TETRA TECH EBA

OQM | Organizational Quality Management Program

UPDATED PRE-FEASIBILITY STUDY ON THE AAPPALUTTOQ RUBY PROJECT, GREENLAND

NATIONAL INSTRUMENT 43-101 TECHNICAL REPORT

PRESENTED TO

True North Gems Inc.

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ACRONYMS & ABBREVIATIONS

AAS	atomic absorption spectroscopy
ARG	Graphitic Argillite
BC	British Columbia
BFA	bench face angles
C	Carbon
CNCF	cumulative net cash flow
DCF	discounted cash flow
DGPS	differential global positioning system
EBA	Tetra Tech EBA Inc.
HQ Drilling	Drill diameter of 63.5 mm
IBA	Impact Benefit Agreement
ICP-AES	Inductively Coupled Plasma - Atomic Emission Spectroscopy
IRR	internal rate of return
LNS	Leonhard Nilsen & Sønner AS, Norway
LNSG	Greenland Division of LNS, Norway
MLSA	Mineral Licencing and Safety Authority of Greenland
METSIM	metallurgical software program
NCF	net cash flow
NSR	net smelter royalty
PFS	Prefeasibility Study
PGA	peak ground acceleration
PQ Drilling	drill diameter of 85 mm
Preg	Pregnant solution
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
QP	qualified person
RC Drilling	reverse circulation drilling
RMI	Resource Modeling Inc.
RMR	rock mass rating
ROM	run of mine
RQD	rock quality designation
SED_NX	Unoxidized sediments
SED_OX	oxidized sediments
SGS	SGS Metcon
Std.	standard
TNG	True North Gems Inc.
TNGG	True North Gems Greenland A/S

UNITS AND SYMBOLS

$	US dollar
$/t	dollars per tonne/m³
%	percent
°	degrees
µm	micron
A	Amperes
CAD	Canadian Dollar
CAD$	Canadian dollar
CAD$/tonne	Canadian dollars per tonne
cm	centimeter
ft.	feet
ft.²	square feet
g	metric gram
g/cc	grams per cubic centimeter
g/t	metric gram per metric tonne
gpm/ft²	gallons per minute per square foot
ha.	hectare
HP	horse power
hr.	hour
kg	metric kilogram
Kg/t	kilograms per tonne
Kl	kilolitre
Kl/t	kilo litres per tonne
km	kilometer
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
KWhr	kilowatt hour
m	meters
m²	meters squared
m³	meters cubed
mins	minutes
ml	milliliter
mm	millimeter
MVA	megavolt-ampere
MW	megawatt
NaCN	sodium cyanide
Oz.	ounce
ppm	parts per million
sf.	square feet
Ton	imperial ton
tonne	metric tonne
tpd	tons per day
V	volt
yd.	yards
yd.³	cubic yards

1.0 EXECUTIVE SUMMARY

Tetra Tech EBA (Tetra Tech) was commissioned by True North Gems Inc. (TNG) to prepare an update to the 2011 Preliminary Feasibility Study (PFS) for their Aappaluttoq Ruby Project, located in southwestern Greenland. This report incorporates updated information on gem valuations and detailed engineering design work completed by TNG and their joint venture partner LNS A/S of Greenland and Norway. No additional geological data has been collected, and the mineral resources used as the basis for the current economic analysis have not changed since 2011. The effective date of this report is January 31, 2015.

1.1 Property description, location and access

The Aappaluttoq Ruby Project is located in southwest Greenland, approximately 150 km south of the capital Nuuk and 20 km southeast of the town of Qeqertarsuatsiaat in the Fiskenæsset mining district. The town of Qeqertarsuatsiaat is home to approximately 240 people and has an all-weather commercial harbour. The property is located near the intersection of 63° 00' North latitude and 50° 19' West longitude.

Access to the project area is from the sea is through the fjords Tasiussassuaq and Tasiussaa. There are two possible entrances to Tasiussassuaq from the open sea and both are through narrow "gates" with limited depth. The tidal current is strong and passage has to be adjusted to the tide. The tidal range is about 3 m.

The project area is located in a maritime influenced polar tundra region. This is characterized by low daily temperatures, with average lows ranging from -10°C in the winter to +10°C in the summer. The amount of sunlight per day varies greatly throughout the year, with long nights in the winter, and long days during the summer. Precipitation remains constant throughout the year, with about 12 precipitation days per month.

1.2 Ownership

TNG has a 93% interest in the Aappaluttoq property and LNS Group have a 7% interest in the project. The site is located on Exploitation License No. 2014/21, which is registered with the Government of Greenland to True North Gems Greenland A/S, a subsidiary of True North Gems Inc. This licence is a 30-year exclusive mining licence covering an area of 20 km^2 granted on the March 10, 2014 and expiring on March 7, 2044. Two exploration licences remain adjacent to the mining area, both are registered under True North Gems Greenland A/S. Currently, TNG has met and maintained all environmental and social requirements for its exploration and exploitation licenses.

1.3 Geology and mineralization

The Aappaluttoq area lies within the Fiskenæsset Igneous Complex and is dominated by an intrusive gabbro to leucogabbro sequence of rocks with significant volumes of ultramafic rock. This ultramafic sequence is intruded into and is structurally juxtaposed against the felsic gneiss basement suite. The Aappaluttoq ultramafic body is internally zoned with a barren ultramafic core (olivine and lesser pyroxene). It is lensoidal in shape and has a minimum strike length of 170 m and is up to 70 m thick. Gradational alteration is prevalent and evident where ultramafic rocks have been altered to phlogopite. It is in these metasomatic/metamorphic reaction zones between the leucogabbro and ultramafic stratigraphy where the ruby mineralization is mostly concentrated. The Aappaluttoq deposit represents one of the few potentially economic examples of metasomatic ruby formation in a mafic or ultramafic host.

The Fiskenæsset Complex was intruded by several generations of quartzo-feldspathic material. These intrusions are widespread in areas of low deformation and are observed as veins and plugs of granitoid composition crosscutting the main mafic and ultramafic layers.

The main ore zone is currently comprised of three main rock-types: sapphirine-gedrite; leucocratic gabbro and a phlogopitite; with the phlogopitite the host for the majority of the ruby held within Aappaluttoq, and the leucogabbro hosting the pink sapphires.

Exploration has been ongoing at Aappaluttoq since its discovery in 2005. Work has consisted of diamond drilling, mapping, and bulk sample collection. In 2007, 46 drill holes were completed at Aappaluttoq totalling 4,622.1 meters. In 2008, 19 drill holes were drilled totalling 1,834.7 meters. Three bulk samples were collected, increasing from 30 tonnes in 2006 to 54 tonnes (28 tonnes rock, plus 26 tonnes of regolith) in 2007, and 160 tonnes (125 tonnes of rock, ~35 tonnes of regolith) in 2008. In 2010, a detailed ground magnetic survey was completed to trace the extent of the UM unit in the subsurface. 2011 to 2013 focussed on permitting, environmental baseline and the social inclusion study. In 2014, the final permits and IBA was completed. Fieldwork focussed on new ARD-ML testing, locating ideal borrow-pit and construction gravels and surveying the infrastructure for the Aappaluttoq Mine area.

1.4 Mineral resource estimates

The Aappaluttoq open pit mineral resource was estimated in March 2011 by EBA (now Tetra Tech). The initial resource estimate was prepared by Tetra Tech from 6,457 m of drilling data and approximately 90 tonnes of bulk samples. No further in-ground geological development work has occurred since then, thus the resource is still current and actively utilized within the updated PFS.

Search ellipses for the interpolation profiles were based on geology and observed continuity of the phlogopitite host zone. A lower cut-off grade of 1 gram per tonne was selected from evaluation of grade tonnage relationship at several cut off grades. The grade data was interpolated into block models using an inverse distance interpolator with a power of 2 (ID2). The resource is presented in Table 1.

Table 1: Current Indicated and Inferred Resources

Category	Volume	Tonnage(1)	Average Grade(2,3)	Average Grade(2,3,4)	Contained Corundum (2,3)	Contained Corundum(2,3,4)
	m^3	*Tonnes*	*Grams/Tonne*	*Carats/Tonne*	*Grams million*	*Carats million*
Indicated	59,110	189,150	313.33	1,566.65	59.27	296.33
Inferred	24,110	77,160	283.46	1,417.28	21.87	109.35

Notes:

(1) Densities are derived from specific gravity measurements of host lithologies and estimated for host zone based on specific gravity of corundum and average grade
(2) Based on a Total Clean Corundum grades greater than 1.7 mm size fraction from mineralogical lab analysis
(3) Top cut grade of 7,325 grams per tonne (97.5 percentile), and a lower cut-off grade of 1 gram per tonne
(4) One gram equals five carats

1.5 Mineral reserve estimates

The updated open pit mineral reserves are shown in Table 2. Tetra Tech has revised the mine plan and schedule, to include push backs, with lower stripping ratios during the first 2 years.

Tetra Tech considers the spatial distribution of the corundum would make in-pit grade control difficult prior to mining. Additional indicated material below cut-off grade will be processed, this material will dilute the reserves prior to processing.

Table 2: Aappaluttoq Probable Open Pit Mineral Reserves

Category	Tonnage	Average Grade	Contained corundum above 1.7 mm
	Tonnes	Grams/tonne	Grams Million
Total probable mineral reserves for mining(1)	166,983	339	57
Mill feed after dilution and mining losses(2)	189,768	292	55

Notes:
(1) All corundum containing indicated resources within the open pit as designed, intended for mill feed
(2) Resulting mill feed including waste dilution due to mining method of an estimated 19 % and mining loss of 4.5 %

1.6 Mining methods

This PFS is based on open pit mining and considers the agreements between TNG and LNSG, whereby LNSG will provide contract mining services to TNG. Mining is planned to be undertaken between the beginning of March and the end of October each production year (except year 1 (2015), which has a reduced season only commencing after completion of site construction).

The mining method considered is an articulated dump truck, tracked excavator or loader operation. All mining equipment will be provided by LNSG, including 3 haul trucks, 3 loaders and 3 excavators as well as a fleet of support equipment.

Mining includes drill and blast of both waste rock and ore, with ore split into blocks using smaller drilling equipment.

The updated pit design is based on maintaining pit slopes below 56 degrees to ensure that pit the pit design conforms to Danish and Greenlandic regulations. Permitting conditions currently limit the pit bottom to 154 m elevation.

The mine plan produced by Tetra Tech includes 6 m benches with triple benching, allowing for 8 m catch berms. Haul roads are planned to be 9 m wide allowing for single lane traffic only. Ore will be mined in 3 m benches through blasting of blocks of roughly 3 by 2 by 1 m, which are planned to be further fragmented using an excavator mounted impact hammer.

