Quarry Operation Plan

WEST REMUS CREEK, EUREKA, NUNAVUT

NUNA EAST LTD.

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Table of Contents

1.0 INTRODUCTION

Nuna East Ltd. ("Nuna East"), is an aboriginally owned contracting firm with resources of heavy equipment and personnel, involved in heavy construction, mining, winter road construction, site service and maintenance activities. Nuna has worked in the North for 25 years and is well versed in northern environments.

Nuna East was awarded the Eureka Recapitalization Runway Project in Nunavut, NT. The intent of this project is to rehabilitate the existing runway airside apron, as well as construct a new airside apron and upgrade the local access road. Mobilization for this work took place in late August 2015 however the project has been unable to proceed due to insufficient borrow material at the planned borrow site.

A Quarry Operations plan was previously submitted in September 2015 for this project naming Blacktop Creek as the primary borrow source and quarry location. Subsequent to additional sampling and testing at this location it was determined that Blacktop Creek was not a viable source of granular material for the project.

The Remus Creek West quarry site has since been identified and qualified as a suitable quarry source to produce the aggregate material required for the recapitalization of the runway. Although the runway rehabilitation phase of the work may not progress immediately, access to the Remus Creek West source requires construction of a road to access the source.

In the short term, this Quarry Development Plan will be utilized by Nuna during initial quarry development and construction of the access road. Future use of the Remus Creek West borrow source for runway rehabilitation is not scheduled at this time.

The Quarry Development Plan will commit to the best management practices of the quarry resource development at the Remus Creek West. Nuna East will work in tandem with the Northern Development regulatory AANDC Land Resources Office to ensure these objectives are met during the initial start-up of the quarry operation and through to the completion of the access road scope of work.

2.0 DESCRIPTION OF THE DEPOSIT

2.1 TOPOGRAPHIC MAPS

Two maps captured from the National Topographic System Index Maps website included in the attachments to show the location of the quarry site relative to the High Arctic Weather Station at Eureka, both from high and low level. The proposed access road route, quarry location and temporary camp and fuel storage area are shown on Figures 1 and 2 below, along with a recent photograph of the area in Figure 3.

