AGNICO EAGLE MINES LTD
MEADOWBANK DIVISION

# WHALE TAIL HAUL ROAD

MARCH 26, 2019

CONFIDENTIAL

# WHALE TAIL HAUL ROAD CONSTRUCTION REPORT

## AGNICO EAGLE MINES LTD

CONFIDENTIAL

PROJECT NO.: 171-17523-00
CLIENT REF: 6103-E-132-001
DATE: MARCH 26, 2019

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# REVISION HISTORY

FIRST ISSUE

| | | | | |
|---|---|---|---|---|
| 2019-03-26 | Final | | | |
| Prepared by | Reviewed by | Approved By (WSP) | Approved by (AEM) | |
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# SIGNATURES

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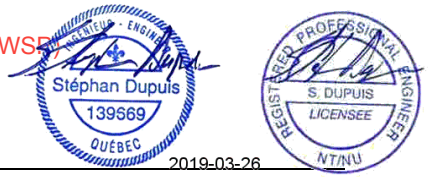


2019-03-26

Stéphan Dupuis, P.Eng.

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Julie Bélanger, Project Superintendent - Amaruq

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# 1 INTRODUCTION

To expand its activities, Agnico Eagle Mines undertook the construction of a new 64 km road, linking up the Meadowbank site to a new exploitation site, Amaruq, located in the Northern territory of Canada, in Nunavut. AEM delegated WSP to provide professional services in engineering and produce plans and technical specifications for the required work to build the Amaruq exploration access road, to be able to reach and explore the Amaruq site. After completing the construction of Amaruq access road, AEM retained WSP to provide detailed engineering for widening the Amaruq access road and to build the production road, Whale tail haul road. It also includes the improvement of the road design by softening slopes and correcting profile to ensure the security of users and allow an easy crossing for wildlife.

The following Construction Summary Report was prepared in accordance with NWB Water License 2AM-WTP1826 Part D, Item 16. It summarizes the activities of the Amaruq access road and the Whale tail haul road construction and includes a site location plan, construction schedule, summary of quantities, a list of the main modifications made during construction, photos of different construction activities and an «as survey» drawings of the road, based on information provided by AEM. Construction activities were supervised by AEM staff and the contractor KCG (Kivalliq Contractors Group).

# 2 SUMMARY OF CONSTRUCTION

## 2.1 SITE LOCATION PLAN

The following figure shows the road location plan.

