ALMIQ CONTRACTING LTD.

SHOP DRAWING / SAMPLE / PRODUCT DATA

IDENTIFICATION FORM

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PROJECT : **CONSTRUCTION OF NANISIVIK NAVAL FACILITY, NU**			**Submittal NO.**	**SUB-ALM-DCC-019**		
OWNER : **DEFENCE CONSTRUCTION CANADA**			**Revision NO.**	0	**Date:**	2014-08-13
			Revision NO.	1	**Date:**	2015-01-16
PROJECT NO. : **NPO1301**	CONTRACT NO. : **55468 CN**	OUR FILE NO. : **148926**	**Revision NO.**	2	**Date:**	2015-04-20
			Revision NO.	3	**Date:**	2016-04-05

DISCIPLINE :

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SHOP DRAWINGS, PRODUCT DESCRIPTION OR SAMPLE SUBMITTED FOR APPROVAL:	**SPECS REFERENCE :**
Quarry Management Plan	01 41 10

NOTES :
See Comment on Page 4

REVIEWED ..... ( )
REVIEWED AS MODIFIED ..... (✓)
REVISE AND RE-SUBMIT ..... ( )
NOT REVIEWED ..... ( )

Reviewed only as to general conformity with the design concept. The engineer does not warrant or represent that the information contained on this drawing is either accurate or complete. Sole responsibility for compliance with, details and dimensions shall remain with the party submitting the drawings.

WORLEYPARSONS CANADA
By: Graham Hirst
Date: 8 Apr 2016

We declare that we have verified the attached documents and/or sample, that they are in compliance with the contract documents and are approved for the construction of the project.

Marc Deschênes, Project Manager
Contractor's Representative

Signature

2016-04-05
Date

ALMIQ CONTRACTING LTD

Nanisivik Naval Facilities

Quarry Management Plan

Revision 3

Prepared by **Almiq Contracting Ltd.**

April 4th 2016

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1. Site description:

The proposed site for the development of this quarry was initially proposed in the tender documents. Stantec, who was mandated by our client, Defense Construction Canada, performed site evaluations prior to tender. The results of their investigations formed part of the tender documents. The proposed site has already been operated as a quarry and has shown to hold sufficient volumes of adequate material for our project needs.

It is located along the access road to the Naval Facility construction site. Approximately 3km from the construction camp, it is otherwise isolated from all other dwellings, installations or human activities. The closest living community is Arctic Bay, located at 33 km from the quarry.

The quarry is for the most part dolomite with an identified diabase dyke which has been found to be suitable for the production of larger "armour stone" elements required throughout the project. The proposed quarry presents an exposed face of approximately 17m in height.

Inspection of the site in June 2014 revealed no special geographic or ecologic features that need be considered or preserved throughout quarry development. Access to the site will be as shown in the following sections.

See Annexe A for topographic information and overall dimensions of potential quarry proposed by client. See Annexe B for additional coordinates showing extent and position of diabase dyke.

2. Mitigation measures

Quarry development carries the risk of various adverse environmental effects. This section identifies these effects and sets out the relevant planned mitigations measures that will minimize their negative impacts.

Impact on land:
As the change in the topography of the land due to quarrying activities is inevitable, measures to restore as much as possible the original conditions of the site will be taken. For the most part, these measures will consist in filling the blasted or excavated zones with clean waste materials from the quarry (surplus materials or materials not being used for the production of aggregates) at the end of operations, respecting surrounding grades, etc.. The objective being to minimize the effect of the quarrying activities performed for the benefit of the Nanisivik Naval Facility project on the surrounding environment (ecosystem, watershed, etc.).

Although unlikely to occur through our planned quarry activities, it is possible that large-scale excavation operations can uncover items of archaeological and paleontological significance or of cultural interest to the local populations. As a general rule, any such chance find will immediately be flagged and operations momentarily brought to a halt as the client and appropriate authorities are informed and consulted on the measures to be taken in order to continue work.

Impact on water and drainage pattern:
We have observed the natural drainage mechanisms of the site as it exists prior to commencing our works. We will manage runoff water during our operation of the quarry by creating the required slopes and trenches on site that will allow the drainage as it currently exists to be maintained without generating any additional pooling.