FIGURE 1 – ACCESS ROAD AND BORROW LOCATION

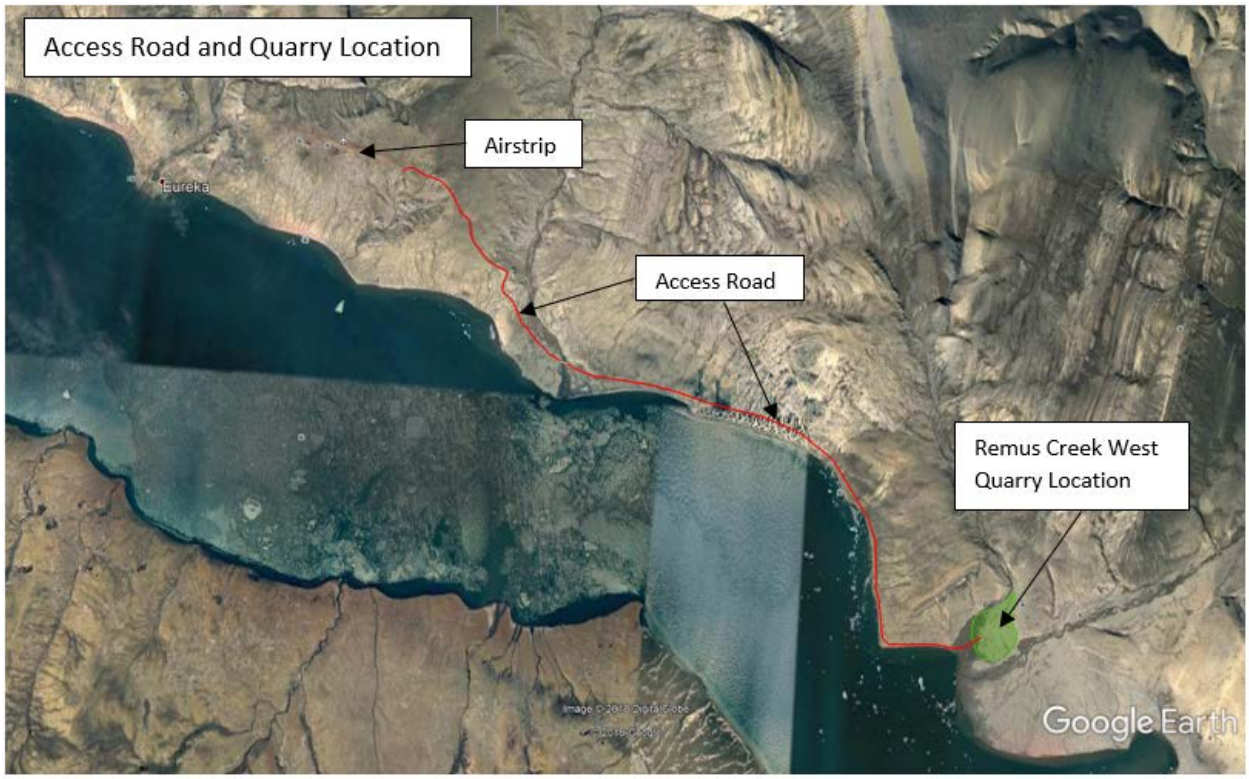


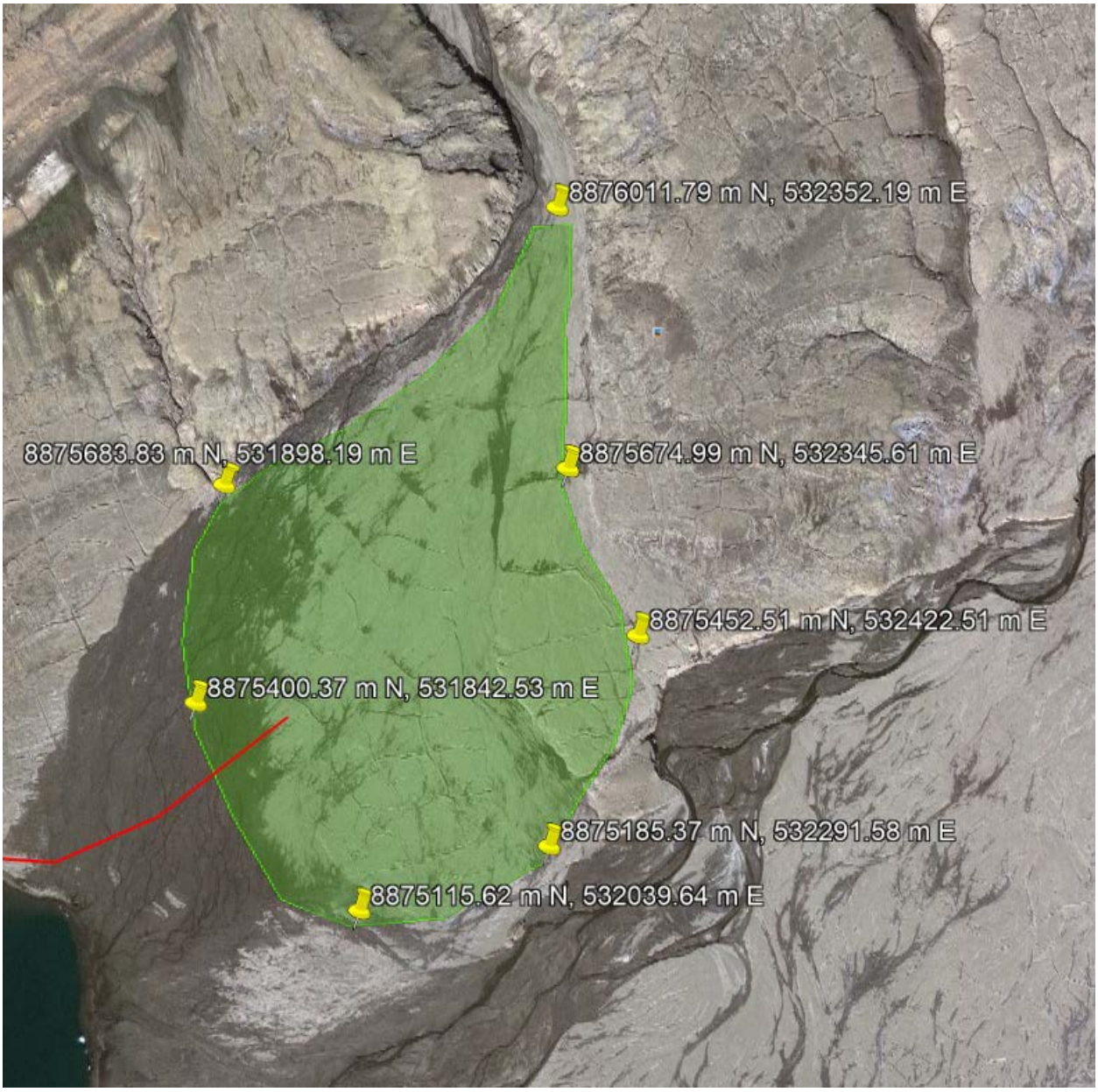
FIGURE 2 – PROPOSED BORROW LOCATION

The estimated total surface area of the proposed borrow area at Remus Creek West as shown above is estimated to be 360,000 m2 and is expected to yield more than 325,000 m3 of raw granular material.

The current program is expected to require extraction of approximately 75,000 m3 of material over an area of approximately 100,000 m2. The area for extraction will be determined on site based on visual assessment of the materials but will be within the green shaded area shown above.

FIGURE 3 – REMUS CREEK WEST

FIGURE 4 – QUARRY LOCATION COORDINATES



2.2 TEST PIT PROGRAM RESULTS

According to Golder Associates Geotechnical Report and visual observations made during the 2016 and 2017 geotechnical investigations, the surficial soils at Remus Creek West consist of sand, gravel and cobbles. A summary of the laboratory test results is presented in Figure 4.

FIGURE 4 – LABORATORY TEST SUMMARY RESULTS

Table 4: Summary of Laboratory Testing Results from West Remus Creek

Test	Test Pit ID									
	RC TP02	RC TP03	RC TP04	RC TP06	RC TP07	RC TP09	RC TP11	RC TP15	RC TP16	RC TP25
Dry Rodded Bulk Density (kg/m^3)	1,328	1,427	1,456	1,456	1,456	1,512	1,470	1498	1,526	1470
Freeze/Thaw Average Loss (%)	12.3	9.2	6.6	11.8	9.8	8.8	8.0	8.6	10.9	8.6