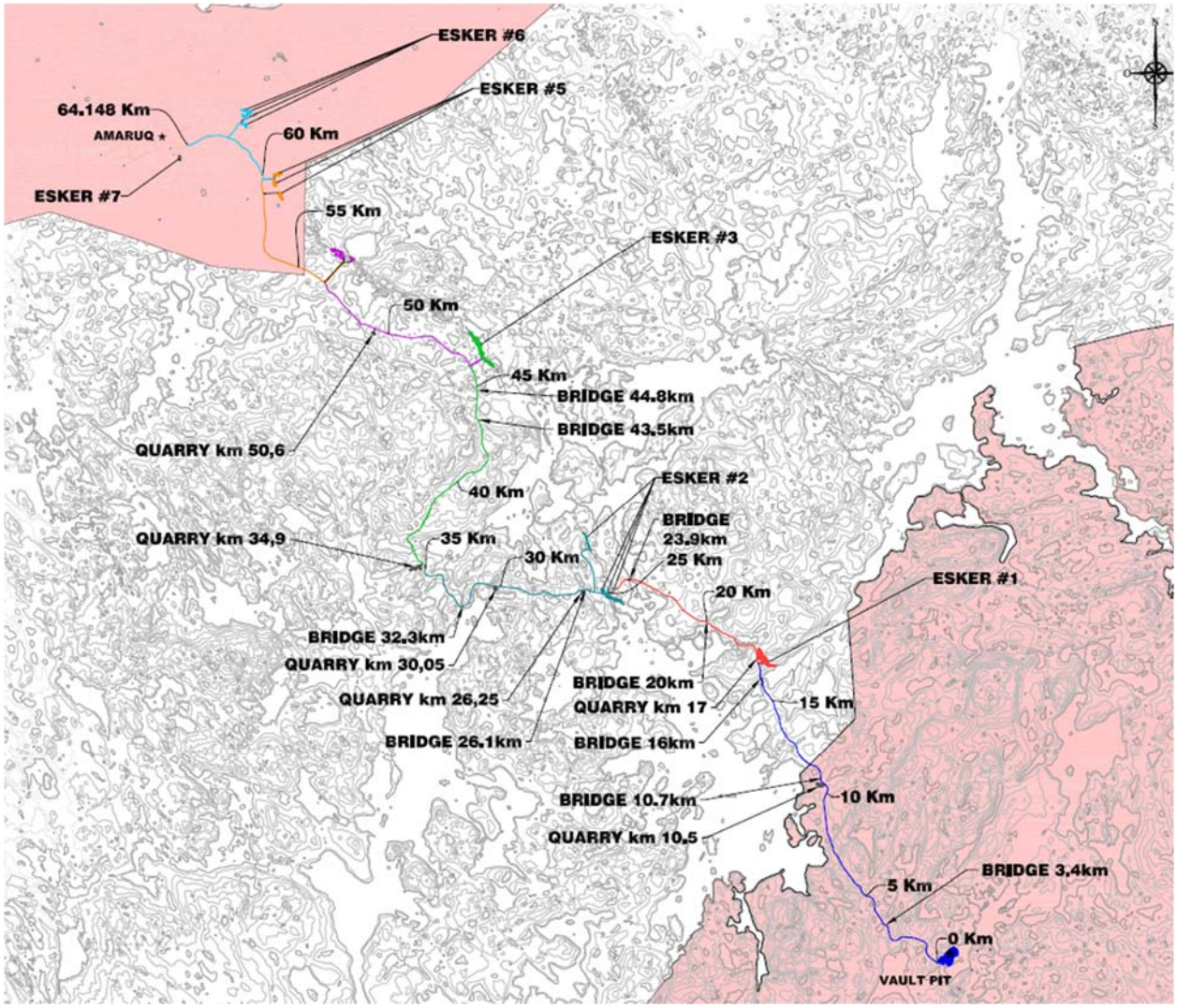


**Figure 1: Location Plan**

## 2.2 CONSTRUCTION SCHEDULE

Construction activities were completed by Contractor KCG, and supervised by AEM staff. The exploration access road was built in 2016-2017 and the operation road was built in 2018. Construction activities include drilling and blasting to prepare rockfill, culvert installation, bridge construction and rockfill activities.

### *2.2.1 EXPLORATION ROAD*

Exploration road construction was divided into five activities:

- Rockfill activities

**Table 1: Rockfill schedule**

| Section | Location | Schedule |
|---|---|---|
| Section #1 | 1+000 @ 16+800 | 2016/02/22 to 2016/09/30 |
| Section #2 | 16+800 @ 25+000 | 2016/10/21 to 2016/12/21 |
| Section #3 | 25+000 @ 35+000 | 2016/12/23 to 2017/05/18 |
| Section #4 | 35+000 @ 43+000 | 2017/05/14 to 2017/05/13 |
| Section #5 | 43+000 @ 52+500 | 2017/06/05 to 2017/07/08 |
| Section #6 | 52+500 @ 57+500 | 2017/07/09 to 2017/08/05 |
| Section #7 | 57+500 @ 64+135 | 2017/08/6 to 2017/08/18 |

- Bridge construction

**Table 2: Bridge construction schedule**

| Location | From | To |
|---|---|---|
| Bridge km 3.5 (10.88 m) | 2016-10-14 | 2017-02-05 |
| Bridge km 10.7 (10.88 m) | 2016-09-26 | 2017-01-10 |
| Bridge km 16.0 (45 m) | 2016-10-24 | 2017-04-17 |
| Bridge km 20.0 (10.88 m) | 2017-03-07 | 2017-04-28 |
| Bridge km 23.9 (66 m) | 2017-02-13 | 2017-07-04 |
| Bridge km 26.1 (10.88 m) | 2017-03-07 | 2017-05-20 |
| Bridge km 32.3 (45 m) | 2017-03-07 | 2017-06-28 |
| Bridge km 43.5 (10.88 m) | 2017-04-23 | 2017-07-19 |
| Bridge km 44.8 (45 m) | 2017-05-01 | 2017-07-18 |

### 2.2.2 OPERATION ROAD

Operation road construction was divided into four activities:

- Culvert activities: from April 24th, 2018 to October 8, 2018
- Rockfill activities:

**Table 3 : Rockfill Schedule**

| Section | Location | Schedule |
|---|---|---|
| Section #1 | 1+000 @ 16+800 | 2018/05/06 to 2018/06/20 |
| Section #2 | 16+800 @ 25+000 | 2018/06/22 to 2018/07/10 |
| Section #3 | 25+000 @ 35+000 | 2018/07/11 to 2018/09/10 |
| Section #4 | 35+000 @ 43+000 | 2018/09/10 to 2018/10/09 |
| Section #5 | 43+000 @ 52+500 | 2018/10/09 to 2018/10/21 |
| Section #6 | 52+500 @ 57+500 | 2018/10/21 to 2018/10/26 |
| Section #7 | 57+500 @ 64+500 | 2018/10/26 to 2018/10/31 |

- Drill and blast activities: from May 9th, 2018 to October 9th, 2018

**Table 4: Drilling and blasting schedule**

| Location | Schedule |
|---|---|
| Quarry Km 10.5 | 2018/05/09 to 2018/06/08 |
| Quarry Km 17 | 2018/06/09 to 2018/06/23 |
| Quarry Km 26 | 2018/06/30 to 2018/07/15 |
| Quarry Km 30 | 2018/07/15 to 2018/08/18 |
| Quarry Km 36 | 2018/08/20 to 2018/09/26 |
| Quarry Km 50.5 | 2018/09/26 to 2018/10/09 |

- Final layer: from July 11, 2018 to November 12, 2018

## 2.3 EXPLORATION ROAD CONSTRUCTION

The exploration road, Amaruq access road, was built to reach the Amaruq site, it is 6.5 metes wide and contains about 290 water crossings, including 9 bridges and 19 culverts with fish habitat. This section sums up the activities of Amaruq access road, according to information given by AEM. It describes the material used in road backfill, a summary of culverts installed and a comparison between specified and as surveyed quantities.

### 2.3.1 ROAD BACKFILL

The road backfill was done with two different materials. Rock from quarries and material from Eskers.

This section sums up the quantities and type of used material for road backfill according to as survey drawings and count truck.