Impact on local wildlife / local hunters:

Prior to commencing work on site, we will discuss with local residents the scope of our mandate and the nature of the construction activities that will be performed, during a planned community meeting. We will enquire of their understanding of how the wildlife could be affected by the activities that will take place on site and gather intelligence on which areas of our site may be particularly susceptible of creating some disturbance.

This conversation with the local residents will provide us with insight on the habitual hunting habits that take place in the areas affected by our operations. We will present them with the planned construction schedule as it relates to the specific areas they will highlight as being common hunting grounds and also discuss in general terms a procedure for accessing those areas affected by our work.

Provide pre-blast wildlife monitor sweep that will take place before every blast. Define a radius within which no wildlife shall be present to proceed with a blast (consider flying rock, noise as potential adverse impacts to the wildlife) The main goal is to ensure all wildlife is outside of the "Danger Zone" prior to a blast.

Dedicated wildlife monitoring resources with a sound knowledge of Arctic fauna will perform an inspection of areas affected by the planned quarry site to identify in detail what wildlife is present prior to commencement of quarrying activities. A detailed list of the findings will be compiled and reviewed, for action where applicable.

Impact on traffic:

Although the traffic on the adjacent road is low, measures will be taken for quarrying blast operations, in order to reach the zero-incident target for the road users. Traffic and access will be closely monitored and controlled; the road will be closed off when required for blasting. Flagmen will regulate traffic in coordination with the blasters.

Erosion control measures:

Quarrying activities as well as aggregate stockpiling may accelerate erosion dramatically, mainly by exposing large areas of soil or aggregates to rain and runoff water. Thereby, special attention will be placed on the monitoring of the eroding effects of operations and of drainage water.

The erosion of the various quarry elements will be visually monitored throughout our presence on site, as per the planned quarry timeline described further in a subsequent section of this management plan. We will validate that, throughout the short duration of our activities on site, no visible, significant change in the flow of runoff water (flow path, volume, flooding, etc.) takes place. Mitigating measures will involve excavating and removing excess sedimentation, reworking trenches and flow paths, creating dikes and other features to control runoff velocity and volume.

Stock piling:

Stock piling of materials produced within the quarry site will take into account drainage considerations in order to prevent water accumulation or modifications to the course of flowing runoff water. This will be managed through the careful application of landscaping and trenching operations.

Large-scale, long-term stockpiling of aggregate material does not make sense in the context of this project and we therefore do not foresee any such stockpiling taking place. What material will be stockpiled will be spread out into multiple smaller piles. This should ensure usability of the material if piled over the winter season and limit some undesirable effects of stockpiling (accelerating runoff velocity, for example).

Noise control:

Noise is generated by a number of different activities carried out at the quarry including: drilling, rock breaking, crushing, extraction, blasting, truck and machinery operation. The noise and vibrations produced will not have a significant impact on human activity due to the

distance to the camp or the closest habitations. Vigilance will be put forth in monitoring any evident impact on wildlife for the short duration of the project.

Machinery will be regularly maintained to ensure that noise produced from machinery is kept to a practicable minimum.

Dust and air control:
Quarrying activities will inevitably produce some level of dust particles resulting from blasting operations or, mostly, during the crushing and screening operations. Dust control throughout aggregate production will be largely ensured through the use of appropriate, effective crushing and screening methods, performed by qualified, experienced operators and using modern, efficient equipment.

Dust control will also be actively realised throughout aggregate production activities by utilising wet suppression methods (water sprinklers) when required. Assuming this will be required a maximum of 80% of the crushing /screening time, we estimate a volume of up to 8,000L of water will be used for dust control. Fresh water will be used according the provisions and allowances of our water permit, pumped from the East Twin Lake and/or Twin Lakes Creek. Captured dust will accumulate under the equipment or settle on the aggregate and be finally managed in the screening process.

Regarding, the exhaust fumes from machines, their impact will be minimised through the use of recent equipment, in good mechanical working order, that will be subjected to regular inspections and maintenance on site.