Tetra Tech has included 19.1% waste dilution in ore and mining loss of 4.5%.

Tetra Tech has scheduled a 9 year mine life, with a three year ramp up period from 2,800 tonnes per year of process feed up to 20,000 tonnes per year in year 4.

In order to maintain access to the open pit, the lakes level will be lowered by 10 m. 1.4 Mm^3 of waste rock and 77 thousand m^3 of tailings will be deposited into the lake over life of mine and as such no surface waste rock dumps or tailings facilities are contemplated.

The mining schedule showing tonnes delivered for processing and the associated grade is shown in Table 3.

Table 3: Open pit mining schedule

Open pit mining schedule										
Year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Total**
Ore tonnes	2,849	12,745	16,560	22,792	22,820	23,564	26,142	31,118	31,178	189,768
Waste tonnes	17,485	167,729	485,012	449,311	571,179	484,642	407,319	249,920	136,266	2,968,862
Corundum Head grade	1,396	438	274	310	196	186	244	226	386	292

1.7 Recovery methods

Information provided on processing has been provided to Tetra Tech by Novus Engineering, who are currently conducting engineering, procurement and construction management for Aappaluttoq processing plant and Nuuk HF facilities. The True North Gems Aappaluttoq Ruby Project's Process Plant consists of the following primary sub-processes:

- Crushing (Primary & Secondary)
- Scrubbing
- Dense Media Separation (DMS)
- Drying, Magnetic Separation and Optical Sorting
- Services

The process is designed to produce a secured rough corundum concentrate that is predominantly corundum particles with minor host rock attachments. The concentrate will be exported from site to Nuuk for further processing.

All sub-processes described will be housed in a single "Process Building" which is a purpose built steel structure housing not only the sub-process facilities but also the Office / Security structure and all required electrical and control facilities. The Process Building will be located adjacent to the project maintenance facility and in close proximity to the open pit. The Process Building will be heated and ventilated as required to allow for personnel comfort and process operations.

Crushing will be undertaken using a primary crusher, which is planned as a diesel powered mobile unit. Secondary crushing will be done by cone crusher. After scrubbing and screening the material into appropriate size fractions, dense media separation using Ferro-Silicon (FESI) powder will be done using cyclone separation. The FESI will be recovered using a magnetic separator and the sinks (containing corundum) will be dried in preparation for optical sorting. Optical sorting will produce primary and secondary dirty concentrate.

Power for processing will be provided by diesel powered generator, with water pumped from the lake.

The optical sorter product will be then packaged for transportation to Nuuk, where hydrofluoric acid digestion in a purpose built facility (temporary for first three years and permanent thereafter) is planned to be undertaken to clean any remaining matrix off the corundum.

After the completion of the corundum cleaning through hydrofluoric acid, sorting of gemstones will be undertaken at TNG facilities in Nuuk.

1.8 Project infrastructure

Tetra Tech has reviewed TNG's plans for construction of the mine site, these were developed by TNG, Novus Engineering and LNSG. Currently TNG and LNSG have planned the following facilities for construction:

1. Mine camp including gym, catering and recreation facilities
2. Mine offices
3. Process facility
4. Mine workshop
5. Outer port facilities
6. Explosive storage and magazines
7. Fuel storage at outer port and at camp
8. Process power generation
9. Camp power generation
10. Site roads including culverts and bridges
11. Helipad

Detailed engineering drawings of site works and infrastructure required for the mining operation have been undertaken by Inuplan, a Greenlandic engineering company as well as by Novus Engineering.

All power for the site is planned to be generated using diesel generators.

Tetra Tech have reviewed the construction layout for permafrost considerations and have noted that permafrost is unlikely to cause construction problems.

TNG are currently planning to construct a permanent cleaning facility and office complex in Nuuk which will replace the temporary rented facility used for corundum cleaning in first three years.

1.9 Market studies, valuations and contracts

Current market conditions support strong growth for both ruby and pink and result from increasing demand among manufacturers and reduced production from classic sources. Prices are trending up in response. There is currently no indication that demand will decline. Worldwide, the population of consumers is growing. This growth compared to the limited production of natural ruby and sapphire supports a positive long-term outlook.

Rough prices used averaged $53 per gram for Ruby and $32 per gram for sapphires. Independent valuations ranged from $5 to $300 per gram for rough gem and near gem material. Individual prices used in the model can be seen in Table 62. The economic evaluation of Aappaluttoq considers 75% rough sales and 25% polished over the life of mine.

Polished prices provided by GemWorld varied from US$65 to US$700 per ct. for Rubies and from US$50 to $700 per ct. for Sapphires.

1.10 Environmental studies, permitting and social or community impact

Under Section 16 of the Mineral Resources Act (Greenland) a full Environmental Impact Assessment (EIA) was required as part of exploitation licence application. This was completed and filed by True North Gems (TNG) in June 2011 and approved with amendments by the Government of Greenland upon signing of the Exploitation Licence in March of 2014.

The Company's interest in the Property is governed by "Exclusive Licence No. 2014/21 for Exploitation of Certain Minerals in Areas at Aappaluttoq in West Greenland" from the Government of Greenland – Ministry of Industry and Mineral Resources (the "Exploitation License"), which Exploitation License became effective on March 10, 2014. A full copy of the Exploitation License is available under the Company's SEDAR filings at www.sedar.com.

1.11 Capital and operating costs

Tetra Tech has reviewed costs provided by LNSG, TNG and Novus Engineering for the construction of the infrastructure required for the Aappaluttoq project. These costs are summarised in Table 4.

Table 4: Summary of Aappaluttoq capital cost estimates for the PFS

Aappaluttoq Capital cost Estimate				
Item	**Life of Mine**	**2015**	**2016**	**2017**
Mine site construction	$21,118,948	$21,118,948		
Process equipment	$3,327,618	$3,327,618		
Temp Nuuk HF facility	$252,720	$252,720		
Permanent Nuuk	$5,732,865	$0	$1,719,860	$4,013,006
Total direct costs in CAD$	**$30,432,150**	**$24,699,285**	**$1,719,860**	**$4,013,006**
Indirect	$340,213	$340,213		
Owners costs	$575,047	$516,168	$29,439	$29,439
Total Indirect in CAD$	**$915,259**	**$856,381**	**$29,439**	**$29,439**
Total Capital in CAD$	**$31,347,410**	**$25,555,666**	**$1,749,299**	**$4,042,445**
Total Capital in US$	**$25,077,928**	**$20,444,533**	**$1,399,439**	**$3,233,956**

Additionally, Tetra Tech assisted TNG, Novus and LNSG with an operating cost estimate as shown in Table 5.

Table 5: Life of mine estimated average cost per tonne for Aappaluttoq in CAD$

Summary	Cost per tonne mill feed
Mining	$201
Processing	$46
G and A	$67
Mine site Power	$57
Transport	$10
Nuuk Office	$146
HF processing	$29
Marketing	$40

Table 5: Life of mine estimated average cost per tonne for Aappaluttoq in CAD$

Summary	Cost per tonne mill feed
Corporate	$18
Capital leasing[1]	$96
Total cost per tonne CAD$	**$711**
Total cost per tonne US$	**$573**

1 Not included in project economics, but included in evaluation of resulting TNG economics.

1.12 Economic analysis

For the purpose of the PFS Tetra Tech and TNG have considered two scenarios for evaluation. The first assumes that the project is 100% owned by TNG the company is required to expense all project costs at 100%. For this scenario upfront capital costs provided by LNSG are considered cash costs to TNG and no leasing or shareholder agreements are included as shown in Table 6 and Table 7. The second scenario evaluates the project as if it is being advanced as a joint venture (JV) agreement with LNSG, this results in reduction upfront cash requirements. This scenario will be referred to as the LNSG JV for the purpose of the PFS as shown in Table 6.

Table 6: Key financial and project highlights of the Aappaluttoq PFS:

Aappaluttoq Ruby Project	Production results	Units
Tonne processed	190	Tonnes (Thousands)
Waste rock mined	2,969	Tonnes (Thousands)
Stripping ratio Mine operational years (starting 2015)	16 9	N/A Years
Total corundum recovered from mine site	52.7	Grams Millions
Rough gemstones recovered from operations	17.5	Grams Millions
Average Ruby and Pink Sapphire Price: US$ pct.[1]	$7	US$ per ct.
Estimated revenue	$573	US$ Million
Economic scenario results	**Project Economics[5]**	
All in cash cost per equivalent rough ct. recovered[2]	$3	US$ per ct.
Total Operating costs	$94	US$ Million
Total Project Capital cost (Initial and sustaining)[3,4]	$25	US$ Million
Total Sustaining Capital cost	$5	US$ Million
Total Pre-tax cash flow from operations	$452	US$ Million
Total Post tax cash flow	$282	US$ Million
Pre-tax NPV at 8% real discount rate	**$275**	**US$ Million**
Post-tax NPV at 8% real discount rate	**$171**	**US$ Million**
Post-tax IRR %	**122%**	
Post tax payback period	**1.8**	**Years**

Notes:
1. The average price utilizes gem and near-gem material only; sale of commercial grade corundum has not been included in this PFS. Price forecasts are inclusive of 2.5% annual escalation from the average 2015 price over the life of the mine, this escalation is based on a conservative estimate of the long term supply-demand balance in the coloured gemstone market. The average is based on a 75% of gems sold as rough and 25% sold as polished.
2. All- in-cash costs include the capital, operating, taxes and royalties projected on a per rough carat produced basis. The calculation is performed by dividing life of mine total cash costs of $291 million by life of 88 million rough carats produced over life of mine.

3. This figure includes the investment that LNSG have made of US$14 million in True North Gems Greenland (TNGG) through an agreement whereby LNSG earns 27% shareholding of TNGG through investment and construction of project infrastructure at Aappaluttoq. Tetra Tech has estimated that the contribution by LNSG reduces upfront capital by an equivalent of US$ 17 million, with the remaining US$8 million covered by TNG.
4. Estimated capital cost includes 4% contingency, varying between 0% for quoted items currently in construction and 30% for equipment for which bids have not yet been received.
5. US$ to CAD$ used through the PFS is US$ 1 to CAD$ 1.24.

Table 7 shows the economic results which result from the joint venture with the LNS group. The high IRR of 485% relates to a leasing arrangement for capital costs, reducing upfront cash capital costs to US$8 million from US$25 million.

Table 7: Key financial and project highlights of the Aappaluttoq PFS for True North Gems.

