Services of Whitehorse. BEL had originally intended to pressure test the log-booms (i.e. with the end caps installed) in Whitehorse prior to mobilizing to site, however, due to a delay in the manufacturing of the end caps and the timing of the equipment availability on the site, the pipes were delivered to the site prior to the installation of the end caps. The end caps were installed on site and sealed as planned using silicone sealant. Due to an incompatibility between the HDPE and the sealant the connection between the caps and the pipes were not found to be water proof resulting in a necessity to remove the pipes from the water and transport back to Whitehorse for resolution. A final solution was found with the assistance of the HDPE pipe manufacturer, Wolseley Engineered Pipe Group, to install preformed polystyrene foam into the pipes and use the manufacturer's recommended method of using a roofing tar to seal the end caps to the pipe (see Appendix D). The polystyrene foam has now been installed and the end capes sealed with the roofing tar; although at this time the log-booms are stored in the BEL yard in Whitehorse and it is the intent that they be transported to site after freshet (i.e. Spring 2014) and installed as per the original intention.

### Log Boom Properties:

Length	15.24 m
Inside Diameter	0.582 m
Wall Thickness	0.085 m
Outside Diameter	0.752 m
Inside Volume	4.054 m <sup>3</sup>
Total Volume	6.769 m <sup>3</sup>
Volume of HDPE	2.715 m <sup>3</sup>
Density of HDPE	0.93 g/cm <sup>3</sup>
Mass of HDPE	2,525.0kg
Mass of 2 end caps	440 kg
Mass of 1 Log Boom	2,965.0 kg
Total Water Displacement	6,764 kg
Outside Diameter of Foam Insert	0.552 m
Volume of Foam Insert	3.647 m <sup>3</sup>
Vol of Voids in Pipe	0.407 m <sup>3</sup>
Mass of Water in Voids	407 kg
Water Absorption of Foam Insert	145.9 kg
Mass of Log Boom Saturated	3,517.9 kg

Details of the calculations can be found in Appendix F.

The Log Boom with the foam, and assuming that the sealant does not remain watertight and allows water to enter the pipe, has a total mass of 3,513.3 kg per section, including 4% water absorption of the foam and all cavities in the pipe are filled with water. Total displacement of the log boom per section is 6,764 kg. This results in approximately 52% submergence, of each section. The diameter of each section is 762 mm so approximately 400 mm of the log boom will be submerged and 362 mm will be above water. The weight of the log boom is equal to the weight of water it displaces when the log boom is 52% submerged, so the remainder of the log boom (48%) will remain above the level of the water.

Installation of the abutment anchors was completed as per the drawings and the approval of the engineer. They were installed as intended and a plate packer was used to compact the backfill. Rip rap was placed around the base of the abutment to mitigate some erosion concern however due to the nature of the soils the entire area may be subject to deterioration during a high flow event.

#### **6. Removal of beaver dams and brushing within the high-water mark on Wolverine Creek**

Removal of the beaver dams was done by hand, utilising labourers provided by BEL. Dam materials were removed by hand using pike poles, mattocks and shovels. Materials removed were placed above the high water mark at the side of the stream. The recommendations of the design report were followed.

A portion of this work also included the removal of foliage within the stream, back to approximately one meter above the high water mark in the rock weir channel. Brush removed was placed away from the stream bed and out of reach of any future high water events. Tools included chain saws and axes.



## Secondary Work

Over the course of the project it became apparent that there were tasks which should be completed that were outside the original scope of work.

These tasks included:

- GPS survey of all installed items;
- Removal and re-install of the two signs;
- Remove a ladder from the abandoned drill to restrict public access;
- Place “*Warning – Keep Off*” signs on the abandoned drill and shovel ;
- Erosion prevention tasks by placing boulders at the toe of the slope near Clinton Creek;
- Grading a sloped area to allow for installation and removal of the log-booms from Hudgeon Lake;
- Excavation of rocks from the log-boom locations to allow sufficient water depth for floatation;
- Erosion protection near the confluence of Wolverine Creek and access road by placing large rocks on the downstream side where water had previously flowed over the road; and
- Clearing of a blocked culvert at the confluence of Wolverine Creek and access road.

## Schedule

The following is an account of when the work was completed:

- **July 18:** BEL first mobilized to the site on July 18 and met the Gammie Trucking excavator operator on site which had also arrived that morning. The excavator made some modifications to the Clinton Creek crossing (i.e. regarding) to allow access for the BEL truck and low-bed. The truck and low-bed had some difficulty climbing the hill on the south side of the creek and 6 of the 12 lock blocks had to be removed from the trailer to get the truck up the hill. Once through the creek and up the hill the first 6 blocks were off loaded at each required location and the truck and low-bed returned to reload the other blocks for distribution. On that day the labourers began the clearing of the beaver dams and brushing along Wolverine Creek.
- **July 19:** Beaver dam removal and brushing in the creek was continued and the remainder of the blocks were distributed. Some of the sign posts were installed as well on this day.
- **July 20:** The remainder of the sign posts were installed and the removal of the beaver dams and brushing of Wolverine Creek were completed. BEL demobilised back to Whitehorse to get more materials.
- **July 22:** 5 more lock-blocks were loaded with the pipes and the abutments for the debris boom, and transported to Dawson.
- **July 23:** The materials were transported from Dawson to the site and one of the abutments was installed. On this day the posts were attached to the lock blocks with the Hilti drill and the Hilti bolts.
- **July 24:** The second abutment was installed. The remainder of the blocks were distributed as required and the excavator removed the large rock from the steep slope above the road. The road was then widened and some erosion prevention work was completed at the toe of the slope near Clinton Creek. The culvert

was cleaned at the site entrance gate and holes were excavated for installation of the swinging gate. BEL and Gammie Trucking demobilized from site.

- **July 30:** BEL mobilized to site again to install the caps on the pipes and place the log-booms in the water. Two of the caps were installed on that day and were sealed to the pipe with silicone.
- **July 31:** Two more caps were installed and the pipes were placed in the water.
- **August 1:** It was discovered that the sealant had not sealed the end caps and that the pipes were partially filled with water. The pipes were pumped out, removed, and placed on the shore.
- **August 2:** The abutments were surveyed using a level, the sign installation was completed and the staff gauge posts were placed. BEL then demobilized to Whitehorse to determine a solution to the sealant issue.
- **September 7:** BEL returned to site with a Kubota KX 080-4 excavator to load the log-booms and transport them to Whitehorse. The intention was to install flotation foam into the pipes in Whitehorse. At that time the skid steer loader was also loaded with the pipes and returned to Whitehorse. The excavator remained at site.
- **September 28:** BEL returned to site to use the excavator to grade the ramp to be used to remove the pipes from the water, grade the bottom of the lake at the location for the pipes and demobilize the excavator. At this time all items included in the project were surveyed using the BEL RTK GPS survey instrument. The data is attached.

At this time the pipes remain in Whitehorse and will be transported to site again in 2014, post freshet, and re-installed.

## Recommendations

Some erosion protection has been placed around the foundation of the abutments however some consideration should be given to improving this. During a high flow event there is a possibility that the materials around the abutment may erode and potentially destabilize the structure. Some materials are located nearby and a further quantity is located near the entrance to the site. Some analysis and design work should be undertaken to assess stream flow velocities, soils properties, rip rap sizing, and extents of the protection. There is a possibility that the materials at the connection between the pipe and the abutment could erode faster due to the flow being directed to this area by the floating pipe.

The log booms have been designed to withstand summer conditions only and will need to be removed seasonally. A procedure has been developed for this process and is included within this report (see Appendix B). A skid way should be constructed at the current location of the ramp. The issue is that the pipes will not roll back into the water easily without some assistance due to the rough nature of the ground.

Performance of the log boom should be monitored monthly during the first season of operation and twice yearly after that, with a focus on the following:

- Monitor floating depth of the pipe to record freeboard from the water to the top of the pipe. This will allow an assessment of the degree of saturation of the flotation foam or whether the end cap seals are water tight.



- Assess erosion around the abutments by looking for settlement of the rip rap around the base of the abutments. Particular attention should be paid to the area at the connection of the abutment and the log boom.
- View erosion along both shores up and down stream of the abutments. Pictures must be taken to analyse yearly changes of the shorelines.
- Volume of materials directed to shore by the log booms should be monitored for scheduling purposes and to ensure timely cleaning. Materials directed to shore should be removed by hand using ropes and saws or axes if necessary.

This report has been prepared for the exclusive use of Government of Yukon. It has been prepared with generally accepted engineering practice. We trust that the report meets your requirements at this time. If further information is required please contact the undersigned.