Permafrost:
In order to prevent any changes to the permafrost levels due to our development and operation of the quarry, we will ensure we do not excavate or blast to any depth exceeding that of the current active layer.

The quarry itself being based on a solid mass of rock, there are no planned remediation methods for protecting exposed levels of frozen rock, which is not permafrost per se.

We will ensure we do not negatively affect permafrost levels in the quarry operations area by limiting the amount of excavation performed to render it adequate for our needs. We will also prevent any water accumulation and pooling by managing water drainage. This will be done by realising effective trenches and slopes that will maintain constant, controlled draining.

Hazardous materials management:
Dispositions will be taken to avoid or mitigate potential adverse effects on the environment due to the use, disposal and transportation of hazardous substances (fuel, oil or explosives).

- All storage, transport and operating conditions must meet the requirements of licences under the hazardous substances (Health Canada /Workplace Hazardous Materials Information System).
- Explosives and detonators are not stored on site.
- Fuel, lubricant and waste oil storage, mechanical elements and parts, will be managed in such a way as to prevent contamination of water and soil. Maintenance activities will take place in the temporary garage located near the construction camp. Refuse will be temprorarilly stored at the construction camp in closed drums before being shipped South for processing in the appropriate facilities.
- Fuelling will not take place near waterways (31m minimum) and will only be performed by trained, qualified personnel. Any spill will be signified by the personnel to their supervisors and treated according to the project spill management plan.
- Qualified personnel with significant experience in quarrying and aggregate production will be responsible for applying and enforcing adequate prevention measures related to health and safety as well as environment preservation.

Safety measures due to proximity of Arctic Bay:

Since the location of the warehouses is far enough from Arctic Bay (33km), the explosives stored do not represent a danger to its inhabitants. More information on the explosives management is provided in the section "4.Quarry operations" of this document.

3. Site design and development

Site access:

The proposed quarry can be accessed directly from the adjacent unmarked road. A u-turn area will be provided a short distance further along the road for rock-trucks. Access to the quarry will come from the south side, exit from the north. The intended staging area of the installation of heavy equipment and the stockpiling and managing of material being transformed is currently approximately 47m (distance of rock face from edge of road) by 63m wide.

Drainage:

Natural drainage occurs from the south and the hills to the east, northward. The general natural drainage mechanisms will be preserved and maintained throughout quarry operations.

Water usage:

A certain volume of water will be required throughout quarrying activities, mainly for dust suppression purposes, as stated and approved in the project's water permit. Water will be taken from either the East Twin Lake or the Twin Lakes Creek for domestic and industrial use. Water will also be purchased from the Arctic Bay Hamlet, as required. Here is a summary of estimated volumes required:

Year	Combined Volumes (m^3/y)
2015	1517
2016	1856
2017	1343
2018	1048

Progressive reclamation:

Progressively rehabilitating the site can reduce the overall risk of inadequate final rehabilitation. The objective is that, once quarry operation for this project has been completed, the quarry site be rendered safe, sustainable and visually coherent to its surrounding. As detailed in the previous section, the excavated zones will continuously be filled with waste materials from the quarry, and more generally the site landscape will be kept in an appropriate condition. Once the blasted faces are cleaned up and freed of any loose material, the resulting surfaces will be considered stable and completely reclaimed. Reclamation activities will therefore take place in an ongoing manner, throughout other production operations.

Temporary accommodation for workers:

Some dispositions will be taken to guaranty the best working conditions for the quarrying staff. Temporary facilities such as a portable toilet or dining facilities will be provided. Grey and black waters will be transported to the Hamlet of Arctic Bay for processing. Domestic wastes (food, combustible materials, etc.) will be incinerated back at the construction camp. Wastes that cannot be incinerated or that cannot be recycled (plastic bottles, aluminum cans, adhesives, sealants, paints, etc.) will be containerized and and temporarily stored at the construction camp before being shipped South for processing.

4. Quarry operations

Aggregate materials will be produced through blasting of existing rock structures. Blast material will then be transformed through the use of scalping, crushing and screening heavy equipment. The transformed aggregates will be both stockpiled on the quarry site and transferred directly to their site locations where they will be put to final use.

