

# **Amaruq Stage 1 WRSF, Ore Stockpile 1 and Starter Pit Design Report and Drawings**

60-Day Notice to Nunavut Water Board  
In Accordance with Water License 2AM-WTP-1826

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June 2018

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## 1 INTRODUCTION

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Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is planning to develop the Whale Tail Pit and Haul Road Project (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine.

The Amaruq property is a 408 square kilometre (km<sup>2</sup>) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 61.3Mt of waste rock, and 6.0Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period.

This report includes all relevant information required to submit a 60 day notice for the construction of the Stage 1 WRSF, an Ore stockpile 1 as well as the location of the starter pit.

## **2 WRSF DESIGN BASIS**

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### **2.1 2018 MINE WASTE ROCK MANAGEMENT PLAN**

As part of the documentation series produced for the Type “A” Water License application, Agnico Eagle presented the Mine Waste Rock Management Plan (Agnico Eagle, 2018) for the Project. This plan described the preliminary design basis and operational procedures for WRSF to be constructed.

Key points for the design and construction of the WRSF from the management plan included the following:

- Seepage and runoff water from the Whale Tail WRSF will be managed by a combination of water retention dikes and water collection ponds (Whale Tail WRSF Pond and Whale Tail Attenuation Pond). Water quality will be monitored as per the Whale Tail Water License requirements. If water quality does not meet discharge criteria, contact water in the water collection ponds will be treated at the Whale Tail water treatment plant (WTP) prior to discharge to the outside environment.
- The Whale Tail WRSF was located considering advantageous topography in the form of a gentle valley presenting one low topographic point near Mammoth Lake where a contact water pond will be built. Only one low topographic point is observed north of the Whale Tail WRSF where potential runoff could escape from the Whale Tail WRSF footprint. As part of the surrounding road, a saddle dam will be constructed at this location to avoid contamination of the sub-watershed located northward of the Whale Tail WRSF.
- As soon as waste rock material will be available from the open pit, the overburden will be surrounded with waste rock material (see Figure A.1 in Appendix A) to control the stability of the pile. If deemed necessary, turbidity barriers in Mammoth Lake will also be installed.

### **2.2 ADAPTATION OF 2018 MINE WASTE ROCK MANAGEMENT PLAN FOR STAGE 1 WRSF**

While awaiting the construction of the WRSF dike expected in winter 2019, the key element of the water and waste management strategy for the Amaruq project, a Stage 1 WRSF, located within the footprint of the final location of the WRSF will be positioned as to be able to control the watershed using the topography in combination with temporary water management structures in order to prevent potentially contaminated contact water from seeping into the environment. The duration of this Stage 1 WRSF will be during the second half of 2018 until the aforementioned WRSF dike is constructed or when weather conditions are sufficiently cold that no thawing or water runoff can occur.

All Potentially Acid Generating (PAG) material in provenance of the starter pit, as well as PAG and till generated from the operation of Quarry 1, will be stored in this location and covered progressively with 4 meters of Non Acid Generating / Non Metal Leaching (NAG/NML) material as to respect closure considerations.

Any excess NAG/NML material not required to cover the Stage 1 WRSF will be stored within the footprint of the final WRSF in a fashion that can be recovered later on when required during closure.

**Table 1: Estimated Quantities of waste rock to be disposed of in Stage 1 WRSF location**

Year	PAG / ML / Till (t)	NAG (t)	Total	
			(t)	(m3)
2018	1,169,258	451,440	1,620,698	854,000

## 2.3 CONSTRUCTION AND OPERATION SCHEDULES AND ASSUMPTIONS

The facilities have been planned to be constructed in two stages:

- Stage 1: Construct the temporary water management infrastructures around the temporary WRSF location and then begin material placement within the prescribed area
- Stage 2: After construction of the WRSF dike, waste rock will be disposed of in accordance with the Mine Waste Rock Management Plan submitted by AEM.

This section of the report focuses solely on the design waste rock storage facility for Stage 1. Stage 2 will be presented in a separate report.

The following construction and operation schedules are assumed:

1. Start construction in early September, 2018;
2. Start operation (placement of waste) in September, 2018 until WRSF dike is completed or freezing temperatures are sustained for a period long enough to establish no thawing or water runoff is possible.

## 2.4 LOCATION OF PROPOSED WASTE ROCK STORAGE FACILITY

Drawing MBK-001 in Appendix A shows the location of the proposed Stage 1 waste rock storage facility in relation to other mine infrastructure.