LA Abrasion (%)	34.6	42.0	48.1	40.6	36.5	46.4	39.1	33.8	35.7	42.1
Micro-Deval (%)	33.6	37.6	35.8	35.0	33.1	37.4	35.5	35.1	40.2	35.1
Petrographic Number	148	140.8	145.6	145.4	127.8	142.6	122.6	135.4	144.2	127.4
Primary Rock, %	Diabese, 38.7	Sandstone, 29.3	Sandstone, 36.7	Diabese, 28.2	Diabese, 23.7	Carbonate, 28.3	Sandstone, 31.1	Diabase, 30,1	Carbonate, 32.4	Sandstone, 26.3
Secondary Rock, %	Sandstone, 12.2	Diabese, 26.9	Carbonate, 16.8	Carbonate, 18.6	Carbonate, 23.6	Diabase, 23.6	Diabase, 23.7	Quartzite, 19.1	Sandstone, 15.3	Diabae, 23.5
					Quartzite, 21.1					

3.0 SITE PREPARATION

3.1 ACCESS

Upgrading of an existing trail that extends from the current Eureka runway to the Remus Creek West borrow area will be required. The trail is currently a light vehicle road only without a permanent crossing at Blacktop Creek. The length of the access road is approximately 12 km south east from the airstrip and generally follows the shoreline of Slidre Fjord. Nuna East will construct this road upgrade using the proposed Remus Creek West quarry as a borrow source, including an all-season crossing at the Blacktop Creek location.

The upgraded road will then provide year-round access to the Remus Creek West borrow area and provide a primary haul route from the quarry to the runway at some future date.

The proposed road alignment and general location of the borrow source is shown in Figure 1 above.