Timeline:

Fall 2014: mobilization of equipment and explosives warehouses; preliminary set-up of quarry in preparation for beginning of quarry operation in 2015

Summer / Fall 2015: finalizing quarry installation; production of approximately 140,000T of aggregate; progressive reclamation

Summer / Fall 2016: **production of 3200cu.m of armour stone;** final reclamation; inspection and monitoring of reclaimed site while other phases of project continue; correction of any discrepancies or performance of general improvements

Summer / Fall 2017: monitoring of reclaimed quarry site

Summer 2018: monitoring of reclaimed quarry site and final demobilization from Nanisivik

Quantity of explosives being used:

As part of this project, 56000kg of explosives and various detonator items will be used. The details are given as follow:

Mass: 50,000 m^3 / 140,000 MT

Explosives:

Rioxam HD	:	29,700 kg
Rioxam WR	:	3,000 kg
Riohit 200 83mm	:	20,300 kg
Booster 400 gr	:	1,560 un

Detonator items:

Rionel DDE 15 m	:	768 un
Rionel DDE 9 m	:	800 un
Rionel SCE 6 m 42 ms	:	100 un
Rionel SCE 6 m 67 ms	:	100 un
Riodet 3,7 m (Electric)	:	150 un
Doubled wire	:	24 rolls

Permafrost: 2,500 m3

Explosives:

Riohit 200 83mm	:	3,000 kg

Detonator items:

Rionel DDE 4.9 m	:	480 un
Rionel SCE 6 m 42 ms	:	100 un
Riodet 3,7 m (Electric)	:	50 un

Explosives management:

Explosives and detonators will be stored in 5 warehouses whose distances between each of them meet the requirements (S05-01: Quantity-Distance Principles Manual). On each of these warehouses will be installed equipment (Protectour kit) for a regular inspection of their status. These kits will allow performing a weekly guard tour while maintaining an accurate history. The geographic position of the warehouses is given as follow:

Warehouse 316208:	N-73°-02'-46.5''
	W-084°-32'-09.4''
Warehouse 316984:	N-73°-02'-48.1''
	W-084°-32'-16.2''
Warehouse 316212:	N-73°-02''-48.6''
	W-084°-32.00'-8''
Warehouse 316211:	N-73°-02'-51.4''
	W-084°-31'-53.5''
Warehouse 316210:	N-73°-02'-54.8''
	W-084°-31'-51.6''