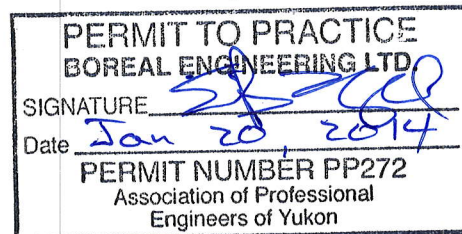
Erik Nyland, P.Eng.

Boreal Engineering Ltd.

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Jan 20 2014

Date





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## Appendices





Pt #	Northing	Easting	Elevation	Description
1	7148207.686	513273.7195	596.2288	GT PST
2	7148215.044	513270.9385	596.0573	GT PST
3	7148272.04	512927.237	598.5236	GT PST
4	7148269.103	512923.6722	598.4587	GT PST
5	7147751.642	513434.0107	566.4563	GT PST
6	7147754.506	513439.097	566.4253	GT PST
7	7147738.875	513328.0249	557.3348	SGN SOFT SH
8	7147601.921	512159.9784	455.1423	SGN SOFT SH
9	7147419.059	512819.0748	413.0726	ABUT
10	7147418.036	512821.6506	413.0539	ABUT
11	7147416.366	512819.5105	413.054	ABUT
12	7147458.762	512825.1765	415.0202	CTL
13	7147392.742	512827.8262	413.1647	ABUT
14	7147393.096	512830.5268	413.1804	ABUT
15	7147390.532	512829.5039	413.251	ABUT
16	7147387.766	512824.1686	411.6524	WATER
17	7147372.713	512827.4003	412.3879	STAFF
18	7147370.665	512906.8792	415.2576	SIGN RD CL
19	7146986.56	513232.1716	431.9418	GATE PST
20	7146992.456	513228.4087	432.4535	GATE PST
21	7146959.139	513312.5306	426.2147	GATE PST
22	7146962.772	513317.199	426.0706	GATE PST
23	7147069.869	513508.4569	420.1207	GATE PST
24	7147075.415	513510.6429	420.1296	GATE PST
25	7147118.573	513449.8325	417.0239	SIGN SOFT SH
26	7147216.74	513322.1422	406.9514	SIGN SOFT SH
27	7147259.795	513301.7737	401.9399	SIGN SLIDE HAZ
28	7147288.619	513273.5911	405.606	0219 UGL
29	7147286.863	513264.1235	406.8126	GATE PST
30	7147281.278	513261.8227	406.4155	GATE PST
31	7147275.807	513259.5278	406.2495	GATE PST
32	7147531.003	514210.4161	379.0462	SIGN NO VEH ACC
33	7147098.309	514216.5495	368.0292	SIGN FRENCH
34	7147097.586	514216.147	367.9388	SIGN ENGLISH
35	7147094.689	514212.1895	367.5849	GATE SWING
36	7147089.592	514211.1174	367.3123	GATE SWING
37	7147111.055	514220.1803	369.039	SIGN RD CL
38	7146928.327	514617.7881	376.2599	SIGN SLIDE 3K
39	7144737.543	516245.7913	337.0079	SIGN SLIDE 3K
40	7147108.896	513640.1581	374.6439	STAFF
41	7147105.624	513603.8501	380.1228	SIGN SLIDE HAZ



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## Appendix B: Installation and Removal Procedure for Log-boom

### Equipment and Tools Required

The following equipment and tools are required to install and remove the log-booms:

- Two large pry bars
- Mid-size to large 4x4 pick-up truck
- Two 40m lengths of ropes
- Two 15m lengths of ropes
- Two 15m lengths of chain
- Adjustable wrench



## Installation

<b>Steps</b>	<b>Actions</b>
<i>Step 1</i>	Install inspection covers and remove rocks securing log-booms in place on ramp.
<i>Step 2</i>	Attach long ropes to the abutment side end-caps of each log-boom.
<i>Step 3</i>	Attach short ropes to end-caps on the other end of each log-boom.
<i>Step 4</i>	Push log-booms into the water using pry bars with ropes secured to shore.
<i>Step 5</i>	Use the short and long ropes to bring the log-booms into place near shore and ensure they are oriented in the right way (i.e. if they are not oriented the right way, then they need to be turned around using the ropes).
<i>Step 6</i>	In the shallow water by the log-boom ramp, join the end-caps of each log-boom using the clevis fasteners; use adjustable wrench to tighten.
<i>Step 7</i>	Detach the short ropes from the end-caps.
<i>Step 8</i>	Run the rope to the other side (i.e. north side) of the lake outlet and pull the log-boom end cap towards the abutment on that side (i.e. by hand with assistance of truck if necessary).
<i>Step 9</i>	Secure the chain around the abutment post on that side with the lock and remove the long rope.
<i>Step 10</i>	Pull the log-boom end-cap towards the abutment on the other side (i.e. south side).
<i>Step 11</i>	Secure the chain around the abutment post on that side with the lock and remove the long rope.

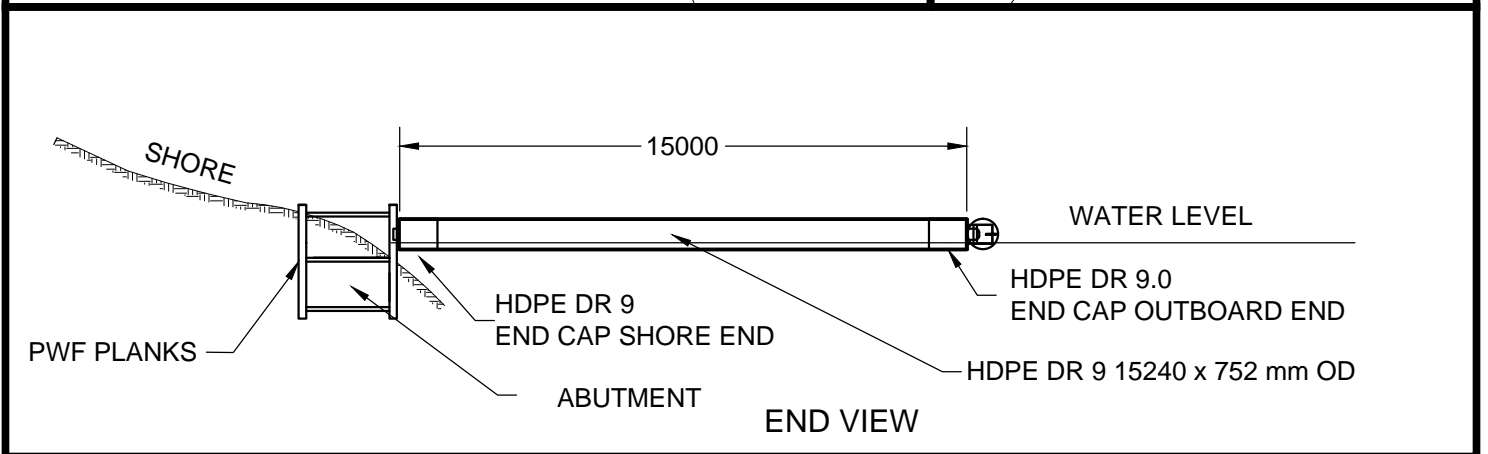
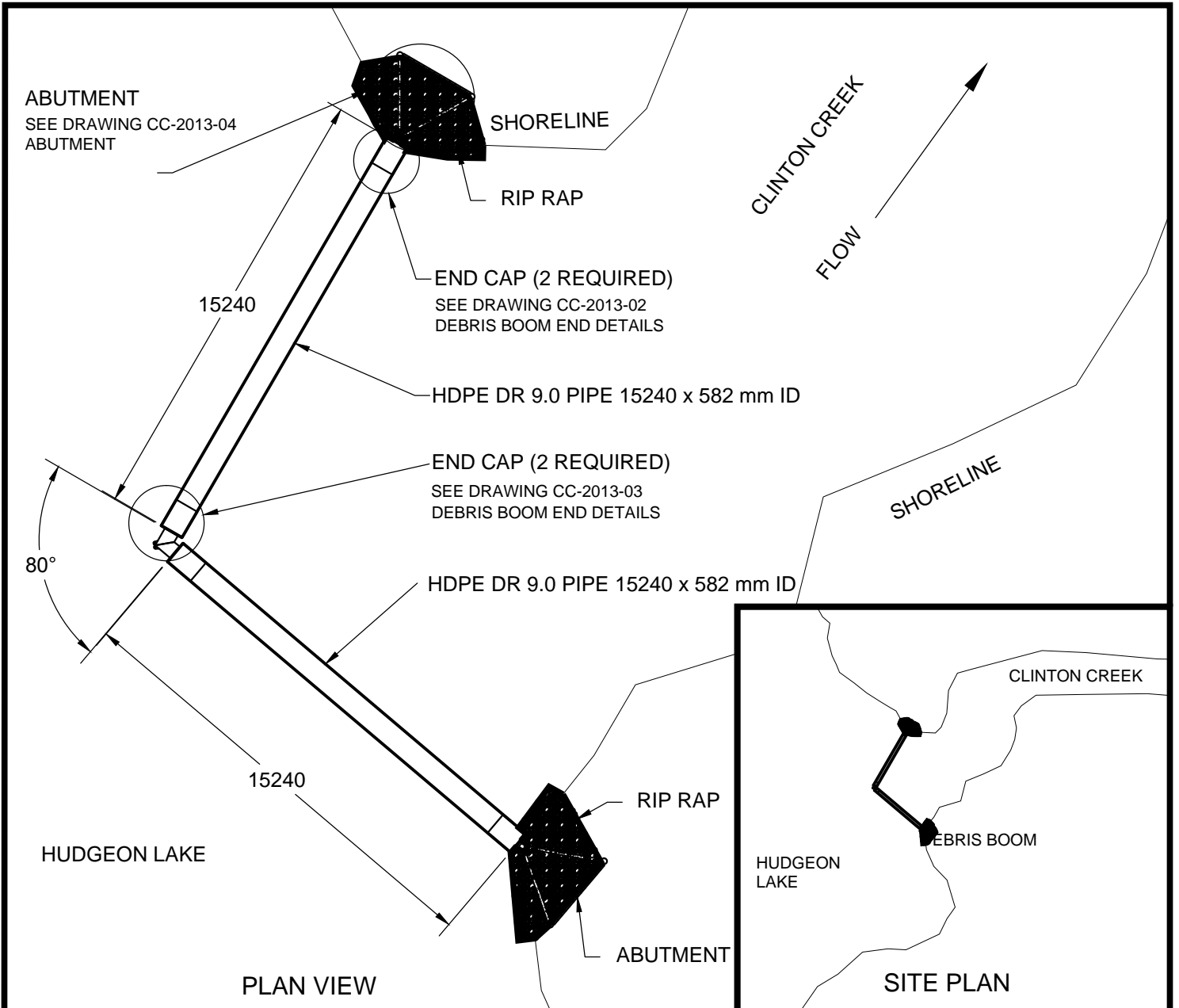
## Removal