Economic scenario results	TNG	Units
All in cash cost per equivalent rough ct. recovered[1]	$3	US$ per ct.
Total Operating costs[2]	$109	US$ Million
Total Capital cost	$8	US$ Million
Total Sustaining Capital cost	$5	US$ Million
Total Pre-tax cash flow from operations	$454	US$ Million
Post tax cash flow	$287	US$ Million
Pre-tax NPV at 8% real discount rate	**$281**	**US$ Million**
Post-tax NPV at 8% real discount rate	**$179**	**US$ Million**
TNG Post-tax NPV at 8% real discount rate[3]	**$125**	**US$ Million**
Post-tax TNG IRR %	**485%**	
Post tax payback period	**1.1**	**Years**

Notes:
1. All- in-cash costs include the capital, operating, taxes and royalties projected on a per rough carat produced basis. The calculation is performed by dividing life of mine total cash costs of $291 million by life of 88 million rough carats produced over life of mine
2. Inclusive of lease payments.
3. NPV solely for TNG interest in the project

The economics presented above are based on the mine plan, schedule and resulting discounted cash flow analysis, which is summarised in Table 8.

Table 8: Summary of project schedule and cash flows over life of mine

Base case economic summary	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
Mining											
Diluted ore mined	Tonnes	2,849	12,745	16,560	22,792	22,820	23,564	26,142	31,118	31,178	189,768
Waste rock mined	Tonnes	17,485	167,729	485,012	449,311	571,179	484,642	407,319	249,920	136,266	2,968,862
Strip ratio		6	13	29	20	25	21	16	8	4	16
Grade of ore mined (head grade)	g/tonne	1,396	438	274	310	196	186	244	226	386	292
Processing											
Total corundum recovered	grams	3,776,870	5,301,717	4,308,416	6,720,272	4,249,618	4,164,969	6,057,930	6,672,251	11,444,662	52,696,705
Revenue											
Rubies sold as rough	grams	26,710	78,792	78,014	197,434	125,157	102,918	129,354	142,472	244,377	1,125,229
Sapphires sold as rough	grams	285,327	841,677	833,361	2,109,041	1,336,954	1,099,393	1,381,796	1,521,921	2,610,494	12,019,964
Rubies sold as polished	ct.	4,140	12,213	12,092	30,602	19,399	15,952	20,050	22,083	37,878	174,410
Sapphires sold as polished	ct.	44,226	130,460	129,171	326,901	207,228	170,406	214,178	235,898	404,627	1,863,094
Net sales revenue	$000	$12,012	$36,323	$36,867	$95,643	$62,151	$52,390	$67,500	$76,210	$134,000	$573,095
Operating costs											
Total operating costs in US$	$000	$5,007	$10,853	$13,770	$13,070	$13,520	$13,170	$13,215	$13,082	$13,072	$108,759
Capital costs											
Mine site construction	$000	$17,031	$	$	$	$	$	$	$	$	$17,031
Process equipment	$000	$2,684	$	$	$	$	$	$	$	$	$2,684
Temp Nuuk HF facility	$000	$204	$	$	$	$	$	$	$	$	$204
Permanent Nuuk	$000	$	$1,387	$3,236	$	$	$	$	$	$	$4,623
Indirect capital costs	$000	$691	$24	$24	$	$	$	$	$	$	$738
Total capital costs in US$	$000	$20,609	$1,411	$3,260	$	$	$	$	$	$	$25,280
Financial											
Cash flow from operations pre-tax	$000	-$20,726	$31,159	$21,519	$81,379	$50,352	$41,089	$56,117	$65,040	$122,831	$448,761
Estimated taxes	$000	$783	$4,662	$8,253	$31,570	$18,360	$14,757	$20,670	$24,162	$46,740	$169,957
After tax cash flow	$000	-$21,508	$26,497	$13,267	$49,808	$31,992	$26,332	$35,447	$40,878	$76,091	$278,805

1.13 Project Sensitivities

To evaluate the economic analysis, Tetra Tech has conducted sensitivity analysis on the economic inputs of the project. This included changing costs and revenue inputs from -40% to +40%, however some sensitivities have been done to a greater extent to test the projects robustness.

The findings show that the project is most sensitive to the percentage of gemstones of the total corundum mined and processed. This shows the project is only feasible as currently assessed if gemstones (gem and near-gem quality material) exceeds 7.5% of corundum content of mined and processed ore over the life of mine. The relationship between project NPV 8% and the percentage of produced corundum as gem quality is shown in Figure 1.

The project has low sensitivity to changes in capital and operating cost and is moderately sensitive to changes in rough and polished gemstone prices.

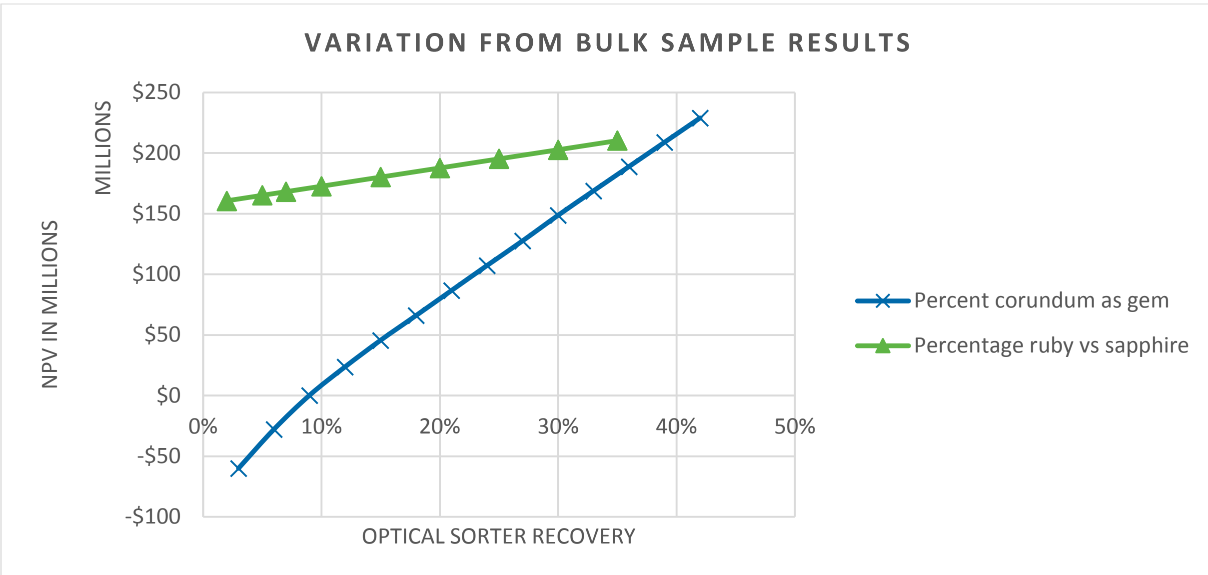


Figure 1: Sensitivity to deviation from bulk sample results, showing percentage of ruby vs sapphire of corundum recovered and percentage of total corundum as gem or near gem quality

1.14 Conclusions

Tetra Tech finds that the Aappaluttoq project has robust economic potential, which is not sensitive to operating or capital costs.

1.15 Recommendations

Tetra Tech recommends that as this project moves forward, the block model is updated to include colour, quality and size distribution of corundum materials.

Once mining commences and a better understanding of operational parameters and constraints are available, it is advised that mining plans are reproduced.

Tetra Tech recommends that TNG and LNSG consider the use of a small bull dozer (equivalent of CAT D6/7) for handling of waste rock, especially when dumping into water.

It is also recommended that a geotechnical study is performed on the rock mass to be mined for the project and that the results are used for revising the mine plan.

It is recommended that True North Gems Inc. conduct site investigations followed by a hydrogeology study to better the understanding of the potential ground water in the open pit.

2.0 INTRODUCTION AND TERMS OF REFERENCE

This report summarizes the results of a Pre-Feasibility Study (PFS) for the Aappaluttoq Ruby Project in southwest Greenland. It was prepared by Tetra Tech EBA Inc. ("Tetra Tech") of Vancouver, BC at the request of True North Gems (TNG), a Canadian based company listed on the TSX Venture Exchange trading under the symbol TGX. This report is an update to an existing PFS on the property that was originally prepared by EBA (now Tetra Tech) in 2011. The current report incorporates the results of additional gem valuations and engineering design work. Geological information, drillhole database and background data presented in this report was supplied to Tetra Tech by TNG and a joint venture partner in the form of LNS A/S of Norway (Greenland division). The mineral resources and reserves used as the basis for economic analysis was prepared and validated by Tetra Tech using the data that was supplied by TNG and LNS Greenland (LNSG).

Units of measurement used in this report conform to the SI (metric) system. All currencies in this report are in US Dollars (USD) unless otherwise noted.

2.1 Site Visits

Qualified persons Mark Horan, P.Eng. and Lara Reggin, P.Geo. visited the Aappaluttoq property as part of this PFS. Lara Reggin's visit took place from October 31st to November 5th, 2010. She was accompanied by John Chow, MAUSIMM, MIEAUST of Tetra Tech EBA (formerly EBA Engineering Consultants Ltd.), Andrew Fagan, M.Sc., C.Geol. and Jonathan Clegg, P. Eng, of TNG and Lars Henrick Larson of MT Hojgaard (MTH). The site visit consisted of a tour of the site infrastructure, the pilot plant in Qeqertarsuatsiaat, and a review the property geology and mineralization. No additional drilling or geological investigations have occurred on the property since the time of Ms. Reggin's site visit and the 2011 resource estimate remains current. In addition, Ms. Reggin completed a visit to the SRC lab in Saskatchewan in February 2011, to view and inspect the lab where samples from the site were processed and assayed.

Mark Horan's visit took place from the 13th to the 16th of October 2014. He was accompanied by Andrew Fagan. The visit included a tour of the exploration camp, the mine site, process plant area, explosives storage and the outer port as well as Nuuk offices and prospective sites for Nuuk processing facilities.

2.2 Effective Date of Technical Report

The effective date of this report is 31st January 2015.