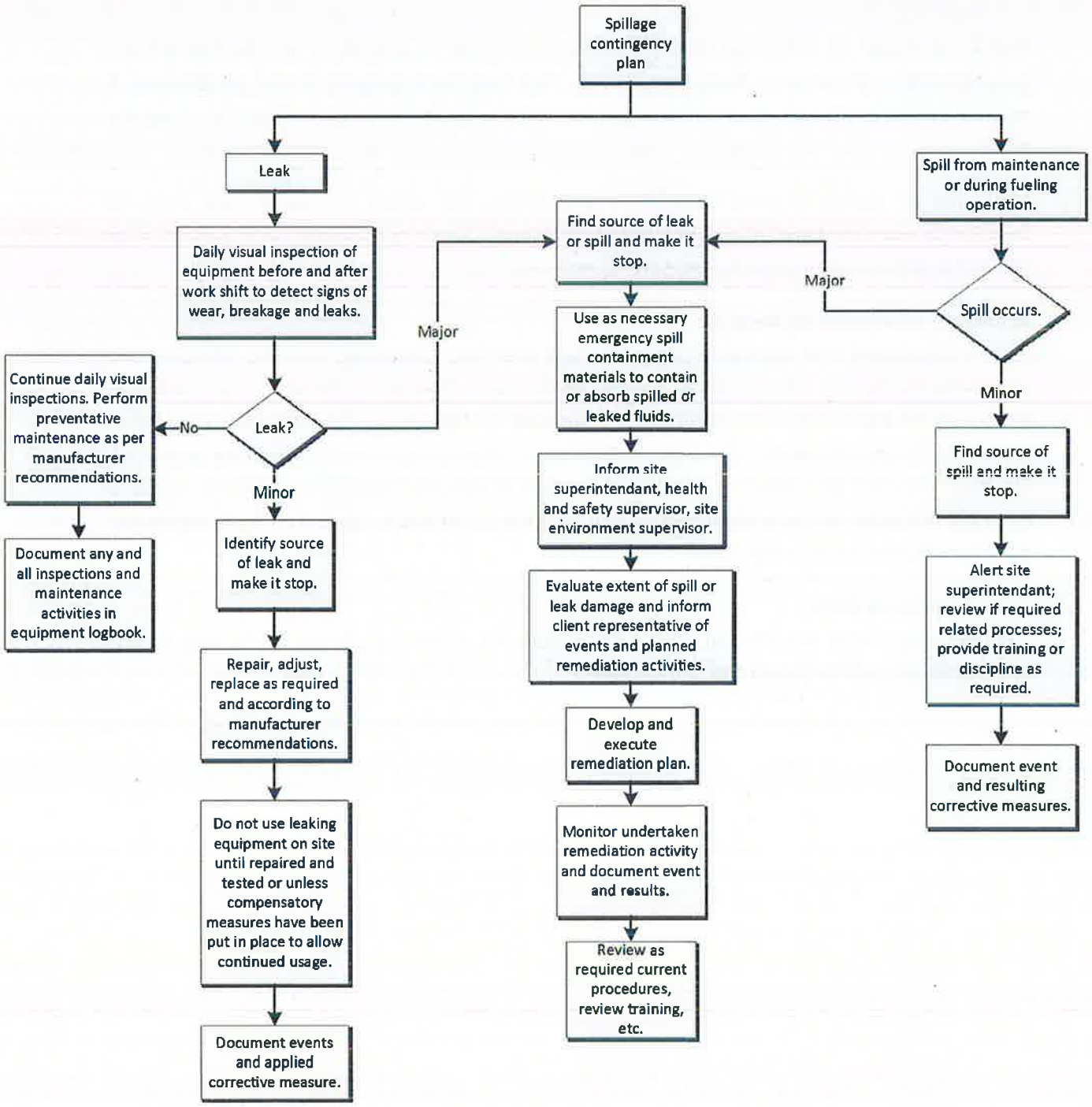
The warehouses Key Control Administrator has the authority and power to implement and enforce the key control policy. No other person shall intentionally modify, or duplicate a key. All keys must be kept in a locked and secure room when not in use. Access to keys will be restricted to authorized persons.

People in charge of collecting, transporting and handling of explosives will be trained and experienced for these tasks. Furthermore, they shall pass the applicable blaster certification. A registry of the explosives taken from inventory will be maintained and updated on a regular base.

Blasts will be carried in strict compliance with health and safety procedures: site must be completely evacuated and all access blocked completely. A safety perimeter will be established and enforced to avoid ingress during blast operations.

Aggregate production techniques:
Rock is processed into aggregate products using crushing, screening, washing, blending and conveying machinery. The products are moved by trucks, loaders or conveyors to stockpiles. Blasts will be planned in order to produce a stepped configuration of the resulting rock faces. Steps will be approximately 10m high by 10m deep, depending on materials being produced. For the most part, we intend on producing the bulk of required aggregate quantities required from the dolomite that was identified on-site. Armour stone will be produced from the denser diabase material found in the dyke.

Spill contingency plan:
The following section describes in greater detail how one major disturbance to the sites natural state, spillages, will be prevented and managed.



Notes:

- Refuelling to take place at least 31m from the nearest bodies of water or from drainage features (trenches, ditches, etc.)
- If a contaminant spill or leak occurs, supervisors will be informed and actions will be taken as per the spill management policy. This involves removing contaminated material, containerizing for transportation to a treatment facility (South), replacing contaminated

material with clean material, reviewing the events that led to the spill or leak and adjusting as required the related methods and processes.

- Training of new employees on site regarding risk management and correct procedures
- Make certain a clear equipment fueling procedure exists and is applied
- Equipment maintenance and repair shop must be adequately set-up in order to prevent accidents
- Oil and fluid storage site must be well defined and secure

Monitoring and maintenance of equipment:

All mechanical equipment shall be operated in accordance with recommended Service Manuals for the equipment. All on site workers to be trained in plant and vehicle maintenance for the plant for which they are primarily responsible. Records of the checks and inspections shall be kept and made available on demand. Oil level and oil leakage shall be checked for all the machines, on a daily base.