<b>Steps</b>	<b>Actions</b>
<i>Step 1</i>	Attach long ropes to the abutment side end-caps of each log-boom.
<i>Step 2</i>	Remove locks from chains around abutments.
<i>Step 3</i>	Pull the rope on the south side log-boom end-cap towards the log-boom ramp (i.e. pulling both log-booms since they are still connected).
<i>Step 4</i>	Pull the log-booms near the shore (i.e. ensure that you can reach the clevis fasteners in the middle in shallow water)
<i>Step 5</i>	Attach short ropes to each of the end-caps that are joined.
<i>Step 6</i>	Remove the clevis fastener that is joining the two log-booms.
<i>Step 7</i>	Move one of the log-booms aside and secure to shore with ropes.
<i>Step 8</i>	Wrap chain around centre of log-boom once; apply chain tensioner/tightener clamp.
<i>Step 9</i>	Continue wrapping chain around log-boom (i.e. +/- 8 wraps) and remove ropes.
<i>Step 10</i>	Connect other chain to the chain on the log-boom and pull with truck and this will cause log-boom to roll upslope.
<i>Step 11</i>	Repeat Steps 8 – 10 until at least 30m upslope on ramp.
<i>Step 12</i>	Remove chains and secure the log-boom with rocks on downslope side.
<i>Step 13</i>	Move the other log-boom into place (i.e. in front of ramp)
<i>Step 14</i>	Repeat Steps 8 – 12 for the second log-boom.
<i>Step 15</i>	Remove inspection covers from both ends of each log boom to allow water to drain



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## Appendix C: As-built Drawings



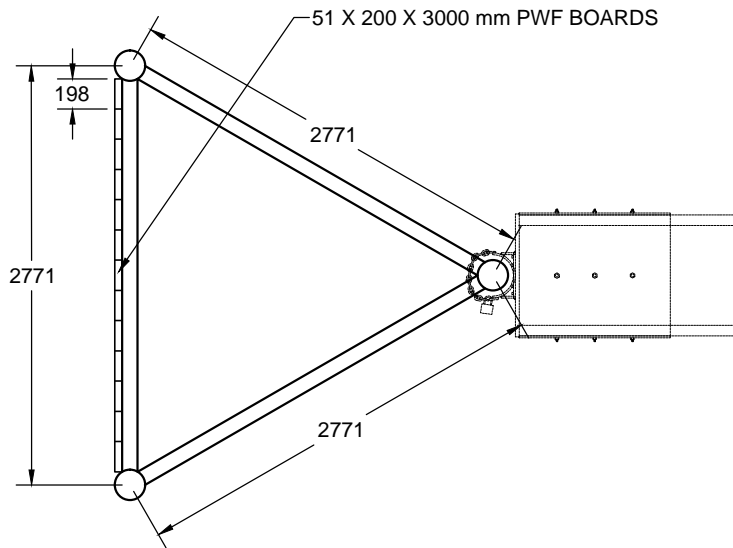
## CLINTON CREEK SITE PLAN

ENERGY MINES AND RESOURCES,  
ASSESSMENT AND ABANDONED MINES

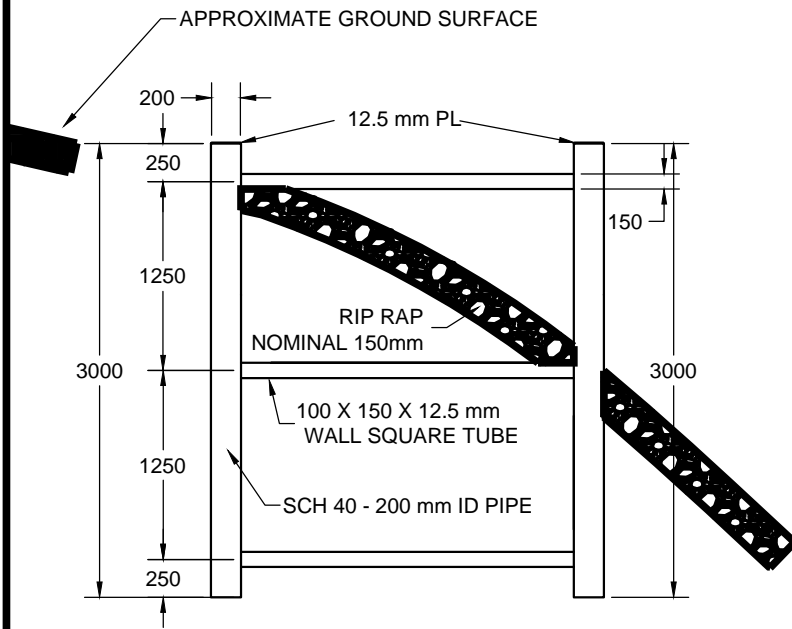
DESIGNED:	E NYLAND
DRAWN:	E Nyland
DATE:	January 18, 2014
DWG#:	CC-2013-01

NOTES:

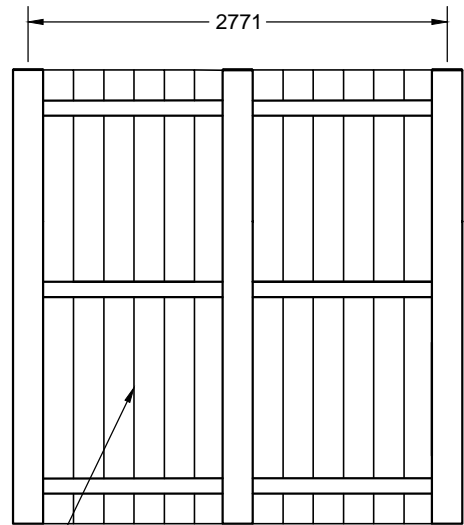
- 1) ALL STEEL TO BE MILD
- 2) PAINT ENTIRE STRUCTURE WITH RUST PAINT
- 3) STRUCTURE TO BE PAINTED ORANGE
- 4) ALL DIMENSIONS IN mm
- 5) ABUTMENT TO BE ALIGNED PER DRAWINGS
- 7) BACKFILL TO BE COMPACTED TO THE SATISFACTION OF THE ENGINEER.
- 8) STRUCTURE TO BE BACKFILLED IN LAYER NO THICKER THAN 200 mm
- 9) BOARDS TO BE PLACED PRIOR TO BACKFILL AND ATTACHED TO SQUARE TUBE WITH 2 x 6 mm SELF TAPPING SCREWS AT INTERSECTIONS
- 10) PIPE TO BE SCHEDULE 40 200 mm ID
- 11) SQUARE TUBE TO BE 100 X 150 X 12.5 mm WALL
- 12) FABRICATION OF STRUCTURES TO BE COMPLETED IN A CWB CERTIFIED SHOP BY A QUALIFIED WELDER
- 13) STRUCTURE TO BE PLACED IN EXCAVATION AND APPROVED BY ENGINEER PRIOR TO BACKFILL
- 14) BOARDS TO BE PWF TREATED
- 15) ABUTMENT TO BE BURIED SIMILAR TO THE PLAN AND TO THE ENGINEER'S APPROVAL