3.0 RELIANCE ON OTHER EXPERTS

This report has been prepared by Tetra Tech in reliance on data compiled by others, including specific contributions as noted below. Information from third party sources is footnoted, quoted as a report in the text, or referenced. Tetra Tech has reviewed all external information and believes it to be reliable for inclusion in the PFS. The information, opinions, estimates, and conclusions contained herein are based on:

- Information available at the time of preparation of this report.
- Assumptions, conditions, and qualifications as set forth in this report.
- Data, reports, and other information supplied by TNG and other third party sources, including:
  - NI 43-101 Technical Report titled "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland" prepared by Lara Reggin, P. Geo. and John Chow, MAUSIMM, MIEAUST of EBA. (Reggin, P.Geo. & Chow)
  - NI 43-101 Technical Report titled "2008 Report on Field Activities for the Fiskenæsset Ruby Project, Greenland" prepared by Bonnie Weston, P.Geo., G.G., of True North Gems Inc. (Weston, 2008 Report on Field Activities for the Fiskenaesset Ruby Project, Greenland 2008)
  - "NI 43-101 Report of Activities for the Fiskenæsset Ruby Project, West Greenland" prepared by Greg Davison, M.Sc., P.Geo., VP Exploration for True North Gems Inc. (Davison 2008)
  - "The Aappaluttoq and Sarfaq Ruby Mineralization: A Review of the 2007/2008 Drilling Programs and Geological Interpretation" prepared by Iain Groves of Insight Geology Pty. Ltd. and Catherine Banfield of True North Gems Inc. (Groves and Banfield 2009)
- For the purpose of this report, Tetra Tech has relied on property ownership information provided by TNG and was made publicly available by the Greenland Government.
- Tetra Tech relied on a Corundum Pricing and Marketing Review authored by Stuart Robertson of GemWorld International Inc.
- Tax estimates have been provided by Chris Richards of TNG reviewed by Claus Bech of Deloitte, in Nuuk, Greenland as tax advisor to TNGG Information on Greenland.
- Geology and Mineralization has been provided by Professor L.A. Groat of the University of British Columbia in consultation with TNG geologists and consultants.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Regional Location

The Aappaluttoq Ruby Project is located in southwest Greenland, approximately 150 km south of the capital Nuuk and 20 km southeast of the town of Qeqertarsuatsiaat in the Fiskenæsset mining district. The town of Qeqertarsuatsiaat is home to approximately 240 people and has an all-weather commercial harbour. The property is located near the intersection of 63°00' North latitude and 50°9' West longitude.

The Fiskenæsset mining district is located on the southwest coast of Greenland. The district measures approximately 60 km × 60 km, and covers portions of three contiguous regional 1:100,000 map sheets: (1) Bjornesund 62 V. 1 Nord; (2) Graedefjord 63 V. 1 Syd; and, (3) Sinarssuk 63 V. 2 Syd. Aappaluttoq is one of several ruby and sapphire prospects currently held by TNG; however, this report only addresses the Aappaluttoq prospect and does not include or consider any other prospects.

4.2 Property Agreements and Legislation

4.2.1 Royalties and Taxes

The royalty and corporate income tax regime is detailed in Exclusive License No. 2014/21 "For Exploitation of Certain Minerals in Areas at Aappaluttoq in West Greenland" between the Government of Greenland and True North Gems Greenland A/S.

In summary:

- TNGG is responsible to pay gross royalties of 5.5% on the basis of the value of minerals sold each year. These amounts are due on an annual basis, and preliminary payment is made at the time of the filing of the corporate tax returns.
- TNGG is to pay corporate taxes at a rate of 30%.
- TNGG must pay additional amounts when earning a profit margin greater than 40% each calendar year. This is considered a Surplus Royalty, and is due at a rate of 15% on the excess margin.
- TNGG is also responsible for withholding tax when making dividend payments to its shareholders, at a rate of 36%.

If corporate income taxes, Surplus Royalty and corporate dividend withholding tax amounts are in excess of the amount payable as gross royalties, then no gross royalties are to be paid for the calendar year.

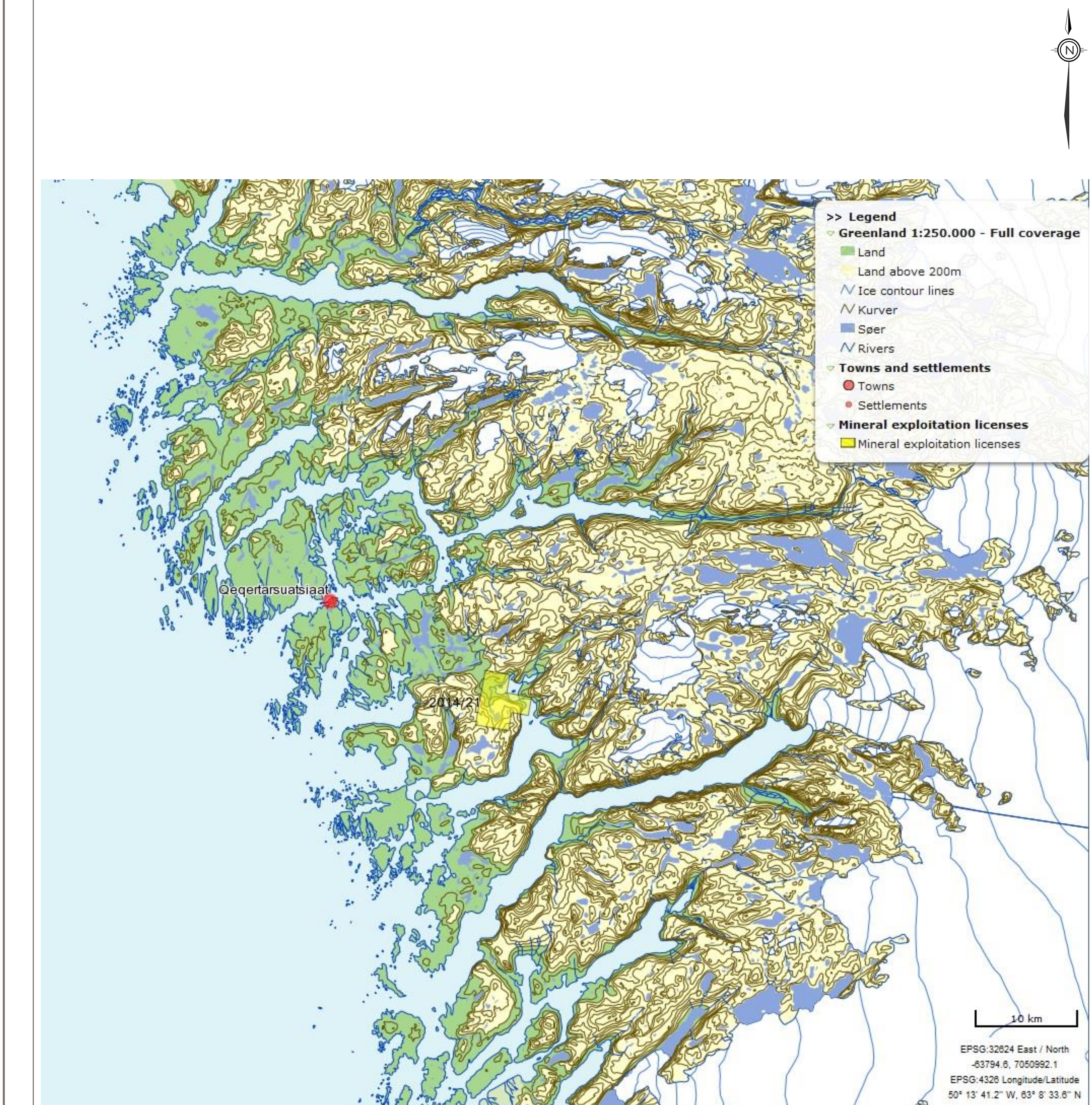
No private royalties are applicable to this project.

4.2.2 Surface and Property Rights

The Aappaluttoq deposit is located on Exploitation License No. 2014/21, which is registered with the Government of Greenland to True North Gems Greenland A/S, a subsidiary of True North Gems Inc. This licence is a 30-year exclusive mining licence covering an area of 20 km^2 granted on the 10th March, 2014 and expiring on 7th March, 2044 (Figure 2).

Two exploration licences remain adjacent to the mining area, both are registered under True North Gems Greenland A/S and are what remains of the 2011 exploration licences after the 2014/21 Exploitation Licence was cut out of the True North land holdings. These exploration licences are in good standing and contain numerous exploration sites that will require future gemstone exploration. The Fiskenæsset Licence (2008/46) currently has an area of 75 km^2 and is currently due to expire on 31st December 2015. The Qaqqatsiaq Exploration Licence (2008/01) has an area of 38 km^2 and is in good standing through to 31st December 2017. Both licences can be extended and the required work has been completed to allow extension upon review by the Greenland Government.

Licence 2008/46 was obtained by TNG by satisfying all terms of an option agreement with Brereton Engineering and Developments Ltd. Past commitments linked to this option agreement include cash payments of CAD$ 50,000 and CAD$ 50,000 worth of Company treasury shares annually for each year TNG maintains the exploration licence. The granting of the 2014/21 exploitation permit from a sub-area of the 2008/46 exploration licence triggered a one-time payment of C$500,000 worth of Company treasury shares to Brereton. This payment has been completed and both the 2014/21 and 2008/46 licences are now unencumbered.



LEGEND	NOTES	CLIENT	Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland
		TRUE NORTH GEMS greenland	Exploitation License Location
	STATUS	TETRA TECH	PROJECT NO. 704-V15103083-01; DWN CS; CKD; APVD MH; REV; OFFICE EBA-VANC; DATE February 13, 2015

Figure 2

4.2.3 Environmental Regulations

The Greenlandic Mineral Resources Act of 7 December 2009 (The Mineral Resource Act 2009) forms the main relevant legislation when requiring a permit for exploitation of minerals. The obligations regarding EIA are outlined in part 15: "A license for and approval of [exploitation of minerals] can be granted only when an assessment has been made of the impact on the environment (EIA) of the performance of the activity and a report thereon (EIA report) has been approved by the Greenland Government". A draft EIA was filed with the Greenland Government on June 6, 2011 and approved in March 2014.

The EIA must cover the exploitation period from mine development prior to the mine start until closure of the mine and a subsequent monitoring period. Baseline studies must be performed and cover a period of some years before construction starts so that the environmental variations are incorporated in the baseline description. The number of years needed for baseline studies will depend on the project and the site. The Company has completed the required baseline studies on the Aappaluttoq property, the surround fjord and water-systems including Lake Ukkaata Qaava.

Currently, TNG has met and maintained all environmental requirements for its exploration and exploitation licenses (The Mineral Resource Act 2009). Rambøll, a Denmark based company, was contracted by TNG to complete this work. Rambøll has close to 10,000 employees and has worked on projects in over 75 countries.

Further details on environmental regulations and practices are detailed in section 20.