Changes to the original development scenario:

During the course of operation, it is possible that the original development scenario may need to be reviewed and adapted to actual operation conditions. The main reasons for such a review are:

- Issues with either quality or quantity of material encountered
- Serious incompatibility of mobilized equipment with existing quarry conditions
- Unforeseeable environmental issue for which the interference with quarry operations cannot be tolerated
- Changes to client requirements, specs or to regulation that render original planning impossible or impractical to pursue
- Issues with space management, stockpiling or equipment layout need to be changed

The project objectives and site conditions are sufficiently documented that we expect no unexpected changes or modifications to our quarry management plan should be required. Any such adaptation requirement will be evaluated on a case-by-case basis, in collaboration with the client and related authorities.

5. Reclamation

Objectives:
Considering the remoteness of the quarry location and the overall current environment to this site, no particular effort is planned to conceal the quarry from view from any nearby location. However, the worked areas of the quarry have to be left in a neat and tidy condition. Any potential risk of erosion, water accumulation or long term inconvenience must be mitigated.

Site cleaning:
All site waste will be gathered and placed in appropriate containers for removal. Pre and post waste removal inspections will be made. Waste will include domestic, metallic and construction material waste. Client and other local stake-holders will be consulted prior to final closing of quarry and completion of reclamation activities to gather input on desired final outcome of site.

Exposed permafrost:
As was previously described in section 2 of the Quarry Management Plan, excavation required by the preparation of the operations area will be limited to a strict minimum and will take into consideration preserving current permafrost levels. A site inspection in 2014 showed the area to be very close to what will be required by quarrying activities. Should we need excavate and expose the permafrost, the locations will be documented and protected at the close of project, during the reclamation phase, using clean aggregate materials.

Permafrost exposure will not be a consideration for the actual blasted zones. No specific reclamation other than what is stated below is planned in relation to permafrost levels.

Complete decommissioning of equipment:
The decommissioning of the machinery will be carried out in strict compliance with the procedures. All the measures will be taken to avoid any oil or fuel spill. All equipment used for the work should be removed from the site, including damaged equipment.

Abandonment of active quarry face:
The blasts will be performed in such a way as to result in 10m high maximum steps. Blasted surfaces will be left free of loose materials. A detailed inspection of the exposed face will be conducted in order to identify unstable blocs that may result in rock falls.

Top soil and vegetation:
It was determined that very little top-soil, loose or natural material exists on site, and no vegetation is to report. There will therefore be no need for planned removal and reclamation activities regarding this matter.