TOP VIEW



END VIEW



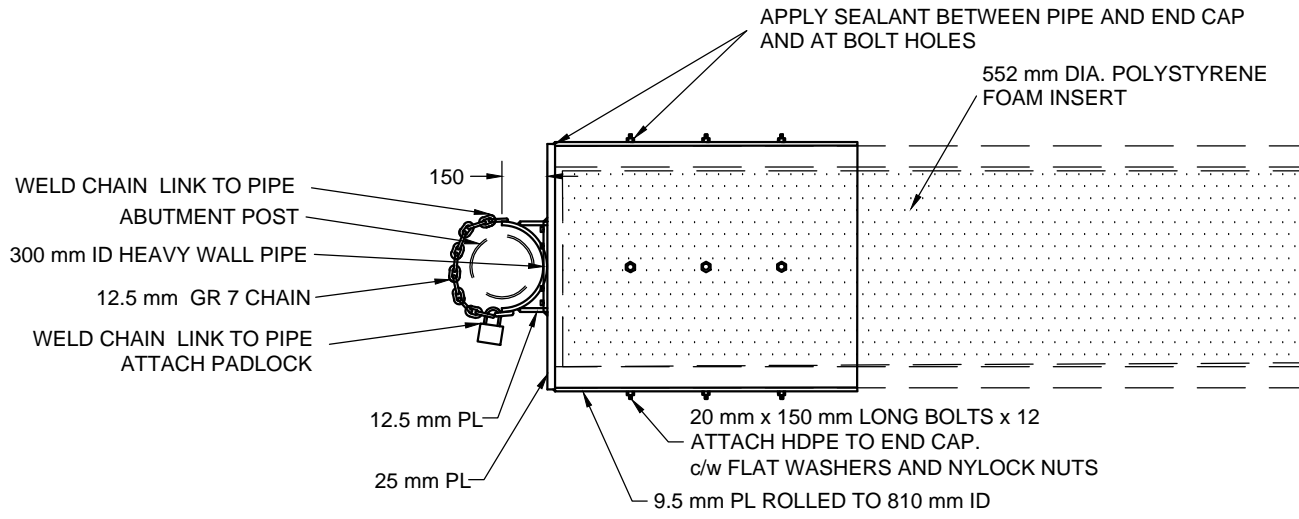
FRONT VIEW



## CLINTON CREEK SITE ABUTMENT

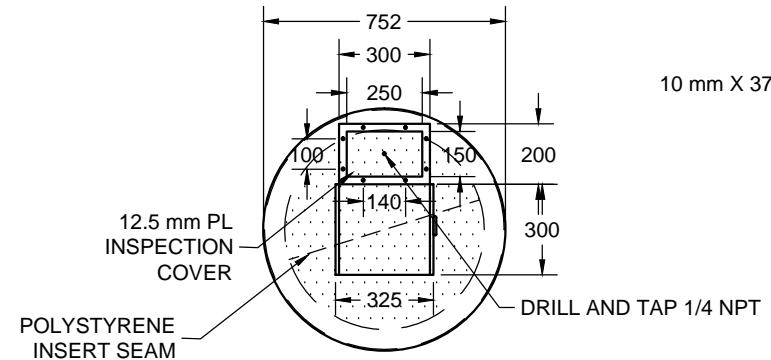
ENERGY MINES AND RESOURCES,  
ASSESSMENT AND ABANDONED MINES

DESIGNED:	E NYLAND
DRAWN:	E Nyland
DATE:	JAN 18, 2014
DWG#:	CC-2013-04

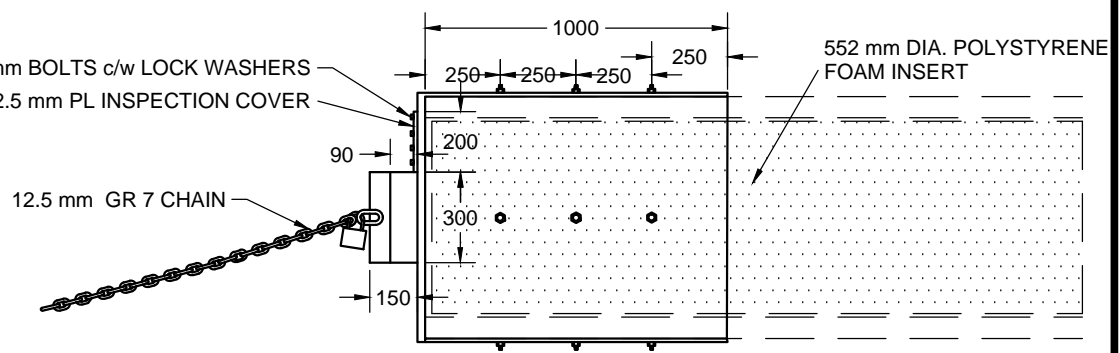


PLAN VIEW

- NOTES:
- 1) ALL STEEL TO BE MILD
  - 2) PAINT ENTIRE STRUCTURE WITH RUST PAINT
  - 3) STRUCTURE TO BE PAINTED BLACK
  - 4) ALL DIMENSIONS IN mm
  - 5) ALL INSPECTION COVERS TO BE FITTED WITH GASKETS AND SEALANT
  - 6) JOINT BETWEEN HDPE AND END CAP TO BE TREATED WITH SEALANT PRIOR TO ASSEMBLY
  - 7) END CAP TO BE FABRICATED IN SHOP PRIOR TO TRANSPORT TO SITE
  - 8) ALL BOLTS TO BE GRADE 8 OR BETTER
  - 9) CHAIN TO BE GRADE 7 OR BETTER
  - 10) FABRICATION OF STRUCTURES TO BE COMPLETED IN A CWB CERTIFIED SHOP BY A QUALIFIED WELDER
  - 11) END CAPS TO BE FITTED TO HDPE PRIOR TO MOBILIZATION TO SITE
  - 12) DRILL AND TAP INSPECTION COVER BOLT HOLES
  - 13) ALL WELDS TO BE MINIMUM 5 mm FILLET OR BACK
  - 14) WELDS TO BE TESTED WATER TIGHT
  - 15) HDPE PIPES TO BE FILLED WITH POLYSTYRENE FOAM INSERTS