**Table 5: Type and quantities of used materiel**

| Chaining | | Type of Backfill | Volume ($m^3$) |
|---|---|---|---|
| 0+000 | 5+000 | Rock | 336 877 |
| 5+000 | 16+000 | Rock | |
| 16+000 | 16+750 | Rock | 188 789 |
| 16+750 | 17+600 | Esker | |
| 17+600 | 18+950 | Esker | |
| 18+950 | 21+000 | Rock | |
| 21+000 | 23+900 | Rock | |
| 24+000 | 25+100 | Rock | 260 449 |
| 25+100 | 26+000 | Esker | |
| 26+000 | 26+280 | Rock | |
| 26+280 | 28+050 | Esker | |
| 28+050 | 28+600 | Rock | |
| 28+600 | 30+350 | Esker | |
| 30+350 | 30+500 | Mix | |
| 30+500 | 31+810 | Esker | |
| 31+810 | 32+450 | Rock | |
| 32+450 | 33+350 | Mix | |
| 33+350 | 33+780 | Esker | |
| 33+780 | 34+840 | Rock | |
| 34+840 | 35+000 | Mix | |
| 35+000 | 39+080 | Mix | 186 312 |
| 39+080 | 40+200 | Rock | |
| 40+200 | 41+790 | Mix | |
| 41+790 | 41+900 | Rock | |
| 41+900 | 43+200 | Mix | |
| 43+200 | 43+500 | Esker | |
| 43+500 | 43+900 | Rock | |
| 43+900 | 44+725 | Mix | |
| 44+725 | 46+070 | Rock | |
| 46+070 | 52+420 | Esker | 114 718 |
| 52+420 | 53+700 | Rock | |

| Chaining | | Type of Backfill | Volume ($m^3$) |
|---|---|---|---|
| 53+700 | 59+800 | Rock | 82 298 |
| 59+800 | 64+150 | Esker | 73 604 |

### 2.3.2 CULVERT INSTALLATION

Culverts construction was done by KCG and supervised by AEM staff. The following tables show information on culverts with fish habitat based on information given by AEM and a comparison between specified and as surveyed culvert lengths. More culvert details are presented in appendix C.

**Table 6: Culverts with fish habitat**

| No. | Location (KM) | Crossing structure | Culvert/Bridge length (m) | Flow characteristics | Channel configuration | Dominant habitat | Fish habitat assessment |
|---|---|---|---|---|---|---|---|
| 1 | 2.1 | #8, #8-2. 900 mm | 27 | No surface flow. May be interstitial flow | Single | Boulder | May not provide fish habitat most of the time due to lack of flow. Fish passage also unlikely. |
| 3 | 8 | #30, 30-2, 31. 900 mm | 21; 18 for #31 | Surface flow, but diffuse in places | Multiple/ Diffuse | Graminoid | May provide seasonal small fish habitat. |
| 4 | 8.4 | #32, 33, 34, 34-2. 900 mm | 18 | Surface flow at crossing. Only interstitial flow in boulder section downstream in 2014 and 2015 | Multiple | Graminoid | May provide seasonal small-bodied fish habitat only. Upstream migration by large-bodied fish unlikely. Only small lake upstream. |
| 6 | 11.1 | #47, 47-2, 47-3, 47-4. 900 mm | 21; 24 for #47-3 | Surface flow | Single | Graminoid | No Arctic Grayling was observed, but provides seasonal habitat for juvenile Arctic Char and likely also provides seasonal habitat for small-bodied fishes. |
| 7 | 12.8 | #58, 59, 60. 900 mm | 18 | Surface flow, but diffuse in places | Multiple | Graminoid | May provide seasonal small-bodied fish habitat only. No upstream migration of large fish likely, due to wetland character of connection and lack of upstream lake habitat. |

| No. | Location (KM) | Crossing structure | Culvert/Bridge length (m) | Flow characteristics | Channel configuration | Dominant habitat | Fish habitat assessment |
|---|---|---|---|---|---|---|---|
| 9 | 18.6 | #74, 74-2. 900 mm | 21 | Mainly interstitial flow in the fall of 2014 | Single | Boulder | Small wetted channel within the larger feature may provide seasonal habitat for small-bodied fishes only. High flows may be infrequent. Not an upstream migration route for large-bodied fish during spring freshet due to sections with only interstitial flow. |
| 11 | 22.1 | #94, 94-2, 94-3, 95, 95-2. 900 mm | 18; 21 for #95 and 95-2 | Surface flow at crossing location, but only interstitial flow in both 2014 and 2015 where boulders dominate downstream of proposed crossing | Multiple/Diffuse | Graminoid | May provide seasonal small-bodied fish habitat only. Upstream migration likely not possible or important due to channel configuration and flow volume. Upstream pond is shallow. |
| 14 | 28.3 | #121, 121-2, 121-3. 900 mm | 45 | Surface flow in some sections and only interstitial flow in others in June 2015 | Single | Boulder | May not provide fish habitat due to lack of surface flow. Fish passage is unlikely. |
| 15 | 30.4 | #129. 1200 mm | 51 | No surface flow in 2014 or 2015. Interstitial flow only in 2015 | Single | Boulder | Provides seasonal fish habitat and seasonal fish passage between ponds. Migration of large-bodied fish unlikely due to shallow nature of small pond south of alignment. |
| 17 | 36.2 | #150, 150-2, 150-3, 150-4, 150-5. 900 mm | 18 | Surface flow | Single | Boulder | Likely does not provide fish habitat. Surface flow is unlikely except possibly during an extreme flow-generating event. Fish passage is likely not an issue due the lack of surface flow in the watercourse. |
| 18 | 41.8 | #167. 600 mm | 33 | No surface flow at crossing in 2014. May be interstitial flow | Single | Boulder | Likely does not provide fish habitat. Surface flow is unlikely except possibly during an extreme flow-generating event. Fish passage is likely not an issue due the lack of flow in the watercourse. Recommendation is precautionary. |