4.2.4 Socio-Economic Impact Assessment

A Socio-Economic Impact Assessment (SIA) must be submitted with the application for an exploitation license. The main objectives of the SIA process for mineral projects in Greenland are:

1. To engage all relevant stakeholders in consultations and public hearings.
2. To provide a detailed description and analysis of the social pre-project baseline situation as a basis for development planning, mitigation and future monitoring.
3. To provide an assessment based on collected baseline data to identify both positive and negative social impacts at both the local and national level.
4. To optimize positive impacts and mitigate negative impacts from the mining activities throughout the project lifetime.
5. To develop a Benefit and Impact Plan for implementation of the Impact Benefit Agreement.

A draft SIA was filed with the Greenland Government on June 6th 2011 and the public consultation process was initiated on June 17th 2013. Three public consultation sessions were held, one in Qeqertarsuatsiaat on the August 26th 2013, one in Paamiut on the August 27th 2013 and the final one in Nuuk on August 29th 2013. The SIA covers the construction stage, the operational stage and closure of the proposed mine. The Draft SIA describes the socioeconomic baseline in Greenland and in the main affected areas, evaluates likely socioeconomic impacts related to the project and identifies measures to mitigate negative impacts requiring mitigation. The social impacts have been assessed at two different levels: potential local impacts in Qeqertarsuatsiaat and impacts at regional and national level (Nuuk, Sermersooq Municipality and at national level) to ensure a socially sustainable development of the mine.

Results from the SIA consultation process (which was closed for comments on September 12th 2013) were then compiled by the Company into the ‘white book’ and submitted to the Greenland Government. This document outlined the concerns brought forward at the public hearings and demonstrated what the company's mitigation methods would be to alleviate each of these concerns. Upon acceptance of the white book, the company and various stakeholders completed negotiation of the Impact Benefit Agreement (IBA). The IBA is a commitment by the company to bring direct employment and training whilst developing new skill-sets and supporting the growth of secondary industries.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility, Local Resources and Infrastructure

The nearby fishing village of Qeqertarsuatsiaat, population 240, lies at the northwest corner of the mining district. The village has no air strip but the full-service commercial harbour is ice-free year round. The Irminger Current, a northern tongue of the warm Gulf Stream, is responsible for moderating the weather and keeping the sea lanes open. Regularly scheduled boat and ferry service routinely move people, mail, and major supplies along the southwest coast of Greenland, including stops at the village of Qeqertarsuatsiaat. The government of Greenland maintains a medical clinic and an extended care treatment facility for the elderly at Qeqertarsuatsiaat.

The access to the project area from the sea is through the fjords Tasiussassuaq and Tasiussaa. There are two possible entrances to Tasiussassuaq from the open sea and both are through narrow "gates" with limited depth. The tidal current is strong and passage has to be adjusted to the tide. The tidal range is about 3 m.

The passage from Tasiussassuaq to the brackish Tasiussaa upper fjord is through another narrow gate, "the inner gate", about 50 m wide and 5 m deep at low tide and the current is very strong during most of the tidal cycle.

The yearly shipping window, in which it is possible to sail safely to the site from Nuuk, is expected to take place from beginning of June to December, depending on the ice conditions for the given year. Shipping of equipment and materials to the site has in the past been done by a small tug boat with barge. Outside this period the primary access to the mine area would be by helicopter from Nuuk.

A temporary camp is currently on site, this will be dismantled once the permanent facilities are constructed. This camp has been used in connection with construction and previous exploration drilling and is located approximately 2 km north of the Aappaluttoq prospect. The camp consists of 18 tents in all, including:

1. 14 accommodation tents;
2. One office tent;
3. One kitchen/canteen tent;
4. One toilet/shower tent; and
5. One core shack tent.

The present camp can accommodate up to 28 persons if tents are shared in double occupancy. At the time of writing (October 2014 through January 2014), permitted construction activities are being undertaken on site, including:

1. Construction of outer port facility;
2. Construction and ground levelling at the inner port;

3. Blasting and construction of site access trails (pre-cursor roads) between the outer port and camp; and

4. Preparation of foundations for camp and helipad;

Current progress on the infrastructure construction will be discussed further in section 24.

5.2 Climate and Physiography

The climate of Qeqertarsuatsiaat is comparable to the climate of Nuuk, both are classified as: “Low Arctic Maritime”. Average monthly temperatures do not exceed 10° Celsius and summer nights are typically frost-free for 60 days a year. Winters lows are typically -8° to -11° Celsius. At Summer Solstice, there are nearly 20 hours of daylight. Precipitation averages around 770 mm per year, mixed rain and snow, with most of the accumulation falling between August and November. Conditions along the coast are often cloudy, with fog to the waterline, especially in the summer months. Conditions are typically dryer and relatively warmer proceeding inland up the fjords, but inland under clear conditions extremely strong katabatic winds can episodically flow off the icecap (Piteraq wind) or descend off of mountain massifs (Foehn wind). Permafrost is discontinuous e.g. in the shade on north facing slopes. Table 9: provides a summary of the climate data available from Nuuk, the nearest meteorological station to the project area.

Table 9: Climate Data for Nuuk

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high (°C)	−4.6	−4.7	−5.1	−1.2	3.1	7	9.9	9.3	6	1.4	−1.3	−3.5	1.4
Average low (°C)	−10.0	−10.7	−10.7	−6.3	−1.7	1.1	3.5	3.5	1.4	−2.7	−5.9	−8.6	−3.9
Precipitation (mm)	40	47	49	47	55	62	87	85	89	66	73	74	774
Avg. precipitation days (≥ 1.0 mm)	9	9	10	9	9	8	10	9	12	10	11	10	116
Sunshine hours	31	84	186	240	186	150	186	124	90	62	30	0	1,369

Note: (BBC World News 2011) (World Meteorological Organization 2011)

Topographic relief in the Fiskenæsset district ranges from sea level to 1,440 m in elevation. The Peak Summit is “Qaqqatsiaq” (The Big One), lying a few tens of kilometers inland from the mine site. Maximum historic tidal variations in the inner harbour of Qeqertarsuatsiaat are less than three metres, however the tidal gates create localized discrepancies in the fjords around the project. The area is host to subarctic vegetation, with till-covered areas blanketed by grasses and ground shrubs (crowberry, birch willow and fen) and flowering plants. No rare or protected plants have been identified in the area during baseline studies.

The Aappaluttoq prospect is located on a promontory extending into a lake. The lake has no official or local name, but local people have proposed the name Lake Ukkaata Qaava (meaning "the lake behind the crest") in connection with the present project. The landscape around the lake rises up to about 600 m above mean sea level (amsl), and has been scoured and eroded by glaciers. The lake and valley are well hidden from sight from most directions by the steep terrain. The only opening is to the north along the outlet from the lake but the height prevents sight from the fjord and camp area or from any other natural viewpoints.

The lake is split into two main basins by two peninsulas connected by a shallow sill. The prospect is located on the peninsula jutting from the southern shore of the lake.

The lake has a surface area of 0.97 km^2 and a topographic catchment area of 6.2 km^2. Both of the lake basins have maximum depths of more than 50 m. The volume of the lake is estimated to be 19.6 M.m^3 based on preliminary bathymetry.

Wildlife in the region includes migratory birds and a few mammals. Birds encountered within the project area include: Northern wheatear, snow bunting, redpoll, raven, and ptarmigan. No water birds in connection with Lake Ukkaata Qaava were observed. Only three mammals are encountered in the region: arctic fox, arctic hare, and caribou.

Photograph 1 shows the local terrain at the project site. The immediate area is the location of the proposed open pit mine. The photograph was taken in early November 2010 and ice build-up can be seen on the shallow portion of the lake, some 20 m in length.

Photograph 1: Aappaluttoq Prospect Site Showing Local Terrain

6.0 HISTORY OF THE PROPERTY

In 1966, ruby was discovered in outcrop on Ruby Island by the Geological Survey of Greenland and Denmark (GEUS). By the end of that season, a total of six ruby locations had been discovered in the district.

From 1970 through 1982, reconnaissance exploration for ruby prospects was carried out in the Fiskenæsset area. A total field aeromagnetic survey over southern west Greenland was completed in 1998 by the GEUS. The geology of the ruby prospects in the Fiskenæsset area was first summarized by Dr. Peter Appel in GEUS Open File 95/11, working on behalf of the Geological Survey of Greenland and Denmark in 1995.

TNG optioned the property in 2004 and the discovery of the Aappaluttoq ruby prospect occurred in August 2005. The Company field crews located the ruby prospect along the southern shore of Lake Ukkaata Qaava, about 3.5 km south and along strike from Ruby Island. The discovery was confirmed and validated by collecting a 100 kg sample of outcrop and mantle talus. From 2005 to 2008, TNG undertook a significant amount of exploration work on the prospect, including sample collection, drilling, prospecting, mapping and ground geophysics surveys. In 2009, Iain

Groves of Insight Geology Pty Ltd. mapped the local geology and reported on it in the document prepared for TNG titled "The Aappaluttoq and Sarfaq Ruby Mineralization" and dated September 2009 (Groves and Banfield 2009).

A summary of the exploration history is presented in Table 10.

Table 10: History of the Aappaluttoq Project

Year	Activity
2004	The Company options Exploration License (No. 2003/03 Fiskenæsset – subsequently renewed as licence 2008/46) registered with Bureau of Minerals and Petroleum (BMP) in the name of True North Gems Inc.
2005	Discovery of the Aappaluttoq prospect
2006	30 tonne bulk sample collected from Aappaluttoq
2007	Three bulk samples ranging from 0.7 to 25 tonnes collected to confirm gemmological criteria, grade distribution and distribution data from the 2006 sample collection
	Diamond drilling in 46 holes totaling 4622.1 m to delineate and identify mineralization
2008	One bulk sample of 125 tonnes was collected to confirm grade distribution and distribution data from previous sampling; and gain sufficient sample to complete metallurgical assessment and design.
	Diamond drilling in 19 holes totaling 1834.7 m to delineate known ruby mineralization at Aappaluttoq including the Aappaluttoq Deep Zone.
2011	Prefeasibility study completed for the property
2014	TNG obtained necessary mining, environmental and social permits (March 2014)
2014	Commencement with construction of mine site infrastructure (October 2014)

A detailed discussion of the drilling and associated sampling history that occurred on the Aappaluttoq prospect in 2007 and 2008 is presented in Sections 9 and 10 of this report.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