END VIEW



SIDE VIEW

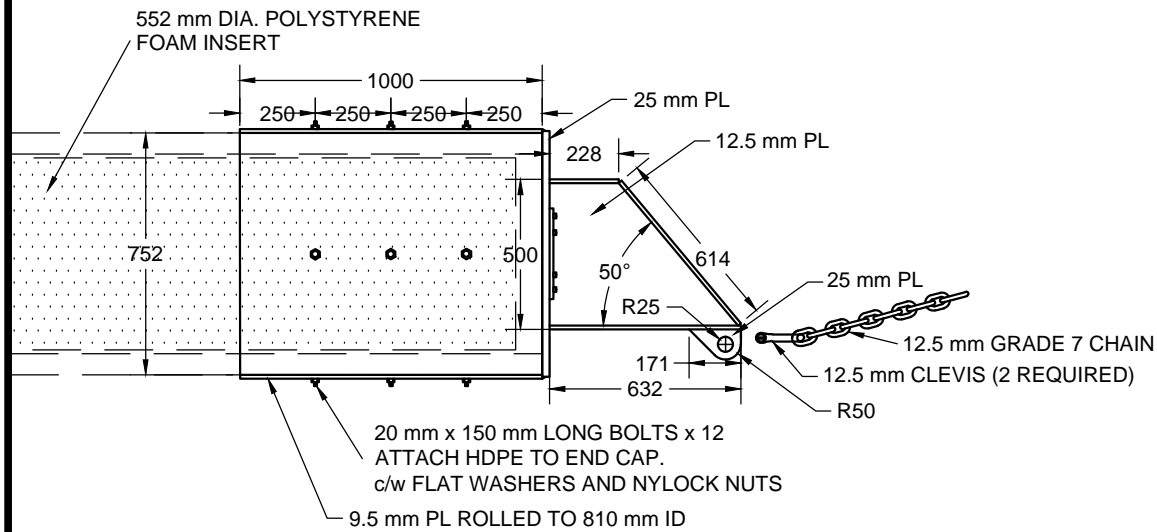
## ABUTMENT END

# CLINTON CREEK SITE DEBRIS BOOM END DETAILS

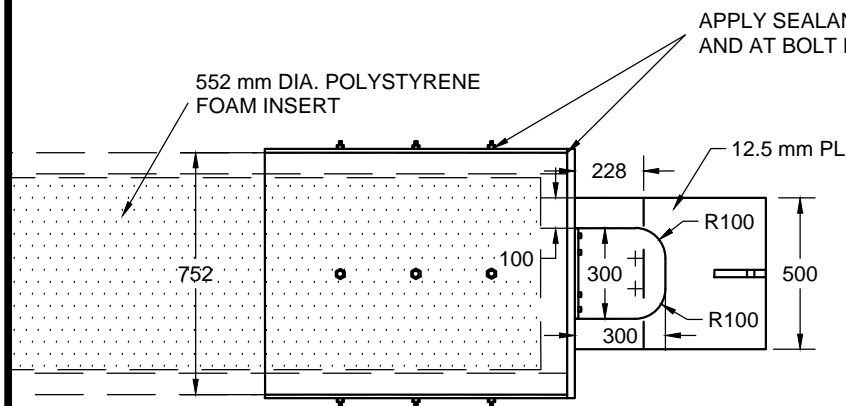
ENERGY MINES AND RESOURCES, ASSESSMENT AND ABANDONED MINES



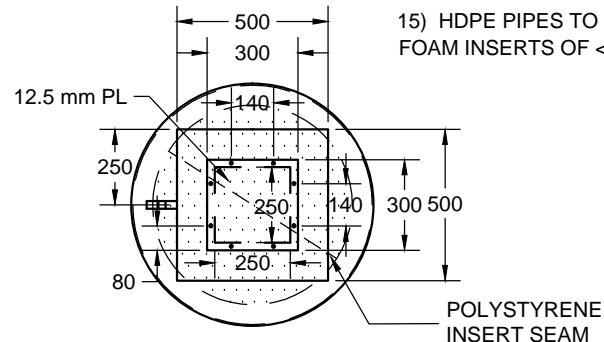
DESIGNED:	E Nyland
DRAWN:	E Nyland
DATE:	January 18, 2014
DWG#:	CC-2013-02-AB



TOP VIEW



SIDE VIEW



END VIEW

## OUTBOARD END

### NOTES:

- 1) ALL STEEL TO BE MILD
- 2) PAINT ENTIRE STRUCTURE WITH RUST PAINT
- 3) STRUCTURE TO BE PAINTED ORANGE
- 4) ALL DIMENSIONS IN mm
- 5) ALL INSPECTION COVERS TO BE FITTED WITH GASKETS AND SEALANT
- 6) JOINT BETWEEN HDPE AND END CAP TO BE TREATED WITH SEALANT PRIOR TO ASSEMBLY
- 7) END CAP TO BE FABRICATED IN SHOP PRIOR TO TRANSPORT TO SITE
- 8) ALL BOLTS TO BE GRADE 8 OR BETTER
- 9) CHAIN TO BE GRADE 7 OR BETTER
- 10) FABRICATION OF STRUCTURES TO BE COMPLETED IN A CWB CERTIFIED SHOP BY A QUALIFIED WELDER
- 11) END CAPS TO BE FITTED TO HDPE PRIOR TO MOBILIZATION TO SITE
- 12) DRILL AND TAP INSPECTION COVER BOLT HOLES
- 13) ALL WELDS TO BE MINIMUM 5 mm FILLET OR BACK
- 14) WELDS TO BE TESTED WATER TIGHT
- 15) HDPE PIPES TO BE FILLED WITH POLYSTYRENE FOAM INSERTS OF <4% WATER ABSORPTION RATE

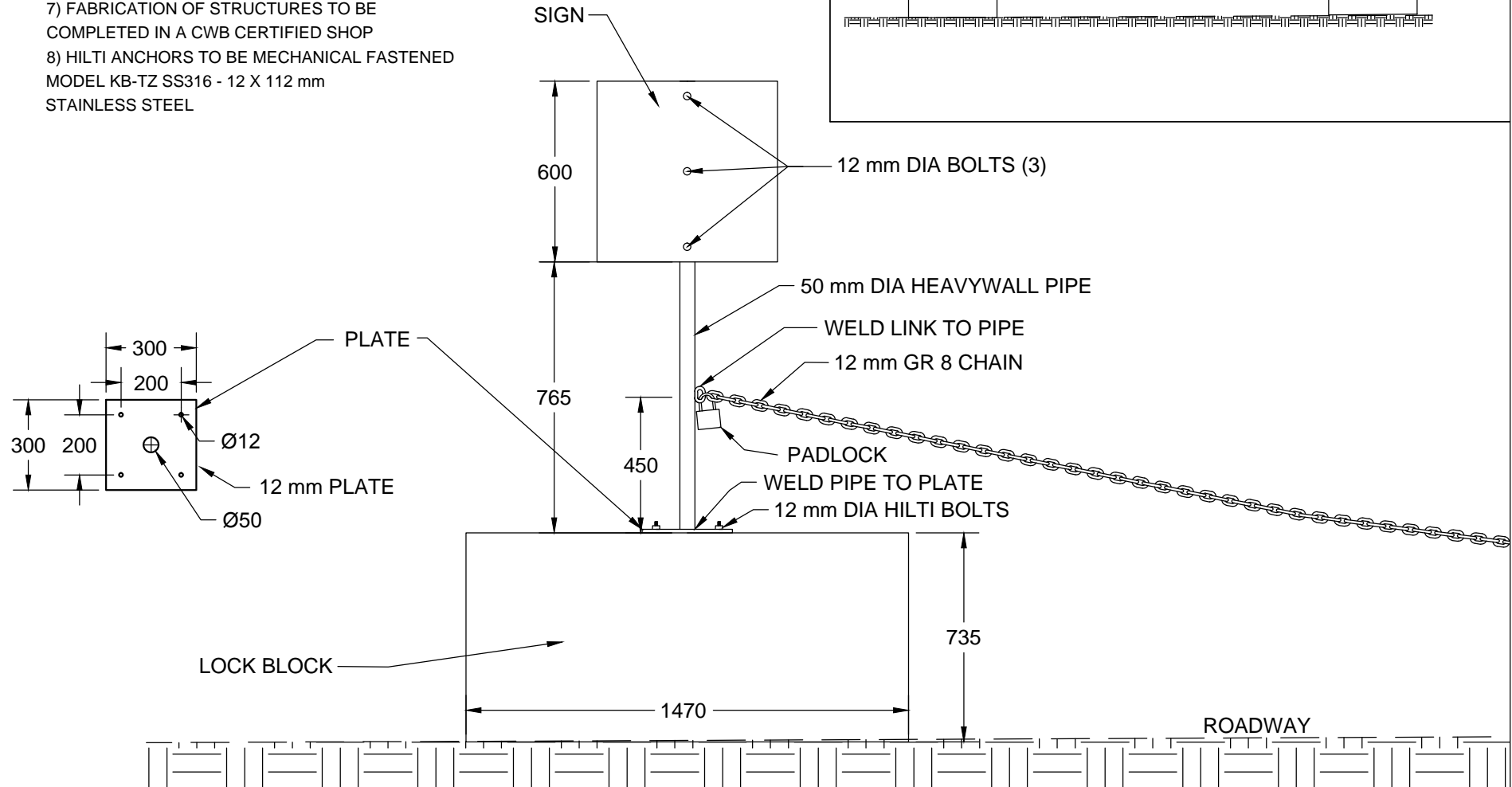
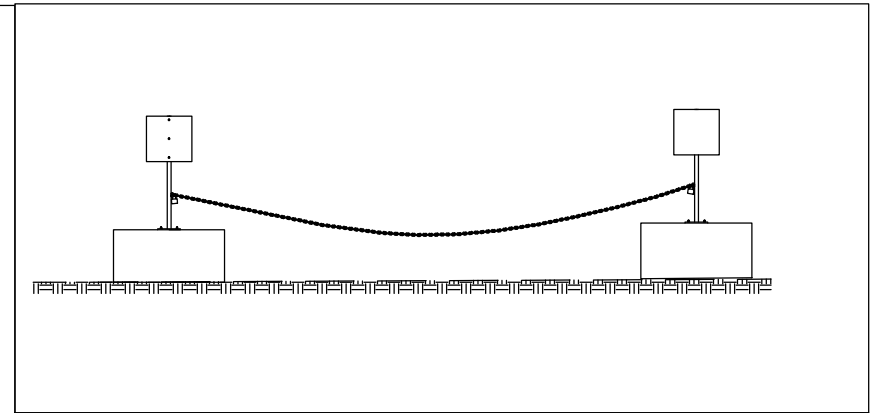