| No. | Location (KM) | Crossing structure | Culvert/Bridge length (m) | Flow characteristics | Channel configuration | Dominant habitat | Fish habitat assessment |
|---|---|---|---|---|---|---|---|
| 20 | 44.4 | #173, 173-2, 173-3. 1000 mm | 36 | Surface flow at crossing and other discrete locations, but interstitial flow through much of watercourse in 2014. More surface flow in 2015 | Single | Boulder | May provide seasonal small-bodied fish habitat only. Upstream migration probably not important due shallowness of small upstream lake. No spawning habitat for large-bodied fish downstream of crossing due to lack of suitable substrate. |
| 22 | 46.1 | #182, #183, #183-2, #184. 800 mm | 18 for #182;<br>24 for #183 and 184;<br>21 for #183-2 | Surface flow | Single | Graminoid | May provide seasonal small-bodied fish habitat only, Upstream migration for large-bodied fishes unlikely due to section of interstitial flow downstream. Only shallow pond upstream. |
| 23 | 49.4 | #208, 209, 210. 900 mm | 18 | Surface flow at crossing but diffuse in some locations and interstitial section downstream in 2014 and 2015 | Single | Boulder | May provide seasonal habitat for small-bodied fish. Migration of large-bodied fish unlikely due to nature of channel, and lack of surface flow in many places. |
| 24 | 51.2 | #218, 218-2, 218-3, 218-4. 900 mm | 18 | Surface flow, but diffuse or interstitial in many locations in 2014 and 2015 | Single | Boulder | May not provide fish habitat most of the time. May never be sufficient water to allow large-bodied fish passage. |
| 25 | 51.8 | #221, 221-2, 221-3. 900 mm | 24 | No surface flow in 2014 or 2015. May be interstitial flow | Single | Boulder | Probably no connection to lakes to north. May provide seasonal habitat for small fishes when flooded in spring. |
| 26 | 56.9 | #253, 253-2, 253-3. 900 mm. | 18 | No surface water in 2014. Surface water, but appears to be standing water, in 2015. | Single | Boulder | Provides small-bodied fish habitat and passage between lakes when flooded in spring. |
| 27 | 59.7 | #267. 900 mm. | 18 | Surface water at crossing in 2015, but appears to be due to high levels in adjacent lakes. Probably dry most of the year | Single | Boulder | May provide seasonal habitat for small-bodied fishes. |
| 28 | 63.1 | #284, 284-2, 284-3. 900 mm. | 24 | Some surface flow at crossing and other discrete location in 2015, but does not appear to be a surface connection to upstream ponds | Single. Poorly defined | Boulder | May provide seasonal habitat for small-bodied fishes. No upstream lake. |

Table 7: Specified vs as built culverts length

| Culvert diameter (mm) | Specified length (m) | As surveyed length (m) |
|---|---|---|
| 300 | 657 | 636 |
| 450 | 534 | 558 |
| 600 | 1674 | 2136 |
| 700 | 115 | 201 |
| 710 | 186 | 237 |
| 800 | 228 | 376 |
| 900 | 1584 | 2387 |
| 1000 | 72 | 129 |
| 1200 | 90 | 189 |

According to the table above, there are some differences between specified and as surveyed lengths. Those differences are due to some changes done on site. Some culverts were cancelled while others were added, profile was raised in some locations that may contains culverts.

### 2.3.1 GEOTEXTILE AND GEOGRID

The table bellow shows locations where geotextile and geogrid were required. The information in the table is based on specification provided by WSP. Some modifications made on site are presented in section 3.

Table 8: Geotextile and geogrid location

| Start | End | Length (m) |
|---|---|---|
| 2+150 | 2+250 | 100 |
| 2+725 | 2+877 | 152 |
| 2+950 | 3+160 | 210 |
| 3+475 | 3+560 | 85 |
| 3+620 | 3+680 | 60 |
| 5+880 | 5+975 | 95 |
| 6+375 | 6+550 | 175 |
| 6+840 | 6+940 | 100 |
| 7+145 | 8+722 | 1577 |
| 8+930 | 9+080 | 150 |
| 9+150 | 13+150 | 4000 |
| 13+225 | 13+300 | 75 |
| 13+340 | 13+480 | 140 |
| 13+620 | 13+990 | 370 |
| 14+275 | 15+400 | 1125 |
| 15+640 | 16+780 | 1140 |
| 17+080 | 17+240 | 160 |
| 18+600 | 18+950 | 350 |