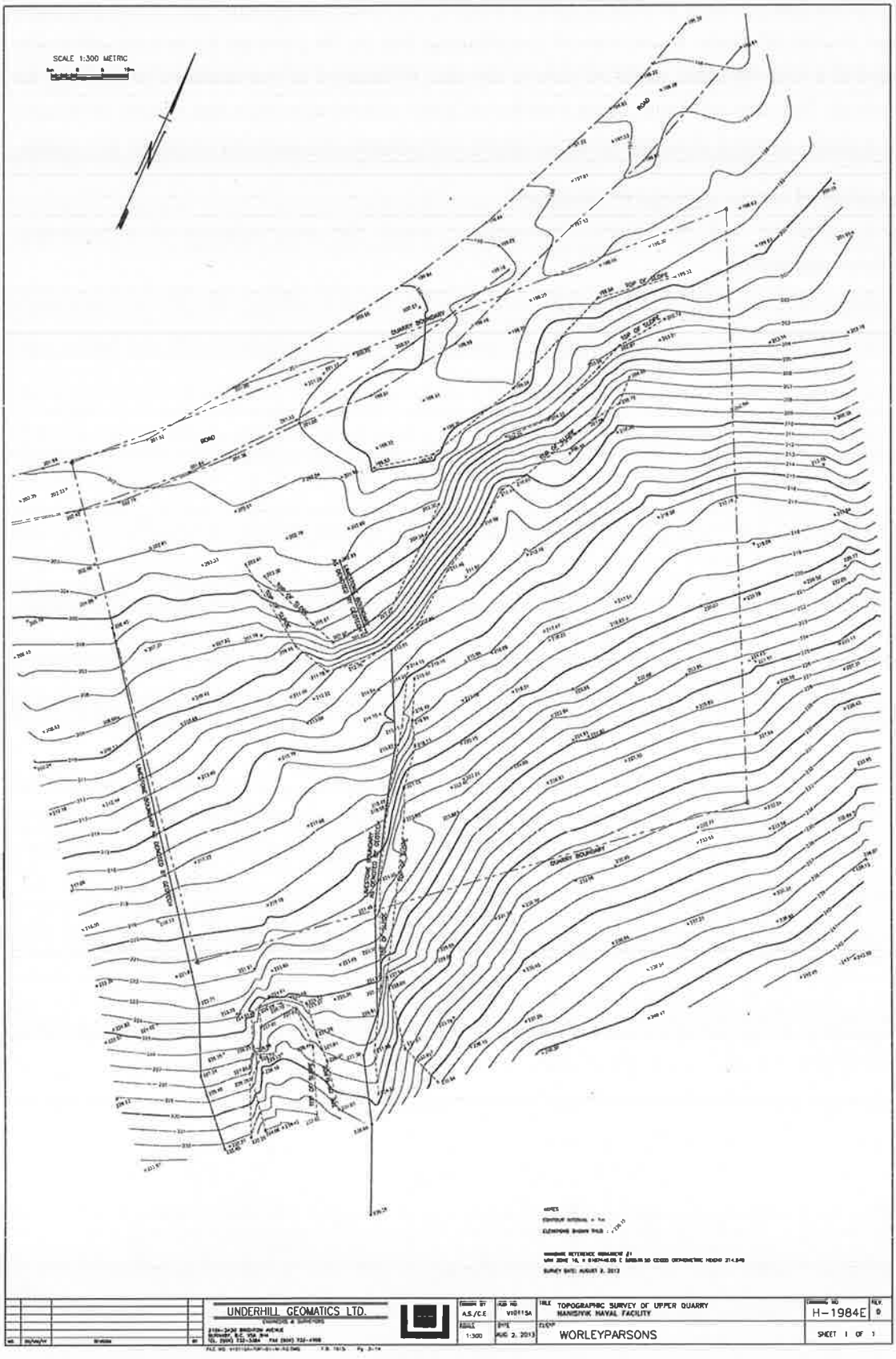
Site landscape:

Because unwanted residual effects of quarry development such as erosion take place gradually over the course of many years, overall landscaping has to be planned to ensure adequate draining and a well-finished, esthetic look to the site. All blasted or manipulated areas have to be stabilized. The site will have to be monitored after quarry operation has ended to ensure erosion is under control, drainage of runoff water is managed and quarried elements are stable.