CLINTON CREEK SITE  
**DEBRIS BOOM END DETAILS**  
 ENERGY MINES AND RESOURCES, ASSESSMENT AND ABANDONED MINES

DESIGNED:	E Nyland
DRAWN:	E Nyland
DATE:	JANUARY 18, 2014
DWG#:	CC-2013-03-AB

NOTES:

- 1) ALL STEEL TO BE MILD
- 2) PAINT ENTIRE STRUCTURE WITH RUST PAINT
- 3) STRUCTURE TO BE PAINTED ORANGE
- 4) ALL DIMENSIONS IN mm
- 5) ALL BOLTS TO BE GRADE 8 OR BETTER
- 6) CHAIN TO BE GRADE 7 OR BETTER
- 7) FABRICATION OF STRUCTURES TO BE COMPLETED IN A CWB CERTIFIED SHOP
- 8) HILTI ANCHORS TO BE MECHANICAL FASTENED MODEL KB-TZ SS316 - 12 X 112 mm STAINLESS STEEL



# CLINTON CREEK SITE LOCK BLOCK GATE

ENERGY MINES AND RESOURCES, ASSESSMENT AND ABANDONED MINES

DESIGNED:	E Nyland
DRAWN:	E Nyland
DATE:	March 26, 2013
DWG#:	CC-2013-07

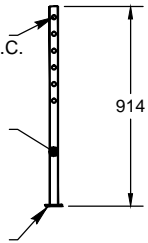
**NOTES:**

1. ALL STEEL TO BE BLACK
2. GRIND OFF ALL SHARP EDGES , BURRS AND SLAG
3. PAINT ALL PARTS WITH PRIMER AND 2 COATS  
SAFETY YELLOW RUST INHIBITING INDUSTRIAL ENAMEL
4. ONE SINGLE SWING GATE SET INCLUDES:  
- 1 GATE PANEL - 1 SUPPORT - 1 HINGE POST - 2 HITCH POSTS
5. THE VALUE OF "X" WILL BE PROVIDED ON A PER JOB BASIS
6. ALL DIMENSIONS IN mm

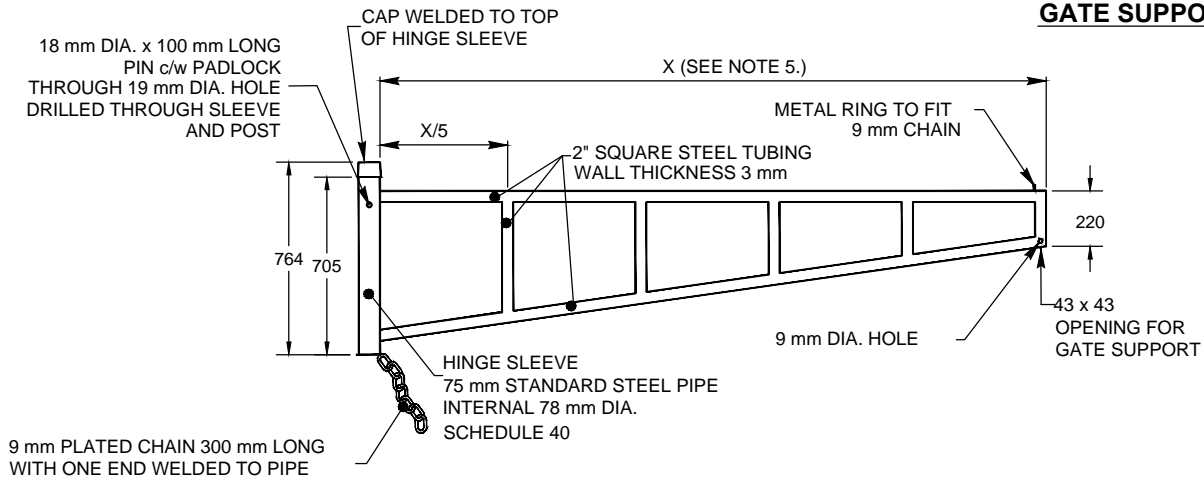
9 mm DIA. HOLES  
DRILLED @ 75 mm C.C.

**GATE SUPPORT**  
38 mm SQUARE STEEL TUBING  
WALL THICKNESS 3 mm

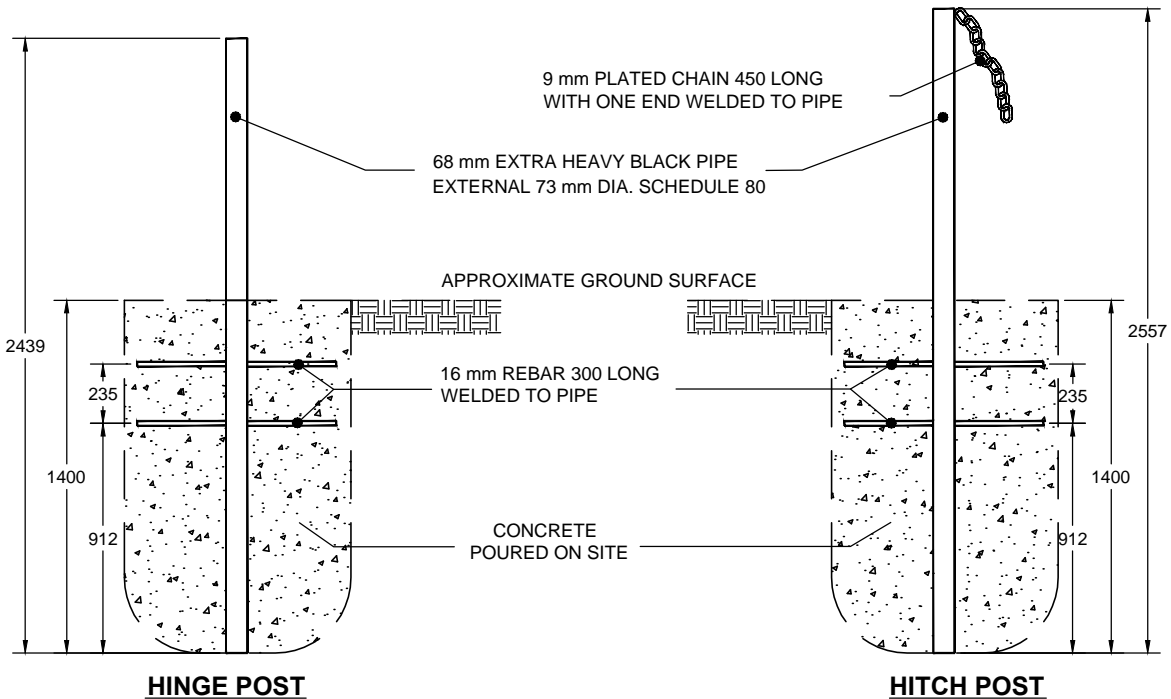
6 x 75 x 300 mm METAL  
SKID WELDED TO  
BOTTOM OF SUPPORT



**GATE SUPPORT**



**GATE PANEL**



**CLINTON CREEK SITE  
GATE**

ENERGY MINES AND RESOURCES,  
ASSESSMENT AND ABANDONED MINES

DESIGNED:	Yukon Government
DRAWN:	E Nyland
DATE:	March 24, 2013
DWG#:	CC-2013-06



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## Appendix D: Log-boom Foam Specifications Sheet and Communications



Erik Nyland <enyland@gmail.com>

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**Foam...**

8 messages

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**Jay.Khan@wolseleyinc.ca** <Jay.Khan@wolseleyinc.ca>  
To: enyland@gmail.com  
Cc: James.Pont@wolseleyinc.ca

Thu, Sep 12, 2013 at 1:49 PM

---

**Subject:** Spec Sheet Polystyrene

Hi Erik,

Please see attached spec sheet.