| Start | End | Length (m) |
|---|---|---|
| 19+475 | 20+300 | 825 |
| 20+820 | 21+000 | 180 |
| 21+610 | 21+860 | 250 |
| 22+160 | 22+200 | 40 |
| 22+690 | 22+720 | 30 |
| 23+800 | 23+840 | 40 |
| 24+850 | 24+980 | 130 |
| 32+050 | 32+175 | 125 |
| 32+225 | 32+350 | 125 |
| 32+400 | 32+500 | 100 |
| 33+520 | 33+700 | 180 |
| 34+875 | 35+050 | 175 |
| 35+400 | 35+700 | 300 |
| 35+750 | 35+775 | 25 |
| 36+310 | 36+325 | 15 |
| 36+550 | 36+675 | 125 |
| 36+950 | 36+995 | 45 |
| 37+075 | 37+100 | 25 |
| 37+200 | 37+300 | 100 |
| 37+475 | 37+500 | 25 |
| 37+750 | 37+800 | 50 |
| 41+775 | 41+900 | 125 |
| 43+275 | 43+600 | 325 |
| 43+800 | 43+850 | 50 |
| 44+250 | 45+225 | 975 |
| 44+320 | 44+379 | 59 |
| 46+200 | 46+550 | 350 |
| 48+425 | 48+500 | 75 |
| 49+370 | 49+400 | 30 |
| 49+600 | 49+725 | 125 |
| 51+190 | 51+225 | 35 |
| 51+325 | 51+625 | 300 |
| 51+790 | 51+875 | 85 |
| 52+175 | 52+550 | 375 |
| 52+650 | 53+125 | 475 |
| 55+446 | 56+475 | 1029 |
| 56+525 | 56+550 | 25 |
| 57+730 | 57+775 | 45 |
| 57+880 | 57+975 | 95 |
| 58+350 | 58+370 | 20 |

| Start | End | Length (m) |
|---|---|---|
| 58+375 | 58+457 | 82 |
| 59+275 | 59+332 | 57 |
| 59+600 | 59+650 | 50 |
| 59+697 | 59+800 | 103 |
| 59+997 | 60+088 | 91 |
| 60+975 | 61+200 | 225 |
| 61+375 | 61+680 | 305 |
| 62+200 | 62+859 | 659 |
| 63+500 | 64+025 | 525 |

## 2.4 BRIDGES

### *2.4.1 CONSTRUCTION*

During the construction of exploration road, there were 9 bridges built. The construction was done by KCG and supervised by AEM staff. the 44 and 66 meters long bridges were built on the shores and then launched on the abutments. Before launching the bridges, WSP staff inspected bolting procedure on splices that join the beams. The abutments were made by corrugated steel boxes filled with granular material. After launching each bridge, the concrete slabs were placed and joined with concrete slurry. The contractor planned dispositions for pouring during cold weather.

The following table shows some bridge information. More information about fish habitat in bridge location are shown in appendix D.

**Table 9: Bridge locations**

| Bridge | Location | Length (m) |
|---|---|---|
| 1 | Km 3.4 | 13.88 |
| 2 | Km 10.7 | 13.88 |
| 3 | Km 16 | 44.87 |
| 4 | Km 20 | 13.88 |
| 5 | Km 23.9 | 66 |
| 6 | Km 26.1 | 13.88 |
| 7 | Km 32.3 | 44.87 |
| 8 | Km 43.5 | 13.88 |
| 9 | Km 44.8 | 44.87 |

Most of bridges were installed in extreme low temperature during winter time. When temperature raised during summer, many problems were detected on different parts of bridges. An inspection was done by Associated engineers who made some recommendations to fix the defects.

The first defect was buckling on beams and noticed by AEM staff on bridges km 23.9 and km 16. The maximum deflection measured was 25 mm during high temperature. Those deflections were less important when temperature was lower. According to the Associated Engineers' Inspection report, the deformations are the result of unbalanced welding shrinkage that occurred during fabrication. The thermic effects of welding cannot be completely avoided, but those deformations have no structural capacity implications. The inspection revealed other defects which were repaired by the contractor:

- Some loose-bolted connections on diaphragm bracing
- Bearing guide plate at the end of slot: this problem was faced in many inspected bridges. The possible cause was the temperature during installation or the fact that backfill on the approach was completely done in one side before the other, which made the bridge move and hit the end of slot
- Some spall on concrete slab
- Some granular material loses at the end of concrete slab

### 2.4.2 LOAD LIMITATION

Bridges were designed for mine haulage operation. A load evaluation of bridges was done by associated Engineering. Five load cases were considered in the evaluations completed on January 5 and April 13, 2018:

- Caterpillar 6020B (224 000 kg)
- Caterpillar 6030 (294 000 kg)
- Caterpillar 785 / Caterpillar 6020B on Sleipner E250 Tow Haul (378 000 kg)
- Caterpillar 777G (182 420 kg)
- Caterpillar 785D (249 480 kg)

The Sleipner Tow Haul is not able to cross the bridges because its wheels are wider than the deck.

For more information and specifications, please see reports in appendix E.

## 2.5 ROAD WIDENING

Whale Tail Haul road, was built for production activities. By widening the access road, the Whale Tail Haul road has 9.6 meters wide that allows fluid circulation of haul trucks. The construction included profile corrections, and slope softening to increase security of users and allow an easy crossing of wildlife where backfill is higher than 3 meters.

This section sums up the activities of the Whale Tail Haul road, according to information given by AEM. It describes the material used in road backfill, a summary of culverts installed and a comparison between specified and as surveyed quantities.

### 2.5.1 ROAD BACKFILL

This section sums up the quantities and type of used material for road backfill according to as survey drawings and count truck.

Table 9 shows a comparison between specified and as surveyed material type and volume. Table 10 shows volumes used in each source of material.