### 3 DESIGN OF STAGE 1 WRSF

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#### 3.1 KEY DESIGN CONSIDERATIONS

In addition to the criteria described in Section 2 of this report, Stage 1 WRSF was designed based on the following considerations:

- Rockfill will be placed directly on original ground.
- The location of the Stage 1 WRSF was chosen in an area where the natural topography surrounding it will direct runoff water towards a containment sump based on a 1:100 year rain event.

#### 3.2 KEY DESIGN PARAMETERS

The key design parameters for the Stage 1 WRSF have been adopted from the Mine Waste rock Management Plan (Agnico Eagle, 2018). Calculations and are summarized in Table 2.

**Table 2: Key Design Parameters for Stage 1 WRSF**

Design Parameter	Design Value
Thickness of first lift of Waste (m)	5.0
Maximum elevation (MASL)	195
Assumed side slopes for ore and pad (H:V)	1.37:1
Assumed density of waste = 1.9 t/m	

Following the above design parameters during waste placement, a maximum theoretical volume of 1.62 M tonnes, or 854 000 m<sup>3</sup>, of waste can be stored in the Stage 1 WRSF.

#### 3.3 STABILITY CONSIDERATIONS

Stage 1 WRSF is a temporary structure that will eventually be merged with the final WRSF. Based on stability and thermal analyses completed at Meadowbank, the waste stockpile will have an acceptable factor of safety against potential slope failures.

#### 3.4 THERMAL CONSIDERATIONS

Permafrost is expected to exist beneath the footprint of the WRSF and it is anticipated that the top surface of the permafrost may aggrade upwards with the placement of waste rock.

## **4 CONSTRUCTION OF STAGE 1 WRSF**

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### **4.1 WATER MANAGEMENT DURING CONSTRUCTION**

To avoid any potential contact water from entering the environment, a low-permability access road built of overburden will be established first to reach the Stage 1 WRSF location and will act as a barrier to any water not naturally diverted towards a containment sump that will be established once the access road is completed and prior to any placement of PAG / ML material. The location of the Stage 1 WRSF was chosen as to use the topography to control water runoff, in combination with the access road and collection sump designed to sustain a 1:100 year rain event. All water collected in the sump will be directed towards Quarry 1 in a closed circuit.



## 5 ORE PAD AND STOCKPILE 1 DESIGN BASIS

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### 5.1 2018 ORE STORAGE MANAGEMENT PLAN

As part of the documentation series produced for the Type “A” Water License application, Agnico Eagle presented the Waste Rock Management Plan (Agnico Eagle, 2018) for the Project. This plan described the preliminary design basis and operational procedures for ore storage to be constructed.

Key points for the design and construction of the ore stockpile from the management plan included the following:

- Seepage and runoff water from Ore Stockpiles will naturally flow to the Whale Tail Attenuation Pond; channels will be constructed if deemed required to direct the seepage and runoff to the pond. If the water quality does not meet discharge criteria, the contact water will be treated at the Whale Tail WTP prior to discharge to the outside environment.

### 5.2 ADAPTATION OF THE ORE STORAGE MANAGEMENT PLAN

While the construction phase of the Amaruq project is ongoing, the planned locations for ore stockpiles 2 and 3, referenced in the waste rock management plan, are not yet available. This section of the report focuses solely on the Ore stockpile 1. Ore stockpiles 2 and 3 will be detailed in a subsequent report.

Refinements to the expected production schedule and predicted ore quantities available for stockpiling are on-going. The current projections of ore volumes to be stockpiled each year are summarized in Table 3.

**Table 3: Estimated balance of Ore Stockpile 1**

Year	Total (t)
2018	160,020
2019	-

### 5.3 CONSTRUCTION AND OPERATION SCHEDULES AND ASSUMPTIONS

The construction and operation of the ore stockpile 1 will be constructed in 2 stages:

- Stage 1 : Construction of the ore pad and progressive placement of ore on Ore stockpile 1 until capacity is reached
- Stage 2 : Construction of ore pads 2 and 3 to accommodate peak volumes of stockpiles

This section of the report focuses solely on the design of the ore storage facilities for Stage 1. Stage 2 will be presented in a separate report and will include Ore stockpile 1.