I will say that the sooner we can get a PO# from you. The sooner the Fab shop can start!

It will take approximately 8 business days to complete this order. I would add a couple of more days to get this to your site. (8-10 business days should be good)

Please advise asap.

Thanks

Jay



**TYPE1 Foam Data Sheet.pdf**

87K

---

**Erik Nyland** <enyland@gmail.com>  
To: Josée Perron <josee.perron@gov.yk.ca>

Thu, Sep 12, 2013 at 1:55 PM

Here is the foam specced by Jay Khan  
Not sure I like it the water absorption is at 4.0%  
I will forward it to Ralph Ford for confirmation.

Erik

[Quoted text hidden]

--

Erik Nyland, P.Eng.  
Boreal Engineering Ltd.  
Cell (867) 335-0211  
[www.borealengineering.ca](http://www.borealengineering.ca)



**TYPE1 Foam Data Sheet.pdf**  
87K

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**Erik Nyland** <enyland@gmail.com>  
To: ralph.ford@wolseleyind.com

Thu, Sep 12, 2013 at 1:57 PM

Hi Ralph,

Jay Khan has organized a local Vancouver area firm to provide us with preformed foam to fit inside the pipes. The spec is attached.

I am not sure this is completely appropriate because the water absorption is 4.0%, which is higher than the Poly Urethane.

Can you advise whether this is appropriate?

Erik

----- Forwarded message -----

From: <[Jay.Khan@wolseleyinc.ca](mailto:Jay.Khan@wolseleyinc.ca)>  
Date: Thu, Sep 12, 2013 at 1:49 PM  
Subject: Foam...  
To: [enyland@gmail.com](mailto:enyland@gmail.com)  
Cc: [James.Pont@wolseleyinc.ca](mailto:James.Pont@wolseleyinc.ca)

[Quoted text hidden]

--

Erik Nyland, P.Eng.  
Boreal Engineering Ltd.  
Cell (867) 335-0211  
[www.borealengineering.ca](http://www.borealengineering.ca)



**TYPE1 Foam Data Sheet.pdf**  
87K

---

**ralph.ford@wolseleyind.com** <ralph.ford@wolseleyind.com>  
To: [enyland@gmail.com](mailto:enyland@gmail.com)  
Cc: [cesar.gallardo@wolseleyind.com](mailto:cesar.gallardo@wolseleyind.com)

Thu, Sep 12, 2013 at 2:11 PM

Erik; the spec sheet Jay sent you came from my associate Cesar who sets 8' from me in our office. This is the foam we use in all our projects. The absorption is rated at less than 4% but in actuality it is 2%, and it is a closed cell so it does not increase absorption long term while most polyurethane is rated for a lesser term at 3%. I was out yesterday so Cesar gave Jay the info I would have been sending you. Best of luck.

**Ralph Ford** | HDPE Technical Advisor**WOLSELEY Industrial Group***Industrial Plastics Division*

740 South 28th Street

Washougal, Washington 98671

360.835.4004 Direct

360.835.2129 Main Office

360.835.3521 Fax

[ralph.ford@wolseleyind.com](mailto:ralph.ford@wolseleyind.com)[www.hdpe.com](http://www.hdpe.com)[www.wolseleyindustrialgroup.com](http://www.wolseleyindustrialgroup.com)

---

**From:** Erik Nyland [mailto:[enyland@gmail.com](mailto:enyland@gmail.com)]  
**Sent:** Thursday, September 12, 2013 1:58 PM  
**To:** Ford, Ralph [Ferguson] - 3067 Washougal  
**Subject:** Fwd: Foam...

[Quoted text hidden]

---

**Erik Nyland** <[enyland@gmail.com](mailto:enyland@gmail.com)>  
To: Josée Perron <[josee.perron@gov.yk.ca](mailto:josee.perron@gov.yk.ca)>

Thu, Sep 12, 2013 at 3:09 PM

Erik Nyland, P.Eng.  
Boreal Engineering Ltd  
Sent from my iPhone

Begin forwarded message:

**From:** <[ralph.ford@wolseleyind.com](mailto:ralph.ford@wolseleyind.com)>  
**Date:** 12 September, 2013 2:11:19 PM PDT  
**To:** <[enyland@gmail.com](mailto:enyland@gmail.com)>  
**Cc:** <[cesar.gallardo@wolseleyind.com](mailto:cesar.gallardo@wolseleyind.com)>  
**Subject:** RE: Foam...

[Quoted text hidden]

---

**Erik Nyland** <enyland@gmail.com>  
To: "<Jay.Khan@wolseleyinc.ca>" <Jay.Khan@wolseleyinc.ca>

Thu, Sep 12, 2013 at 4:28 PM

Hi jay

Please proceed with the order. We do not use POs however I can issue a cheque right away if that helps. Please encourage the supplier to expedite this as fast as possible because we expect snow in that area almost any time now. Snow would prevent us from accessing the site.

Erik

Erik Nyland, P.Eng.  
Boreal Engineering Ltd  
Sent from my iPhone

[Quoted text hidden]

<TYPE1 Foam Data Sheet.pdf>

---

**Erik Nyland** <enyland@gmail.com>  
To: Josée Perron <josee.perron@gov.yk.ca>

Thu, Sep 12, 2013 at 5:14 PM

Erik Nyland, P.Eng.  
Boreal Engineering Ltd  
Sent from my iPhone

Begin forwarded message:

**From:** <ralph.ford@wolseleyind.com>  
**Date:** 12 September, 2013 2:11:19 PM PDT  
**To:** <enyland@gmail.com>  
**Cc:** <cesar.gallardo@wolseleyind.com>  
**Subject:** RE: Foam...

[Quoted text hidden]

---

**Jay.Khan@wolseleyinc.ca** <Jay.Khan@wolseleyinc.ca>  
To: enyland@gmail.com

Thu, Sep 12, 2013 at 10:18 PM

Erik,

I will advise Friday with delivery status.

Thanks

Jay

---

**From:** Erik Nyland [mailto:[enyland@gmail.com](mailto:enyland@gmail.com)]  
**Sent:** Thursday, September 12, 2013 4:29 PM  
**To:** Khan, Jay [Canada] EPG  
**Subject:** Re: Foam...

[Quoted text hidden]

## Description

InsulFoam I is a versatile insulation consisting of a superior closed-cell, lightweight and resilient expanded polystyrene (EPS). InsulFoam I meets or exceeds the requirements of ASTM C578, Type I, *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*. InsulFoam I has a nominal density of 1.0 lb/ft<sup>3</sup>. In addition, InsulFoam I offers a long-term stable R-Value and has excellent dimensional stability, compressive strength and water resistance properties.

## Uses

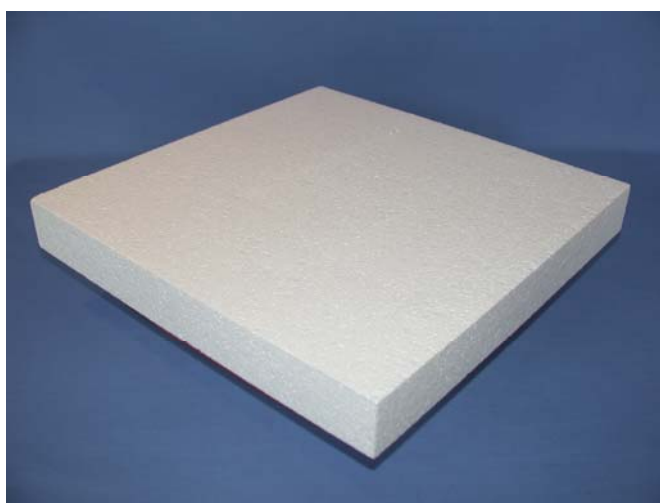
InsulFoam I is a quality EPS product and is used in numerous building construction applications.

**Roofing:** InsulFoam I is well suited for single ply roof applications employing mechanically fastened or ballasted TPO, PVC, EPDM and CSPE as well as low-sloped built-up, modified bitumen and fully adhered single ply roofs incorporating a coverboard or slip sheet. Please consult local building codes and membrane manufacturers for system requirements.

**Other Construction Applications:** InsulFoam I is used in assorted building applications including pre-stressed and pre-cast structural concrete panels, lightweight concrete deck fill, metal roof flute fill, siding backer board, building sheathing, roads and bridge fill, below slab and perimeter insulation and numerous other geofoam applications.