Access within the borrow area is generally unrestricted and requires little to no preparation. The entire area is comprised of exposed sand and gravel with negligible vegetation or other organic material. Traffic patterns within the quarry will be determined to limit traffic to those specific areas required for quarry operations and to limit unnecessary travel in areas that will not be disturbed at this time.

3.2 SITE CLEARING

There will be no requirement for site clearing, vegetation removal or topsoil salvage at the proposed quarry location. Observations at the site indicate the site to be clear of vegetation and organic surficial soils.

3.3 BUILDINGS OR OTHER FACILITIES

Nuna East will be setting up a temporary (24-30 man) construction tent camp at Remus Creek West for the duration of the road construction project. The exact location of the tent camp will be selected on site in consultation with the authority having jurisdiction (JHA), however a proposed location is indicated on Figure 2 above. The proposed location is outside of the quarry limits to allow maximum access to the borrow source and to separate the personnel lodgings in a safe area away from quarry operations.

An electric perimeter bear fence will be provided around the competed camp setup.

The camp will be provided and operated by a reputable Northern camp supplier familiar with all regulatory requirements for this region.

The camp will be equipped with a first aid room/supplies, communications, kitchen, office and sleeping tents. Pacto toilets and a top load waste incinerator will be provided for camp and black water waste.

Potable water for camp will be retrieved from Remus Creek and treated prior to use in the camp. Treatment will include filtration, UV screening and offsite testing prior to use.

Grey water discharge will be placed in holding/settling tanks and tested to meet guidelines for discharge to the environment. Water meeting discharge guidelines will be decanted from the tanks to an approved discharge area

The camp will be setup at the start of the project in June of 2018 and demobilized at the end of the road construction phase.

Fuel will be stored in 4,995 liters double wall containment capsules at a designated laydown area near the camp location. Fuel will then be distributed using a fuel lube truck with no greater than 4,995 liters on board at any time.

3.4 TOPOGRAPHIC SURVEY FOR FUTURE VOLUME CHECKS

A private legal surveying company will be contracted to perform all of the survey requirements for the project including the quarry site development. They will use up to date technology of satellite surveying/imagery, AutoCAD and end area method for calculation of the volumes.

The estimated quantities for extraction is 75,000 m3 of raw granular material, as required for access road construction only.

An original ground topographic survey will be completed prior to quarry activities and repeated upon completion of quarrying to obtain a final measurement of the materials excavated from the quarry source. The final quantities used will be submitted to INAC, Lands Resources Officer on a required monthly reporting form.

4.0 QUARRYING OPERATION

4.1 QUARRY DEVELOPMENT

The quarry site development will use conventional stripping methods with progressive excavation in thawed material. Additional depth of cut will be achieved after removal of the initial layer and subsequent thawing of freshly exposed material.

The quarry will be developed using a D8 Dozer, 980 loader and a 320 excavator. The dozer will cut and push material into stockpiles and windrows as appropriate such that the loader and/or excavator can more readily load the material into haul trucks.

There are no drill & blast requirements.

The total area that will be developed to meet the project's needs is approximately 100,000 m2. To the extent possible the excavations will be of uniform depth over a wide area to maintain positive surface drainage.

Reclamation procedures/methods will be in place to ensure cleanup, trimming and tidiness of the quarry.

4.2 EQUIPMENT

The equipment proposed for the access road construction and quarry development will be as follows:

Description	Weight (Kg)
Pick-up F350	3,636
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Pick-up F350 w/ Truck Cap	3,636
Flatdeck F550	3,359
Mechanic Truck F550	5,456
Lube / Fuel Truck	13,100
Roll-off / Vac Truck	11,340
Spare components for vac truck (flatdeck, potable water tank)	9,071
Winch Tractor	13,640
Scissor deck trailer	8,000
Packer CS563	11,818
Skid Steer 257B c/w forks, bucket bound on top	4,091
Dozer D6	21,047
Dozer D7	24,600
Dozer D8T	42,573
Excavator 320EL	24,730
Loader 980 H	39,909