Table 10: Specified vs as surveyed material type

| Chaining | | Specified | | As surveyed | | |
|---|---|---|---|---|---|---|
| | | Type of Backfill | Volume (m³) | Source | Type of Backfill | Volume (m³) |
| 0+000 | 5+000 | Rock | 23900 | Transit Pad - Vault Pit | Rock | 138 097 |
| 5+000 | 16+000 | Rock | 83888 | Transit Pad - Vault Pit - Quarry KM10 & 17 | Rock | |
| 16+000 | 16+750 | Rock | 1837 | Quarry Km17 | Rock | 75 474 |
| 16+750 | 17+600 | Esker | 22912 | Esker 1 | Esker | |
| 17+600 | 18+950 | Esker | | Quarry Km17 | Rock | |
| 18+950 | 21+000 | Rock | 20938 | Quarry Km17 | Rock | |
| 21+000 | 23+900 | Rock | 19493 | Quarry km17 | Rock | |
| 24+000 | 25+100 | Rock | 187657 | 12,5% Esker 2a &2b<br>26,7% Quarry Km 26<br>58% Quarry Km 30<br>2,5% Quarry km17& Km 35 | Mix | 211 196 |
| 25+100 | 26+000 | Esker | | | | |
| 26+000 | 26+280 | Rock | | | | |
| 26+280 | 28+050 | Esker | | | | |
| 28+050 | 28+600 | Rock | | | | |
| 28+600 | 30+350 | Esker | | | | |
| 30+350 | 30+500 | Mix | | | | |
| 30+500 | 31+810 | Esker | | | | |
| 31+810 | 32+450 | Rock | | | | |
| 32+450 | 33+350 | Mix | | | | |
| 33+350 | 33+780 | Esker | | | | |
| 33+780 | 34+840 | Rock | | | | |
| 34+840 | 35+000 | Mix | | | | |
| 35+000 | 39+080 | Mix | 88132 | 27,5% Esker 3<br>16,5% Quarry km30<br>56% Quarry km 35 | Rock:35+000 to 43+200<br>Esker: 43+000 to 45+900 | 99 451 |
| 39+080 | 40+200 | Rock | | | | |
| 40+200 | 41+790 | Mix | | | | |
| 41+790 | 41+900 | Rock | | | | |
| 41+900 | 43+200 | Mix | | | | |
| 43+200 | 43+500 | Esker | | | | |
| 43+500 | 43+900 | Rock | | | | |
| 43+900 | 44+725 | Mix | | | | |
| 44+725 | 46+070 | Rock | | | | |
| 46+070 | 52+420 | Esker | 35067.47 | 77% Esker 3<br>14% Esker 5<br>9% Quarry Km 35 | Esker | 48 957 |
| 52+420 | 53+700 | Rock | 6483.19 | | | |

| Chaining | | Specified | | As surveyed | | |
|---|---|---|---|---|---|---|
| | | Type of Backfill | Volume (m³) | Source | Type of Backfill | Volume (m³) |
| 53+700 | 59+800 | Rock | 28810.59 | 70% Esker 3<br>3% Esker 5<br>3% Esker 7<br>12% Quarry km 35<br>12% Quarry Km 50 | Esker | 30 211 |
| 59+800 | 64+150 | Esker | 22112.41 | 64% Esker 5<br>11% Quarry Km 35<br>25% Quarry Km 50 | Mix | 17 159 |

**Table 11: Used Volume**

| Source of material | Used volume (m³) |
|---|---|
| Esker #1 | 33808.5 |
| Esker #2a | 23224.5 |
| Esker #2b | 7627.5 |
| Esker #3 | 76981.5 |
| Esker #5 | 19606.5 |
| Esker #6 | 2029.5 |
| Esker #7 | 1044 |
| Quarry KM 10 | 86872.5 |
| Quarry KM 17 | 54246.5 |
| Quarry KM 26 | 59112 |
| Quarry KM 30 | 139932 |
| Quarry KM 35 | 57514.5 |
| Quarry KM 50 | 8532 |
| Stock Pile KM 17 | 11763 |
| Stock Pile KM 35 | 15862 |
| Transit pad | 55849.5 |
| Vault Pit | 5616 |

According to the truck count, there are 660 000 m³ of used material from quarries and Eskers. However, there were only 621 131 m³ that was used for the road. The rest of materiel was used for road maintenance, bridge approach, culvert construction, access roads for Eskers, riprap and material for abutment.

### 2.5.2 HIGH BACKFILLS

In some locations, backfill is high. To ensure security of users and allow an easy crossing for wildlife, the slopes are softened from 2:1 to 4:1 when backfill is higher than 3 meters. The table bellow shows locations where slopes are softened.

**Table 12: Backfill higher than 3 m**

| Chaining | | length (m) | Max height (m) |
|---|---|---|---|
| 1+510 | 1+530 | 20 | 3 |
| 2+110 | 2+195 | 85 | 4 |
| 2+650 | 2+680 | 30 | 3 |
| 3+360 | 3+425 | 65 | 4.8 |
| 3+440 | 3+560 | 120 | 4.8 |
| 4+710 | 4+780 | 70 | 3.5 |
| 5+320 | 5+345 | 25 | 3.8 |
| 5+530 | 5+625 | 95 | 5 |
| 5+895 | 5+960 | 65 | 3.8 |
| 6+520 | 6+595 | 75 | 3.8 |
| 7+200 | 7+225 | 25 | 3.5 |
| 10+655 | 10+710 | 55 | 4.75 |
| 10+730 | 10+810 | 80 | 4.75 |
| 15+830 | 16+040 | 210 | 6.25 |
| 16+095 | 16+150 | 55 | 5.25 |
| 17+390 | 17+420 | 30 | 4.2 |
| 18+025 | 18+180 | 155 | 9 |
| 18+310 | 18+590 | 280 | 3.8 |
| 19+620 | 19+660 | 40 | 3.2 |
| 19+910 | 19+960 | 50 | 4 |
| 19+980 | 20+090 | 110 | 4.5 |
| 20+305 | 20+390 | 85 | 4 |
| 23+515 | 23+560 | 45 | 3.5 |
| 23+700 | 23+890 | 190 | 6.8 |
| 23+960 | 24+040 | 80 | 6.8 |
| 24+940 | 25+070 | 130 | 8.2 |
| 26+050 | 26+110 | 60 | 7 |
| 26+130 | 26+190 | 60 | 6.5 |
| 27+175 | 27+200 | 25 | 3.5 |
| 27+360 | 27+390 | 30 | 3.2 |
| 27+755 | 27+800 | 45 | 3.25 |
| 27+990 | 28+050 | 60 | 6 |