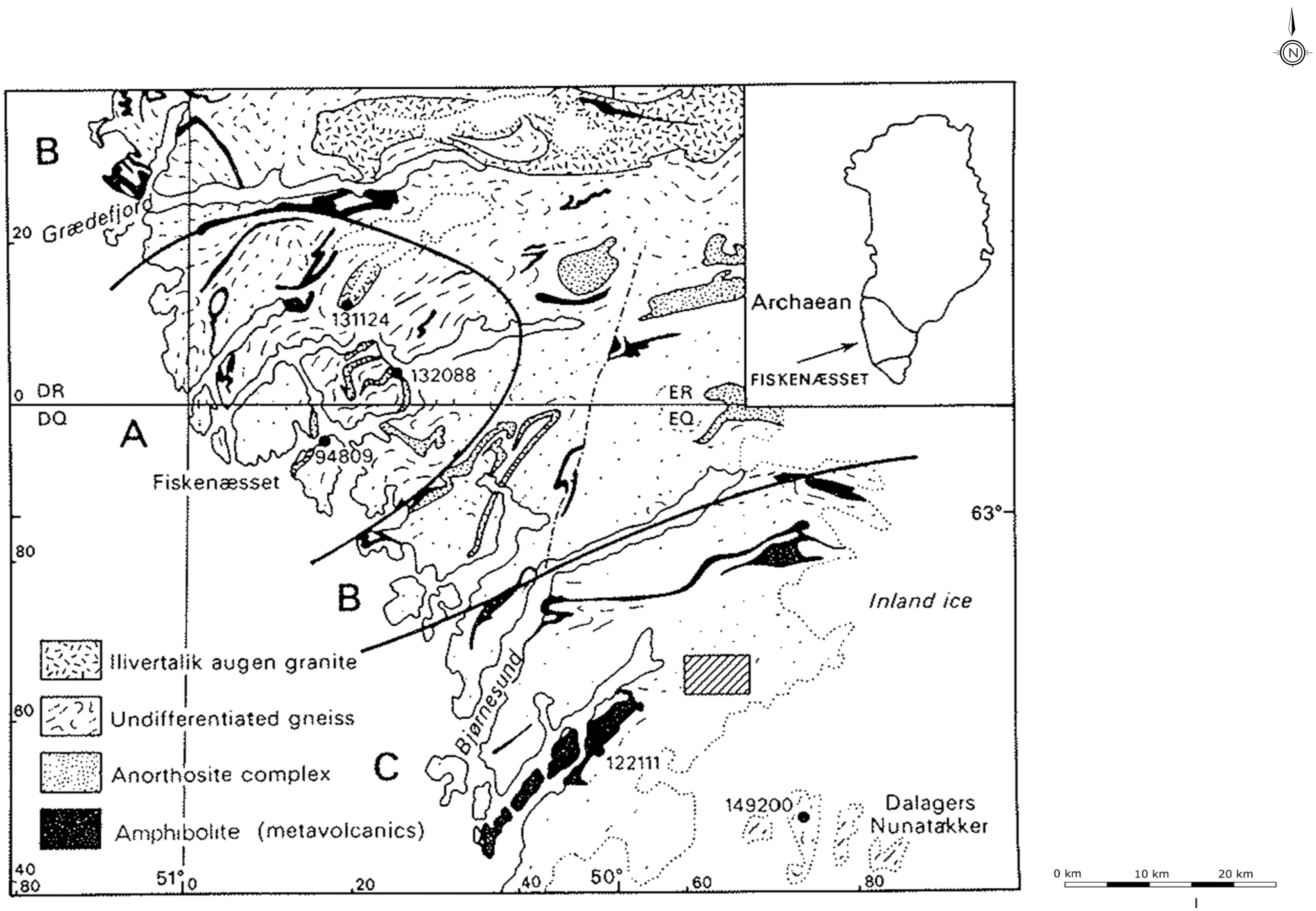
7.1 Regional Geology

The regional geology of the North Atlantic region involves a long and complicated tectonic history. The Fiskenæsset Igneous Complex is located within a poorly understood region of south-western Greenland in an area this area is believed to be part of the North Atlantic Craton.

The cratonic area of SW Greenland is composed of six Mesoarchean to Neoarchean (ca. 3000-2720 Ma) crustal blocks that display similar structural architecture (Windley and Garde 2009). From South to North these include the Ivittut, Kvanefjord, Bjørnesund, Sermilik, Fiskefjord, and Maniitsoq blocks. The lower region of these blocks was metamorphosed at granulite facies, before being partially retrogressed to amphibolite facies assemblages. The upper region of the blocks was subjected to prograde amphibolite facies metamorphism, which never reached granulite facies. The crustal blocks consist primarily of orthogneisses derived from tonalite-trondhjemite-granodiorite (TTG) protoliths; they contain numerous layers of anorthosite and amphibolite (Friend 2009); (Steenfelt, Garde and Moyen 2005) that are themselves, highly-deformed.

The Fiskenæsset area is situated near the center of the preserved Archean complex of southern Greenland. The area has been well mapped by the Geological Survey of Denmark and Greenland (GEUS) at a scale of 1:20,000. Pidgeon & Kalsbeek (Pidgeon and Kalsbeek 1978) noted that a detailed picture of igneous, metamorphic and structural events has been established for various subareas within the Fiskenæsset area, however the geology of the area as a whole is very complicated and the correlation of geological interpretations of the various subareas is incomplete. This appears to be the case even today, although recent interpretations (Polat, et al. 2010); and others) have assisted in providing insight into the understanding of the regional geology.

The Fiskenæsset anorthosite complex is a layered-cumulate igneous intrusion that occurs in the lower zone of the Bjørnesund structural block. It appears as a sheet-like body concordant with the adjacent orthogneisses and amphibolites (J. Myers 1985). The complex is mid-Archean (2970Ma) in age (Polat et al. 2011), and individual layers in the complex range in width from 2 km to less than a meter. The km-scale fold interference patterns observed are a result of three phases of isoclinal to tight folding (J. Myers 1975). A general overview of the tectonic history of the Fiskenæsset Complex is presented in Figure 4.



LEGEND

NOTES

Taken from Pidgeon and Kalsbeek (1978)

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems greenland

TETRA TECH

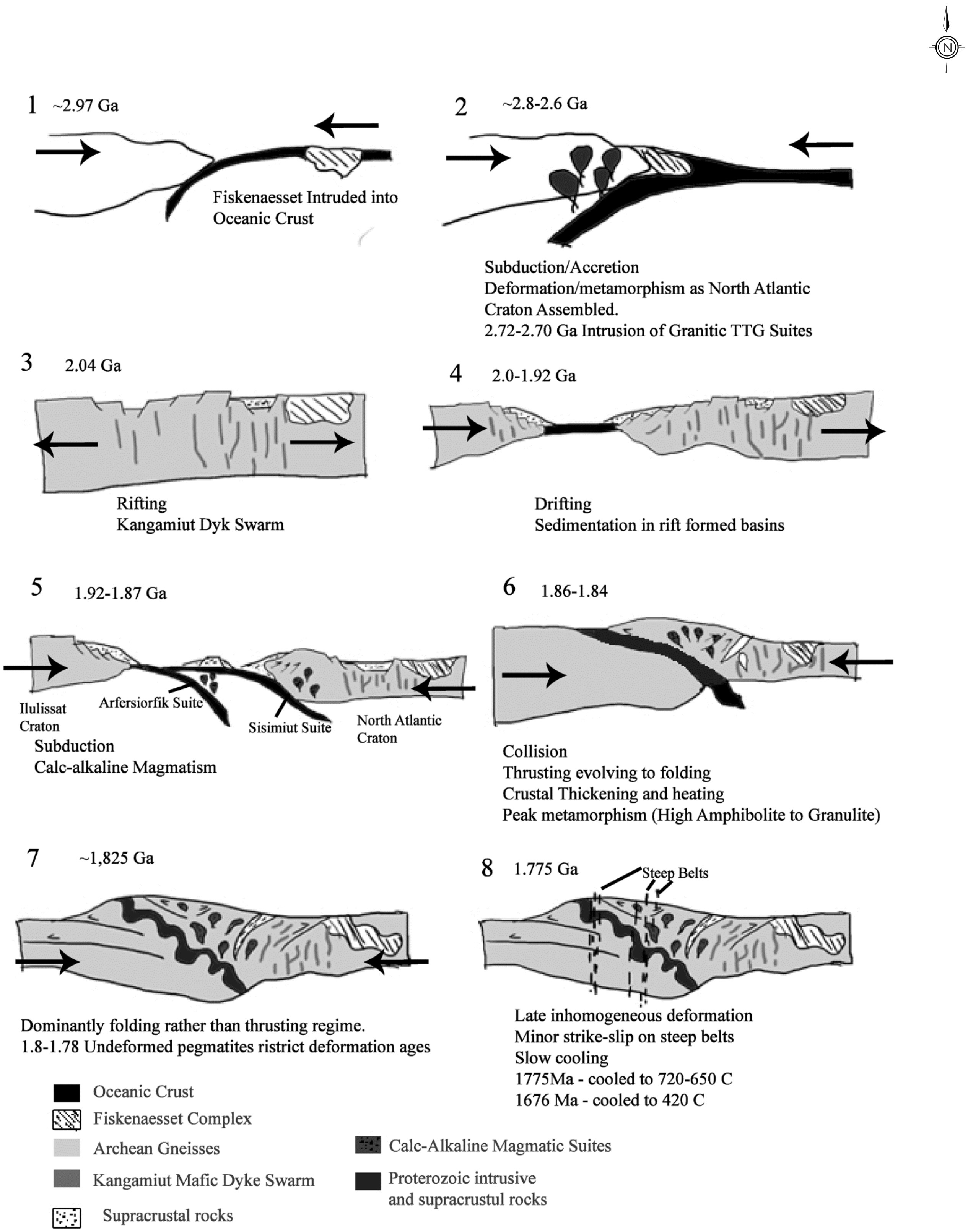
Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Geological Sketch of the Fiskenæsset Area

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	

OFFICE	DATE
EBA-VANC	February 13, 2015

Figure 3



LEGEND

NOTES

From Pidgeon and Kalsbeek (1978)

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems greenland

TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Tectonic History of the Fiskenæsset Complex