The following construction and operation schedules are assumed:

1. Start construction of the ore pad in September 2018
2. Start operation (placement of ore) in October, 2018;
3. Complete Stage 1 construction and operation until design capacity is achieved

#### **5.4 LOCATION OF PROPOSED ORE STORAGE FACILITY**

The following drawings are available in Appendix A of this report:

- Drawing MBK-001: Plan View of Ore Stockpile location
- Drawing MBK-002: Typical Cross Section and Construction Details

## 6 DESIGN OF ORE STOCKPILE AND PAD 1

### 6.1 KEY DESIGN CONSIDERATIONS

In addition to the criteria described in Section 6, Ore Stockpile Pad 1 was designed based on the following considerations:

- A minimum 1.0 m of overburden and/or waste rock will be placed over original ground to reduce any thaw-induced differential settlements.
- Waste rock will be placed to follow the natural topography, thereby reducing the likelihood of water ponding on the surface of the pad requiring additional maintenance. A final grade of about 0.5% sloping towards the attenuation pond will be achieved. Any surface run off from the ore stockpile or the pad will therefore be directed to the attenuation pond containment area.

### 6.2 KEY DESIGN PARAMETERS

The key design parameters for the ore stockpiles are summarized in Table 3.

**Table 4 Key Design Parameters for Ore Stockpiles**

Design Parameter	Design Value
Pad thickness (m)	2.0
Maximum height of stockpile (m)	20.0 max
Maximum elevation (MASL)	180.0
Assumed side slopes for ore and pad (H:V)	1.37:1
Assumed density of ore = 1.9 t/m	

Following the above design parameters during ore placement, a maximum theoretical volume of 789 K tonnes, or 415,717 m<sup>3</sup>, of ore can be stored on ore stockpile 1.

### 6.3 STABILITY CONSIDERATIONS

The ore stockpiles are temporary structures and small compared to the waste rock storage facilities (WRSFs). Based on stability and thermal analyses completed for the WRSFs presented in the Mine Waste Rock Management Plan (Agnico Eagle, 2018) and experience with similar structures at other mine sites such as Meadowbank, the ore stockpiles will have an acceptable factor of safety against potential slope failures.

### 6.4 THERMAL CONSIDERATIONS

Permafrost is expected to exist beneath the footprint of the ore storage pads and it is anticipated that the top surface of the permafrost may aggrade upwards with the placement of the pads.

## 7 CONSTRUCTION OF ORE STOCKPILE 1 PAD

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### 7.1 CONSTRUCTION MATERIALS AND ESTIMATED QUANTITIES

Table 5 provides the estimated in-place quantities of the construction materials to be used and key specifications.

**Table 5 Estimated In-Place Quantities for Construction of Ore stockpile 1 pad**

Material	Surface Area (m <sup>2</sup> )	Volume of Rockfill (m <sup>3</sup> )	Material Source and Specifications
Overburden	46,000	92,000	Sourced from starter pit stripping of competent overburden

### 7.2 WATER MANAGEMENT DURING CONSTRUCTION

The ore stockpile 1 is situated in a location where natural topography will ensure that any runoff water drain towards the attenuation pond. Therefore, additional and separate water collection systems are not required.

## 8 STARTER PIT

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Prior to the eventual partial dewatering of Whale Tail Lake, planned in early 2019, the need for a starter pit was required to generate ore in anticipation of commercial production in Q3 2019, as well as supplemental material for infrastructure construction that remains. It is located within the permitted limits for the Whale Tail Pit. Table 6 represents the amount of material extracted from the starter pit:

**Table 6 Estimated quantities of material extracted from the starter pit**

Material	Volume (m3)	Quantity (T)
Overburden	266,595	506,530
PAG	145,425	410,091
NAG	49,875	142,111
Ore	63,525	178,658
Total	525,420	1,237,391

### 8.1 CONSTRUCTION AND OPERATION SCHEDULES AND ASSUMPTIONS

The following operation schedules:

1. Start operations in August 2018
2. End of operations of starter pit in December 2018, making way for whale tail pit

### 8.2 LOCATION OF PROPOSED STARTER PIT

The following drawings are available in Appendix A of this report:

- Drawing MBK-001: Plan View of starter pit location

## **9 DRAWINGS**

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The following drawings are available in the Appendix A of this report:

- MBK-001 : Plan View of WRSF Stage 1, Ore Stockpile 1 and Starter Pit
- MBK-002 : Section views of WRSF Stage 1, Ore Stockpile 1 and Starter Pit