| Chaining | | length (m) | Max height (m) |
|---|---|---|---|
| 28+225 | 28+490 | 265 | 8 |
| 28+545 | 28+600 | 55 | 5.2 |
| 29+940 | 30+000 | 60 | 5.25 |
| 30+320 | 30+515 | 195 | 9.2 |
| 30+740 | 30+830 | 90 | 6.5 |
| 30+925 | 31+060 | 135 | 7.5 |
| 31+775 | 31+900 | 125 | 8 |
| 32+350 | 32+470 | 120 | 7.75 |
| 33+250 | 33+310 | 60 | 3.25 |
| 33+700 | 33+825 | 125 | 5.8 |
| 35+640 | 35+820 | 180 | 7 |
| 41+825 | 41+930 | 105 | 5.2 |
| 43+540 | 43+575 | 35 | 4 |
| 43+590 | 43+675 | 85 | 4.8 |
| 44+730 | 44+820 | 90 | 5.2 |
| 44+875 | 44+955 | 80 | 5.8 |
| 46+575 | 46+640 | 65 | 5 |
| 61+760 | 61+825 | 65 | 4 |
| 63+050 | 63+150 | 100 | 4 |
| 63+410 | 63+490 | 80 | 4.75 |

### 2.5.3 CULVERT INSTALLATION

This section presents a comparison between specified and as surveyed culverts installed during construction.

**Table 13: Required vs as built culverts length**

| Culvert (Galvanized sheet metal pipe) | Required 6m sections | Required 9m sections | Required 12m sections | Total required length (m) | As surveyed length (m) |
|---|---|---|---|---|---|
| 300 mm diameter | 30 | 3 | 1 | 221 | 282 |
| 450 mm diameter | 35 | | 2 | 238 | 252 |
| 600 mm diameter | 101 | 9 | 4 | 743 | 863 |
| 700 mm diameter | 26 | 1 | | 165 | 240 |
| 800 mm diameter | 15 | 2 | 3 | 150 | 240 |
| 900 mm diameter | 86 | 31 | 11 | 949 | 1038 |
| 1000 mm diameter | 4 | | | 24 | 36 |
| 1200 mm diameter | 4 | 3 | 1 | 65 | 72 |
| | | | **Total** | 2555 | 3023 |

According to the table above, there are some differences between specified and as surveyed lengths. Those differences are due to some changes done on site. Some culverts were cancelled while others were added, profile was raised in some locations that may contains culverts.

## 2.6 DRAWINGS AND PHOTOGRAPHS

Based on a survey provided by AEM, an as survey drawing was produced for the exploration road and for the production road. The drawings are presented in appendix A.

Technical drawing for bridges are presented in appendix F.

Photographs of road backfill, drilling and blasting quarries and culvert installation are shown in appendix B.

# 3 MAIN MODIFICATIONS

Based on information and surveys given by AEM, this section sums up the main modifications made during construction.

## 3.1 EXPLORATION ROAD CONSTRUCTION

Many changes were made during the access road construction, such as geotextile addition or removal, profile raising, changing culvert location, or culvert cancellation. Those changes were made according to site conditions.

### *3.1.1 CULVERT*

The following table shows cancelled culverts. More culvert details are presented in appendix C.

**Table 14: Cancelled culverts**

| Number | Location | Diameter |
|---|---|---|
| #4 | 1+325 | 800 |
| #6 | 1+792 | 600 |
| #16 | 5+040 | 300 |
| #29 | 7+785 | 900 |
| #29-2 | 7+787 | 900 |
| #44 | 9+487 | 300 |
| #49 | 11+407 | 450 |
| #51 | 11+902 | 300 |
| #71 | 18+287 | 450 |
| #72 | 18+350 | 450 |
| #127 | 29+336 | 300 |
| #128 | 29+522 | 300 |
| #172 | 44+436 | 600 |
| #200 | 48+420 | 600 |
| #228 | 53+020 | 710 |
| #229 | 53+272 | 300 |
| #257 | 57+550 | 600 |
| #258 | 57+900 | 600 |
| #278-2 | 61+898 | 600 |
| #282 | 62+898 | 450 |
| #285 | 63+253 | 300 |
| #286 | 63+408 | 200 |

### 3.1.2 GEOTEXTILE AND GEOGRID

The following table sums up the main modifications made for geotextile and geogrid installation. According to site conditions, there are some locations where geotextile was added and other where removed.