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	

OFFICE	DATE
EBA-VANC	February 13, 2015

Figure 4

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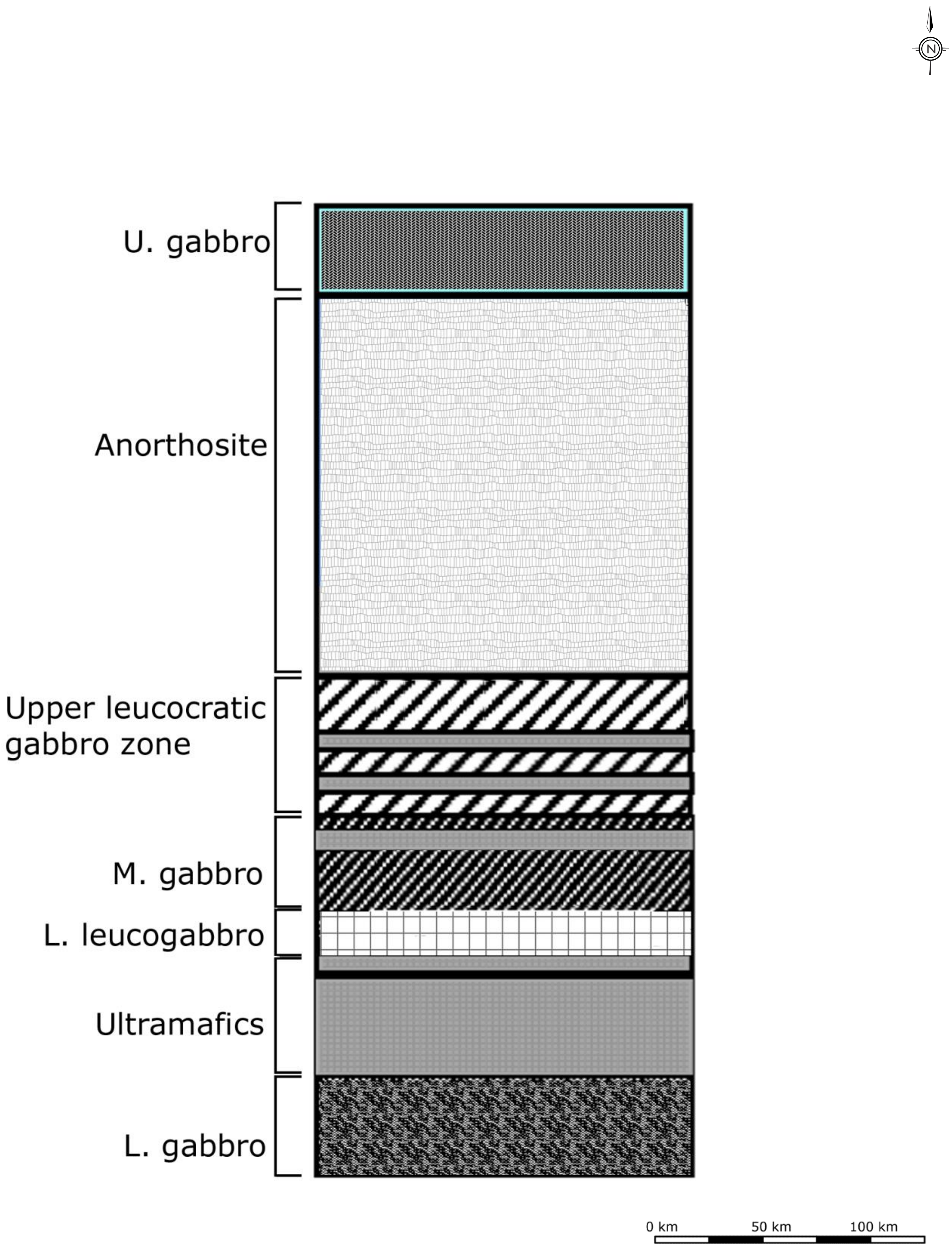
The as yet uncharacterized source magma of the Fiskenæsset Complex was metasomatized by slab-derived highly aluminous hydrous melts in the upper mantle/lower crust, creating a hybrid magma rich in aluminum (Polat, et al. 2010). This was then emplaced as multiple sills of semi-molten crystalline material into the overlying tholeiitic basalt and gabbroic oceanic crust. Geochemical data suggests that the emplacement was at relatively shallow crustal level (Windley and Smith 1974). All rock types, regardless of composition, are characterized by negative Nb anomalies which is consistent with a supra-subduction zone geodynamic setting. The basal amphibolite (remains of the Archean oceanic crust) is now observable as inclusions within the gneiss and as discrete highly deformed belts. This unit is the host of the meta-anorthosites and associated rocks of the main Fiskenæsset Igneous complex. The exact emplacement of the complex is difficult to characterize due to overprinting by later deformation, TTG influx, and metamorphic events. However, (Ashwal, et al. 1989) suggested that the emplacement of the complex, subsequent intrusion of TTGs, and high grade metamorphism took place within 70 million years based on a five-point Sm-Nd isochron age of 2860±50 Ma; studies are underway to better confirm this (Fagan & Groat, on-going research).

The intrusive suite comprises gabbro, ultramafic rocks, leucogabbro, and calcic anorthosite. As all rocks have been metamorphosed, the pre-nom “meta-“ should be included for exactness, however given the primary textures preserved in some rocks, and the fact the complex has traditionally been mapped as protolith, the word ‘meta’ is implied for igneous rocks mentioned in this report. The anorthosite and various leucogabbros are the dominant rock types present. The complex itself has a thickness of approximately 550 m (J. Myers 1985), and a simplified stratigraphy is provided in Table 5.



LEGEND	NOTES	CLIENT	Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland
	From Polat et. al. 2010 Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"	True North Gems greenland	Simplified Stratigraphy for the Fiskenæsset Complex
	STATUS	TETRA TECH	PROJECT NO. 704-V15103083-01; DWN CS; CKD; APVD MH; REV; OFFICE EBA-VANC; DATE February 13, 2015; Figure 5

The cumulate layering within the intrusive complex is generally zoned upwards from mafic to calcic units. The leucogabbros grade into anorthosites with increasing plagioclase content. Seven individual map units are recognized at regional scale. Myers (J. Myers 1985) established a detailed stratigraphy of the complex; from the base moving stratigraphically higher:

1. The Lower Gabbro Unit. A standard gabbro, often strongly deformed and preserved in up to 50 m thick layers.
2. Ultramafic Unit. Comprises graded dunite, peridotite and hornblendite with a total thickness of about 40 m; the unit is usually highly deformed.
3. Lower Leucogabbro Unit. This consists of leucogabbro, gabbro and minor ultramafic layers with a total thickness of 50 m. The lower subunit contains layers rich in spinel and magnetite.
4. Middle Gabbro Unit. This unit is about 40 m thick, comprising gabbro, anorthosite and ultramafic layers. The base of the unit is marked by up to 6 m of hornblende-orthopyroxene-spinel bearing ultramafic rock overlain by peridotite. The composition of the Middle Gabbro Unit is distinctly different from other units of the intrusion and this unit appears to represent the influx of a second batch of magma with higher MgO/FeO ratio.
5. Upper Leucogabbro Unit Comprises 60 m of rhythmically layered ultramafics and anorthosite. The cumulate plagioclase clusters are up to 20 cm in diameter. Several chromite-rich sub-layers are found in the anorthosite and in the peridotite layers.
6. Anorthosite Unit. This unit forms a significant interval in the igneous complex –and is about 250 m thick. It shows weak internal stratigraphy with no prominent layering. Cumulate layers can form up to 2 m thick; sub-layers with up to 80% cumulus plagioclase are frequent, as is the presence of chromite bands.
7. Upper Gabbro Unit. This unit is up to 50 m thick consisting of gabbro with layers of peridotite. Where the rocks are strongly deformed, garnet is generally prominent.

The entire area has been subjected to at least one episode of late Archean, granulite facies and retrograde amphibolite facies metamorphism – creating at least 3 stages of regional folding (Henriksen, et al. 2000). Myers (J. Myers 1985) noted that, despite the folding and metamorphism, some parts of the Fiskenæsset complex locally retain their igneous stratigraphy, cumulate textures, mineral grading, layering, channel deposits and cross cutting relationships. The recrystallization of the rock units is directly tied to metamorphic deformation, with igneous minerals best preserved in zones of lowest strain. In the Fiskenæsset Complex, some zones suffered post-tectonic metasomatic alteration and resetting (Pidgeon and Kalsbeek 1978) and (J. Myers 1985).

The Fiskenæsset complex was intruded by several generations of quartzo-feldspathic material; these intrusions are widespread in areas of low deformation, they are observed as veins and plugs of granitoid composition crosscutting the main mafic and ultramafic layers (and the TTG gneisses). The timing of granitoid intrusion has been dated between 2714 Ma and 2736 Ma (Fagan & Groat, 2014) however its connection to and the timing of localized metamorphism is currently unknown. The complete Fiskenæsset Complex, associated sub-parallel layers of amphibolite and granitoid gneiss were folded during three major episodes of ductile deformation - F1, F2, F3 (Kalsbeek and Myers 1973). Each deformation event contributed a complex sequence of fold and fabric development, creating complex interference patterns.

The F1 event, folded the sequence into large recumbent isoclinal, nappe-like structures. Subsequently, these structures were refolded (F2 and F3) into folds with steep axial surfaces at high angles to each other. The F2 folds are tight and isoclinal, and imparted the main east-west tectonic grain observed across the region. They are also associated with the development of a strong planar cleavage fabric. The F3 folds have vertical axial surfaces that trend northwest – southeast and plunge to the southeast (J. Myers 1985). F3 folds were contemporaneous with the early stages of the last major metamorphic/metasomatic episode (at amphibolite facies) which led to the alteration of mineral assemblages throughout the region – see Mineralization section, this report, for further details. Zircon ages of 2660 ±20Ma are interpreted as a maximum date for the end of amphibolite facies metamorphism.

Subsequent to all deformation and metamorphic events, the Fiskenæsset complex was cut by undeformed and unaltered dolerite and tonalitic dykes of early Proterozoic age (J. Myers 1985). Weathering and quaternary ice-sheet development have eroded and exposed the core of the complex, however, it remains one of the best preserved Archean layered mafic igneous complexes in the World.

7.2 Local Geology

Aappaluttoq lies on a small NNE trending peninsula extending into Lake Ukkaata Qaava. There is significant outcrop, with about 40% of the Aappaluttoq prospect exposed at surface and 60% covered by the lake.