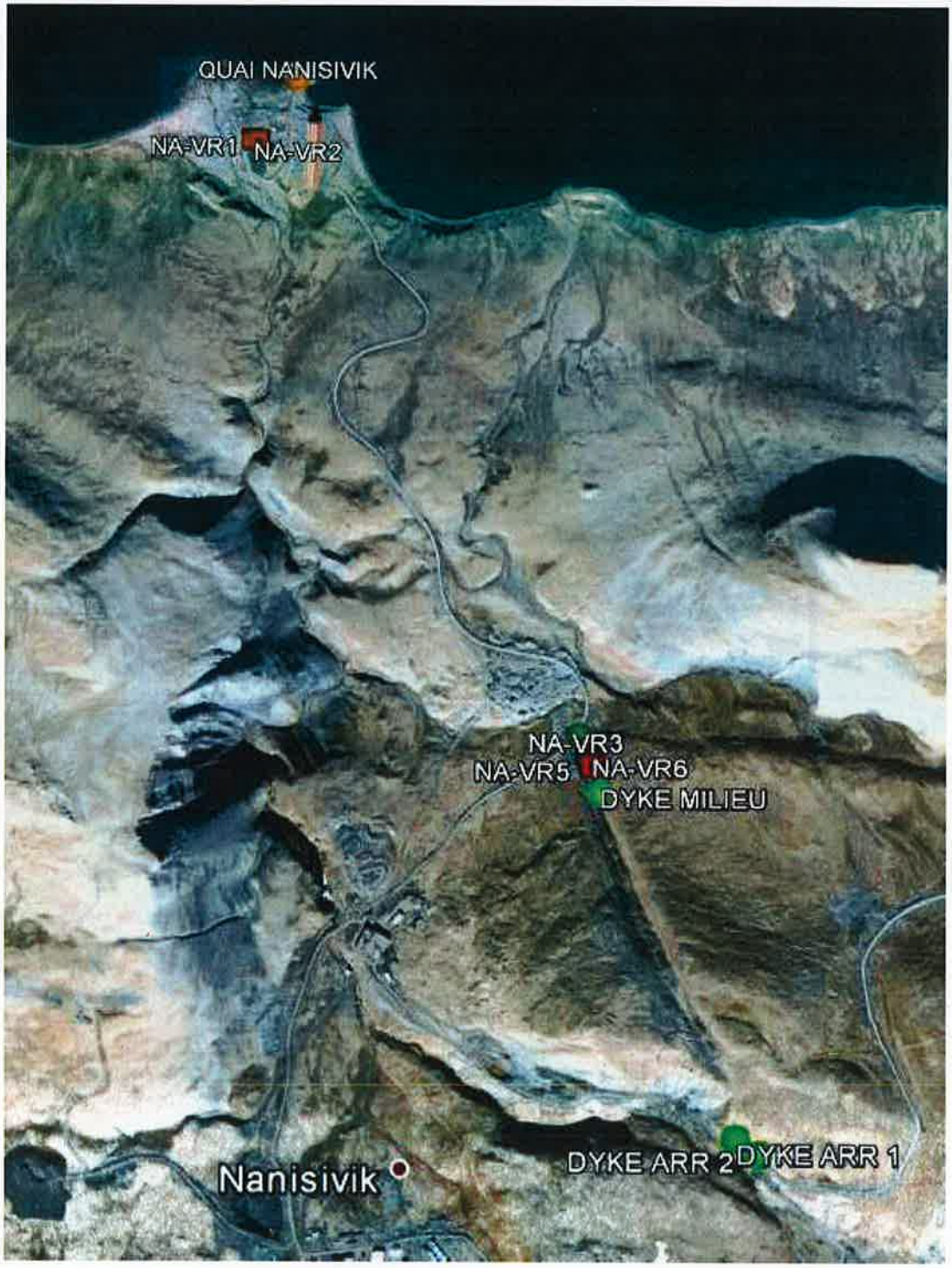
Management of excess aggregates produced:

Quarrying activities will be closely managed to avoid the accumulation of unnecessary stockpiles of aggregate.

Annex A - Topography



Annex B - Extent of proposed quarry



The image shows the overall dimensions of the potential quarry, the following coordinates locate the diabase dyke that were identified as being especially usable for the production of certain types of materials. NA-FR3 is the location that is closest to the road. DYKE ARR2 shows the position of the furthest extremity of the dyke. Also refer to Annexe A.

Symbole	Nom	Position
	DYKE ARR 1	N73 02 19.0 W84 30 09.9
	DYKE ARR 2	N73 02 17.5 W84 30 02.2
	DYKE DIABASE	N73 02 58.0 W84 31 02.0
	DYKE MILIEU	N73 02 52.3 W84 30 55.0
	NA-VR1	N73 04 05.6 W84 33 07.4
	NA-VR2	N73 04 05.8 W84 33 10.0
	NA-VR3	N73 02 56.3 W84 30 59.1
	NA-VR4	N73 02 56.7 W84 30 58.6
	NA-VR5	N73 02 55.1 W84 30 56.8
	NA-VR6	N73 02 55.4 W84 30 57.7
	QUAI NANISIVIK	N73 04 09.7 W84 32 50.3

Annex C - Quarry current condition (June 2014)