| Chaining | | Type of change | Note |
|---|---|---|---|
| 7+420 | 7+501 | Addition | with geogrid |
| 16+758 | 18+100 | Removal | |
| 17+080 | 17+240 | Addition | |
| 18+850 | 18+951 | Addition | |
| 19+835 | 19+860 | Addition | with geogrid |
| 20+575 | 20+820 | Removal | |
| 20+820 | 21+060 | Removal | |
| 21+610 | 21+859 | Addition | |
| 22+040 | 22+160 | Removal | |
| 22+160 | 22+200 | Addition | |
| 22+200 | 22+292 | Removal | |
| 22+540 | 22+620 | Removal | |
| 22+720 | 22+780 | Removal | |
| 23+400 | 23+800 | Removal | |
| 24+575 | 24+650 | Removal | |
| 25+231 | 25+361 | Removal | |
| 26+680 | 26+885 | Removal | |
| 28+300 | 28+317 | Removal | |
| 28+525 | 28+585 | Removal | |
| 31+950 | 32+050 | Removal | |
| 32+175 | 32+225 | Removal | |
| 32+350 | 32+400 | Removal | |
| 32+500 | 33+115 | Removal | |
| 33+900 | 34+875 | Removal | |
| 35+210 | 35+400 | Removal | |
| 35+700 | 35+750 | Removal | |
| 36+130 | 36+310 | Removal | |
| 36+900 | 36+950 | Removal | |
| 36+995 | 37+075 | Removal | |
| 37+185 | 37+265 | Removal | |
| 37+435 | 37+475 | Removal | |
| 41+775 | 41+850 | Addition | with geogrid |
| 43+600 | 43+800 | Removal | |
| 44+320 | 44+370 | Addition | |
| 46+112 | 46+142 | Removal | |

| Chaining | | Type of change | Note |
|---|---|---|---|
| 49+171 | 49+370 | Removal | |
| 51+075 | 51+190 | Removal | |
| 51+150 | 52+599 | Removal | |
| 51+790 | 51+810 | Addition | |
| 52+695 | 52+720 | Addition | with geogrid |
| 52+900 | 52+980 | Addition | with geogrid |
| 55+511 | 55+710 | Removal | |
| 55+800 | 56+446 | Removal | |
| 57+016 | 57+730 | Removal | |
| 57+775 | 57+880 | Removal | |
| 58+220 | 58+320 | Removal | |
| 58+350 | 58+370 | Addition | |
| 58+457 | 58+975 | Removal | |
| 59+125 | 59+275 | Removal | |
| 59+332 | 59+603 | Removal | |
| 59+650 | 59+697 | Removal | |
| 59+697 | 59+740 | Addition | |
| 59+780 | 59+795 | Addition | |
| 59+866 | 59+997 | Removal | |
| 59+997 | 60+088 | Addition | |
| 60+088 | 60+245 | Removal | |
| 60+625 | 60+775 | Removal | |
| 60+680 | 60+940 | Removal | |
| 61+200 | 62+340 | Removal | |
| 61+900 | 62+210 | Removal | |
| 52+859 | 62+990 | Removal | |

## 3.2 ROAD WIDENING

Note that chaining used in drawing and tables presented in this report are not the same as what displayed on the road. Chaining on site considers that the road begins from Baker Lake, which is 115 km away from Vault pit, the beginning of road chaining on drawing.

By drawing the «as survey» plans, we have noticed that the road is wider than what specified in plans for construction.

However, the road footprint was similar. The reason is that the final layer was thinner or partially missing. According to given information, the road backfill material was enough and there was no need to put a final layer. Therefore, the road profile, as surveyed, is lower than what specified in construction plans. Also, the final layer is missing in some locations because the material used for backfilling which was from Esker was good enough and there was no need to put 0-3/4 gravel.

Some other modifications are presented in the table below:

**Table 15: NOC Summary**

| NOC | Title | Details | | | |
|---|---|---|---|---|---|
| 001 | — Culvert #21 6+314 - French Drain | — French drain added | | | |
| 002 | — Bridge Approach Environment | — Approach bridge in 3+440 | | | |
| 003 | — Culvert #77 - 19+003 - Cancellation | — The extension is replaced by a french drain due to existing roc on the extension side | | | |
| 004 | — Culvert Change 32+146 | — Culvert #133 extension cannot be realised on the left side. The culvert will be extended 6 meters on the right side | | | |
| 005 | — Slope 41 - 15+850 @ 15+950 | — No details | | | |
| 006 | — Road alignment modification between 18+240 @ 18+560 | — curve radius raised | | | |
| 007 | — Final Layer reduction | — Modification of backfill materiel | | | |
| | | — 34+840 | — 39+080 | — Mix | — Esker layer on top of a Rockfill foundation |
| | | — 40+200 | — 41+790 | — Mix | — Esker layer on top of a Rockfill foundation |
| | | — 41+900 | — 43+200 | — Mix | — Esker layer on top of a Rockfill foundation |
| | | — 43+900 | — 44+725 | — Mix | — Esker layer on top of a Rockfill foundation |
| 008 | — Road alignment modification 27+100 @ 27+500 | — curve radius raised | | | |
| 009 | — Culvert #134 - 32+400 - Cancellation | — No details | | | |

| NOC | Title | Details |
|---|---|---|
| 010 | – Bridge approach KM 43.5 and KM 44.7 | – Backfill with rock 20 meters both sides of the bridge and then backfill from esker 3 |
| 011 | – KM 53+500 curve modification | – curve radius raised |
| 012 | – Road 1m wider 59+800 @ 64+000 | – 1m wider to avoid incident caused by shoulder softness |