Loader 980 G c/w forks & bucket	39,909
Loader 966	25,000
Grader 14H	20,454
Rock Truck 730	25,550
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Jaw Plant 25" x 42"	57,240
Power Tower 6' X 8'	24,690
Stacking Conveyor with Hopper36" x 50"	18,200
Screen Plant 6" x 20"	45,068
Cone Plant 40"	29,563
Bin wall, cross conveyor	18,000
Screen Plant (new)	44,000
20' Sea Can - hose press	9,890
Washroom / Lunchroom (Wheeled) (survival shack)	10,000
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QA/QC Trailer	8,145
Office Trailer	9,000
30 man tent camp	155,273
Duel Burner Incinerator	27,500
Generator 275kw	9,000

4.3 EROSION PROTECTION

Regular inspection and remedial action will be in place to capture any erosion problems that may arise during the quarry development such as ditching and maintaining proper drainage.

Silt fence will be on hand and installed as necessary to mitigate silt transport from the quarry operation into nearby waterways.

4.4 SETBACKS

The quarry site has a natural sloping terrain and therefor a 100 m setback will be established between the quarry development and the existing water courses. Setbacks will be surveyed and staked before any construction can proceed. Positive drainage will be a natural progression in the quarry design and stripping/farming approach. Since these activities will be surveyed by grade calculation, slope values and positive drainage will be maintained. The pit floor will also have a positive grade applied for drainage to flow and will not create a ‘ponding effect’. Grades will not exceed 4% in value to avoid any adverse flow and erosion problems.

5.0 AGGREGATE PROCESSING

5.1 CRUSHING

It is anticipated that the crushing plant will produce 10,000 m3 of aggregate. Total estimated crushing duration is 14 days for the purposes of producing crushed material for access road topping only.

5.2 STORAGE AREA OVERSIZE MATERIAL

It is not expected to encounter oversized cobles that cannot be processed during the development of the quarry. No other reject material is anticipated during the quarrying operation.

5.3 STORAGE AREA FOR FINISHED PRODUCTS

It is expected that all the processed quarry material will be consumed and hauled to the project location. All products will be consumed and hauled away, no stockpiles of produced aggregate materials will remain at the quarry locations when the work is complete. A detailed and final quantity list of the quarry materials consumed will be provided at the end of the project.

6.0 RECLAMATION

6.1 DESIRED FUTURE CONDITION OF THE SITE & ENVIRONMENTAL PROTECTION

Nuna East will have an ongoing cleanup plan in order to keep up with the required progression of the work. The quarry site will be kept level and tidy on completion of the quarry activities. In the event that the quarry floor soil is contaminated. The remediation plan will be to immediately clean up the area and place the contaminated soils into drums and keep stored on to a lined pad in preparation for transporting off site to a certified land fill. All contaminated drums will be labeled as such with TDG and DFO requirements.

At the completion of the quarry development, the typical cut depth is expected to be no more than about 1 m deep. Trimming of the slopes will be completed with to 3H to 1V grades.

The pit floor will be graded with a dozer to promote free drainage. Baselines and survey elevations will be set into place in order to ensure proper drainage. This will remain consistent through the quarry development.

6.2 WATER DIVERSION AND PROTECTION

As described previously, the quarry development will ensure positive drainage for the quarry floor. On completion of the operations and final clean-up of the quarry, the positive drainage course will be improved to enhance drainage requirements. Based on the initial development of the quarry, no disruption to drainage courses will be encountered. No ‘man made materials’ will be placed i.e. culverts, drainage structures, etc. into the quarry development.

6.3 SLOPING/BENCHING

Nuna East will maintain a progressive maintenance program ensuring that the quarry is kept sloped and contoured throughout the project. Experienced operators will adhere to the Northern Land Use Guidelines for the reclamation of the quarry.

6.4 CAMP RECLAMATION AND WASTE DISPOSAL

At the completion of the project the camp complex will be removed and transported back to Eureka station for final demobilization. The site will be cleared of debris and non-burnable garbage will be hauled and disposed of in a local landfill. Food waste will be incinerated and dangerous goods will be placed in drums labeled appropriately with TDG and DFO requirements for demobilization.

6.5 ROAD CLOSURE

The upgraded haul road from the airstrip to the quarry site will be handed over to the ECCC site manager upon completion.