## Advantages

- **Environmentally friendly.** It contains no formaldehyde or ozone-depleting CFC's or HCFC's, contains recycled material and is 100% recyclable if ever removed or replaced.
- **Stable R-Value.** Designers are well served knowing the product's thermal properties will remain stable over the entire service-life. There is no thermal "drift" so the product is eligible for an Insulfoam 20-year thermal performance warranty.
- **Proven Performance.** The same fundamental EPS chemistry has been in use since the mid-1950s so the actual performance of the product is well known.
- **Water Resistant.** EPS is not hygroscopic (does not readily absorb moisture from the atmosphere) and does not promote migration of moisture into the insulation.
- **Code Approvals:** Insulfoam EPS is recognized by the International Code Council Evaluation Service (ICC-ES) and has numerous Underwriter Laboratory and Factory Mutual Approvals. Please contact your local Insulfoam representative for details.



## Sizes

InsulFoam I is typically available in 4' x 4' and 4' x 8' sizes with thickness from 1/4" to 40" and readily available in custom lengths and widths with little or no impact on lead time. It can also be provided in tapered panels.

## Typical Tested Physical Properties\*

Property	Test Method	Value
Density (nom. pcf)	ASTM C303	1.0
C-Value (Conductance) – per inch BTU/(hr•ft <sup>2</sup> •°F) @ 25° F @ 40° F @ 75° F	ASTM C518 or ASTM C177	0.23 0.24 0.26
R-Value (Resistance) - per inch (hr•ft <sup>2</sup> •°F)/BTU @ 25° F @ 40° F @ 75° F	ASTM C518 or ASTM C177	4.35 4.17 3.85
Compressive Strength (psi, 10% consolidation)	ASTM D161	10-14
Flexural Strength (psi)	ASTM C203	25-30
Dimensional Stability (maximum %)	ASTM D2126	< 2.0
Water Vapor Transmission (perm. In)	ASTM E96	2.0-5.0
Absorption (% vol.)	ASTM C272	< 4.0
Capillarity	--	none
Flame Spread	--	<20
Smoke Developed		150-300

\* Properties based on data provided by resin manufacturers, independent test agencies and Insulfoam

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## Appendix E: Photo Diary



Photo 1 – Lock Blocks on truck in Whitehorse



Photo 2 – Truck stuck at Clinton Creek Crossing



Photo 3 – Hitachi ZX 200 unloading lock blocks at gate locations



Photo 4 – Placing lock blocks at the airport road



Photo 5 – Road blocked at the gabion baskets to prevent access along creek



Photo 6 – Road blockage along creek near gabion baskets



Photo 7 – Rock removed from slope above road



Photo 8 – Rock removed from slope and area it came from



Photo 9 – Information signs



Photo 10 - Brushing in Wolverine Creek



Photo 11 - Tailings at Wolverine Creek



Photo 12 – Lower Beaver Dam Removed



Photo 13 - Upper Beaver Dam Removed



Photo 14 - Brush removed from Wolverine Creek



Photo 15 - Brush removed from Wolverine Creek



Photo 16 - Delivery of pipes and abutment structures to site



Photo 17 - Unload abutment structure from truck



Photo 18 - Installing abutment structure and compacting backfill



Photo 19 – Installed south abutment



Photo 20 - Installing north abutment



Photo 21 Placing rip rap around north abutment



Photo 22 - Signage at Wolverine Creek crossing



Photo 23 - Signage and gate at top of tailings pile



Photo 24 - Signage and gate at airport access road



Photo 25 - Signage and gate at trail off mill site access road



Photo 26 - Soft shoulder sign on mill site access road



Photo 27 - Signage on mill site access road



Photo 28 - Installed north abutment



Photo 29 - Installed south abutment



Photo 30 - Post for staff gauge



Photo 31 - Gate and sign at trail on waste rock pile



Photo 32 - Gate and sign at trail on waste rock pile



Photo 33 - Gate and sign at access road to abandoned shovel and drill



Photo 34 - Sign and evidence of ladder removed from abandoned drill



Photo 35 - Sign on abandoned shovel



Photo 36 - Soft Shoulder sign on road along waste rock pile



Photo 37 -- Sign along road on waste rock pile



Photo 38 Gate and sign at abandoned section of road on waste rock pile



Photo 39 - Sign along road on waste rock pile



Photo 40 - Sign on waste rock pile near Clinton Creek



Photo 41 - Signage at site access



Photo 42 - Sign and rock blockage at Wolverine Creek access



Photo 43 - Log-booms on shore after removal from water



Photo 44 - Log-booms in place showing settlement in the water



Photo 45 - Log-booms loaded for transport to Whitehorse



Photo 46 – Flotation foam installed in pipes



Photo 47 - Foam inserted into pipe.



Photo 48 - Foam being placed in pipe



Photo 49 - Foam installed in pipe and end cap installed



Photo 50 - Foam installation complete with inspection covers installed



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## Appendix F: Details of Log Boom Calculations

## Log Boom Specifications and Calculations

Element / Component	Value	Formula	Calculations
Length	15.240 m		
Inside Diameter	0.582 m		
Wall Thickness	0.085 m		
Outside Diameter	0.752 m		
Inside Volume	4.054 m <sup>3</sup>		
Total Volume	6.769 m <sup>3</sup>		
Volume of HDPE	2.715 m <sup>3</sup>		
Density of HDPE	930 kg/m <sup>3</sup>		
Mass of HDPE	2525.0 kg		
Mass of 2 End Caps	440.0 kg		
Mass of 1 Log Boom	2965.0 kg	[Mass of 1 Log Boom] = [Mass of HDPE] + [Mass of 2 End Caps]	2965.0 kg = 2525.0 kg + 440.0 kg
Density of Freshwater	1000 kg/m <sup>3</sup>		
Total Water Displacement (Mass) – Floating	3517.9 kg	[Total Water Displacement (weight)] = [Mass of Log Boom Saturated] *	3517.9 kg = 3517.9 kg
Total Water Displacement (Volume) – Floating	3.518 m <sup>3</sup>	[Total Water Displacement (volume)] = [Mass of Log Boom Saturated] / [Density of Water]	3.518 m <sup>3</sup> = 3517.9 kg / 1000 kg/m <sup>3</sup>
Outside Diameter of Foam Insert	0.552 m		
Volume of Foam Insert	3.647 m <sup>3</sup>	[Volume of Foam Insert] = $\pi$ [(Outside Diameter of Foam Insert) / 2] <sup>2</sup> X [Length]	3.647 m <sup>3</sup> = $\pi$ (0.552 m / 2) <sup>2</sup> X 15.24 m
Volume of Voids in Pipe	0.407 m <sup>3</sup>	[Volume of Voids in Pipe] = [Inside Volume] – [Volume of Foam Insert]	0.407 m <sup>3</sup> = 4.054 m <sup>3</sup> – 3.647 m <sup>3</sup>
Mass of Water in Voids	407 kg	[Mass of Water in Voids] = [Volume of Voids in Pipe] X [Density of Water]	407 kg = 0.407 m <sup>3</sup> X 1000 kg/m <sup>3</sup>
Percentage of Absorption of Foam	4%		
Water Absorption of Foam Insert (Mass)	145.9 kg	[Water Absorption of Foam Insert (Mass)] = [Volume of Foam Insert] X [Percentage of Absorption of Foam] X Density of Water	145.9 kg = 3.647 m <sup>3</sup> X 4% X 1000 kg/m <sup>3</sup>
Mass of Log Boom Saturated	3517.9 kg	[Mass of Log Boom Saturated] = [Mass of 1 Log Boom] + [Mass of Water in Voids] + [Water Absorption of Foam Insert (Mass)]	3517.9 kg = 2965.0 kg + 407 kg + 145.9 kg
Total Water Displacement (Mass) – Submerged	6769 kg	[Total Water Displacement (Mass) – Submerged] = [Total Volume] X [Density of Water]	6769 kg = 6.769 m <sup>3</sup> X 1000 kg/m <sup>3</sup>
Buoyancy (Submergence Percentage)	52%	[Buoyancy (Submergence Percentage)] = [Mass of Log Boom Saturated] / [Total Water Displacement (Mass) – Submerged] **	52% = 3517.9 kg / 6769 kg
Buoyancy (Submergence Height)	0.391 m	[Buoyancy (Submergence Height)] = [Buoyancy (Submergence Percentage)] X [Outside Diameter]	0.391 m = 52% X 0.752 m
*This is calculated as the actual weight of water displaced by the floating object.			
**Given that the buoyancy of an object is a function of its density; submergence percentage can be calculated by dividing the total mass of the object by total mass of water displaced by the object if it were fully submerged (i.e. the total mass of the object if it had the density of fresh water).			