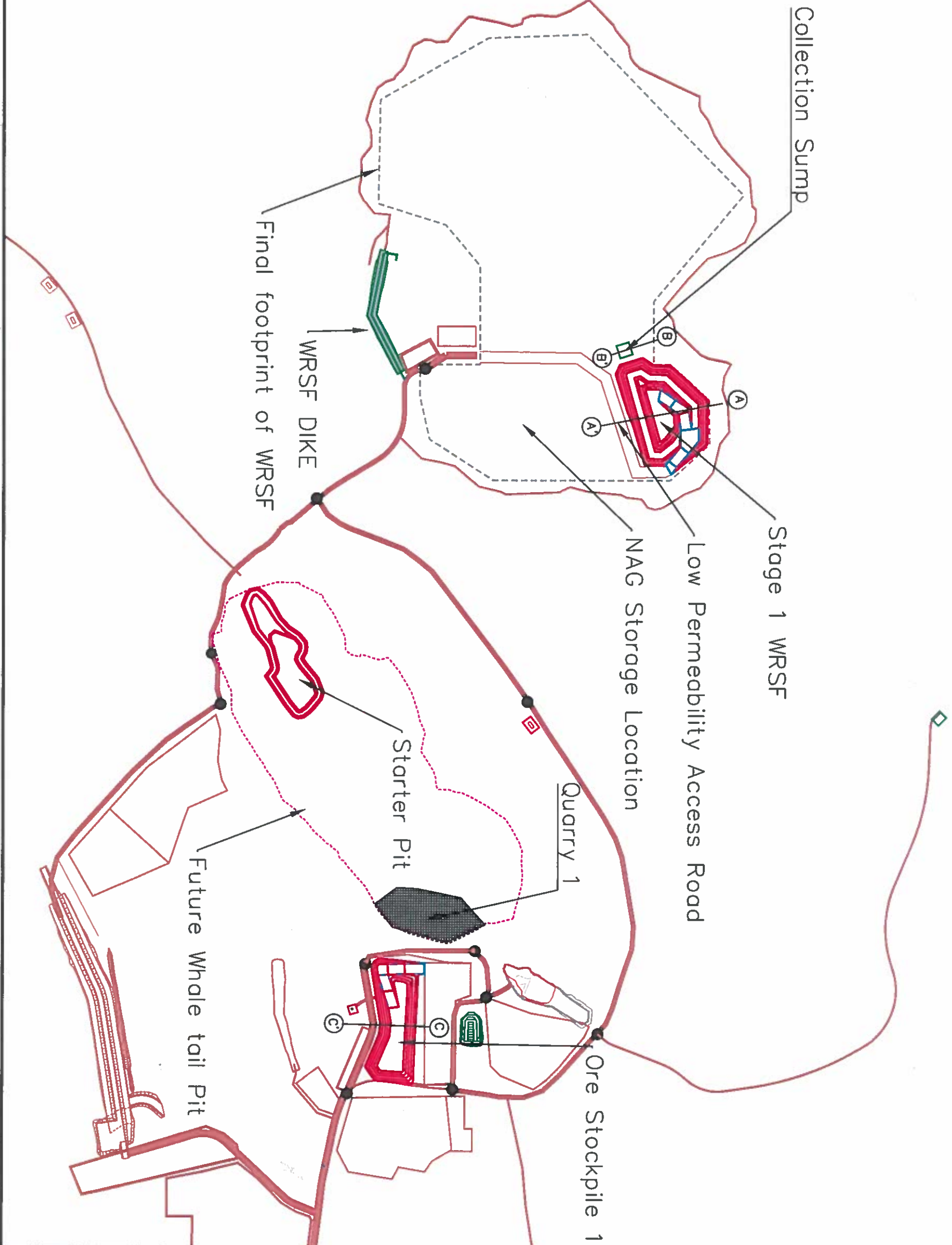
## REFERENCES

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Agnico Eagle. 2018. Amaruq Gold Project: Mine Waste Rock Management Plan. Version 2. 655183-2000-40ER-001-02. May 2018.

## **Appendix A: Design Drawings**





NOTES:



**FOR CONSTRUCTION**  
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DATE : 2018/06/15



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PROJECT NO. 	
DATE 2018-06-15	

AGNICO EAGLE - MEADOWBANK DIVISION  
60 day Notice  
WRSF, Starter Pit and Ore stockpile  
PLAN VIEW  
ROADS & PADS CONSTRUCTION

SCALE	NTS	FILE .DWG	REVISION	DATE/DATE
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