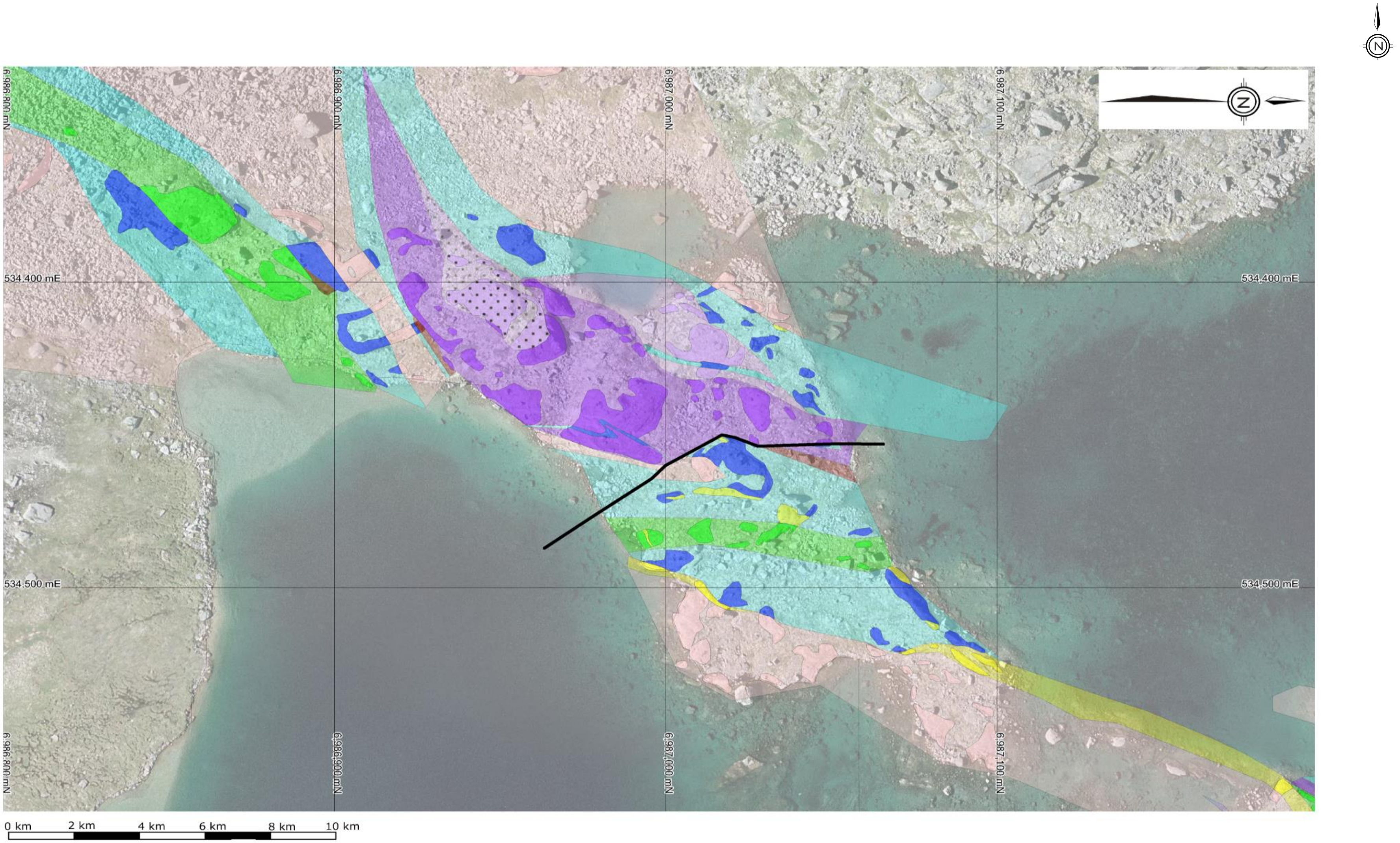
Detailed 1:200 scale mapping shows the geology of Aappaluttoq is confined to the lower part of the stratigraphy of the Fiskenæsset complex, namely the Lower Gabbro, Ultramafic, Lower Leucogabbro, and Middle Gabbro sequences, and it is noted that there is a total lack of anorthosite and chromite bodies within this sequence Table 11 provides a list of lithologies identified on the property. The rock codes provided are used throughout cross sections and resource models discussed in this report.

Table 11: Property Geology

Lithology Type	Rock Code
Phlogopite	PHLOG
Gabbro (Leucocratic and Mafic)	GAB
Sapphirine Gedrite	SAPGED
Pegmatite	PEG
Gneiss, Augen Gneiss	GNS
Ultramafic	UM

The geology of the Aappaluttoq area is dominated by an intrusive gabbro to leucogabbro sequence of rocks with significant volumes of ultramafic rock. The connection between this sequence and the local felsic gneiss basement suite has yet to be established with definitive isotopic dates. However, the rocks encountered at Aappaluttoq differ from basement amphibolites (meta-volcanic rocks) in a number of ways; they are less homogenous, do not show a strong cleavage, and they are distinctively granular. The basal amphibolites are geometrically unrelated to the anorthosite complex. The Aappaluttoq ultramafic body is internally zoned, with a barren ultramafic core (olivine and lesser pyroxene). It is lensoidal in shape and has a minimum strike length of 170 m and is up to 70 m thick. Gradational alteration is prevalent and evident where ultramafic rocks have been extensively altered to sapphirine-gedrite and phlogopite. It is in these metasomatic reaction zones between the leucogabbro and ultramafic stratigraphy where the ruby mineralization is mostly concentrated. Pegmatite dykes are prevalent throughout the property area but do not appear to correlate with corundum mineralization. (Groves and Banfield 2009). Oxygen isotopes on the corundum suggest a purely ultramafic affinity. (Fagan & Groat, 2014).

Structurally, the Aappaluttoq area is very complex with assimilation of the intrusive complex into the gneiss during gneissic/granitic intrusion, and through fragmentation of the intrusive complex by a series of regional folding events. The stratigraphy observed in the Aappaluttoq area generally trends northeast and dips at 50 to 60° to the northwest. The units dip steepen in the northern part of the area. (Groves and Banfield 2009) The deposit geology is presented in Figure 6.



LEGEND

Limonite	GABL	SAPGEG
GNS	GAB	GOS
PEG	PHLOG	UMS
GABM	AMP	UM

Fault

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems greenland

TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Property Geology Map of Aappaluttoq

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	
OFFICE	DATE			
EBA-VANC	February 13, 2015			

Figure 6

7.3 Mineralization

The Aappaluttoq deposit represents one of the few potentially economic examples of metasomatic ruby formation in a mafic or ultramafic host. The classification of (Keivlenko 2003) and (Giuliani, Ohnenstetter, et al. 2007) shows the mineralization at Aappaluttoq has similarities to the Rai-Iz massif deposits in the Ural Mountains of Russia and to the newly discovered ruby bearing amphibolite gneisses of Mozambique (Pardieu, 2014).

As described in detail elsewhere (sections 7.1 and 7.2), the rocks at Aappaluttoq have very different histories and evolution pathways. The main ore zone is currently comprised of three main rock-types: sapphirine-gedrite, leucocratic gabbro and a phlogopitite; the latter being the most important of these.

The sapphirine-gedrite rocks at Aappaluttoq lie 30 km from the world type-locality for the mineral sapphirine ($[Mg,Al]_8[Al,Si]_6O_{20}$) located within the village of Qetertarsuatsiat (formally known as Fiskenæsset) on the west coast of Greenland. The Fiskenæsset igneous complex contains multiple areas rich in sapphirine-gedrite, many of these were described in detail by (R. Herd 1973) (R. Herd 1969). The authors agree in principle to the established mineralization model for these rocks; metamorphism and metasomatism altered the ultramafic rock by adding silica (SiO_2) and alkalis (K_2O, Na_2O). TNG views this rock as a key indicator for potential corundum mineralization in the Fiskenæsset district, as it forms along the boundary between the ultramafic and the Al+SiO_2 enriched rocks of the gabbroic suite in the Fiskenæsset complex. However, the presence of elevated silica makes this rock an unlikely host for a major volume of free corundum. It is possible that on a local scale, where the metasomatic overprinting has not been as significant, there exists mineralization potential.

The leucocratic gabbro is one of the main rock-forming units within the Fiskenæsset igneous complex. This unit contains a small amount of gem corundum as ruby, but a larger amount of pink sapphire. The gabbro is very rich in Al, and is believed to be the unit responsible for releasing the Al to form the corundum throughout the Aappaluttoq deposit.

The phlogopitite is believed to be the host for the majority of the ruby held within Aappaluttoq, although it also holds a minor amount of pink sapphire. This unit is a metasomatic product, formed once the hydrous fluids responsible for the growth of the gem corundum began to crystallize. No age dates have been obtained on this unit yet.

The processes involved in the generation of gem corundum are complex. The presence of corundum dates back to the original building-blocks of the Fiskenæsset igneous complex around 2970Ma (Polat et. al, 2010); subsequent metamorphic overprinting and metasomatic alteration formed and finally upgraded the deposit into what we see today. All of the previous tectonic activity and the generation of the gabbroic sequences are critically important to understanding how and where the corundum mineralization was produced.

Upper amphibolite to granulite metamorphism (as the various W Greenland continental blocks were accreted and attached) released a large volume of fluid into the igneous complex – the nature of these fluids has not been examined in any great detail; however, they would probably be made of H_2O, $\pm K_2O$ $\pm Na_2O$ $\pm CO_2/CH_4$ depending on localized pressure/temperature and fO_2 conditions. These fluids could move along the contact zones between the various rock-types in the igneous complex (ultramafic/gabbro etc.), creating a zone of alteration in the bedrock. These hot pressurised fluids would facilitate the dissolution of silica from the gabbros into the ultramafic across a large geochemical gradient. The influx of silica and high Al-content of the surround rocks caused the ultramafic unit to be altered into sapphrine-gedrite. This metamorphic/metasomatic event would gradually decrease the silica saturation in the gabbro and increase it within the ultramafic; creating a gabbroic environment that is gradually becoming more and more depleted in silica. The primary regional metamorphism ended around 1825Ma, leaving the ultramafic-sapphirine/gedrite-gabbro sequence in place. It is possible that low grade corundum formed at this time, and various non-gem sites located inland are probably of this type.

A second metamorphic event at temperatures and pressures corresponding to amphibolite facies occurred around 1860Ma-1825Ma. It is this event and the infiltration of new fluids along the previous plane of weakness (between the gabbro and ultramafic) that creates the main corundum mineralization.

The source of Al to initially start the mineralization lies within the gabbroic units. It is locked up in primary calcic plagioclase (anorthite); interaction with the metasomatic fluid changes the stability of the feldspars and they are replaced by albite-oligoclase feldspar by the following reaction:

$$Na_{0.05}Ca_{0.95}Al_{1.95}Si_{2.05}0_8 + K_20 + Na_20 + H_20 = Na_{0.90} + Ca_{0.10}Al_{1.05} + Si_{2.95} + O_8 + Al + bringe$$

$$Anorthite + alkali\text{-}rich\ hydrous\ fluid = albite + corundum + changed\ fluid$$

This alteration of the feldspars allows free Al to be released. As this element is incompatible, and thus is unstable being in a fluid phase it will oxidise in the hydrous fluid, creating a stable corundum crystal (Al_2O_3). Once the crystals have begun to form, they will act as nucleation centres for other Al ions within the fluid, allowing the concentration of corundum to occur and creating larger crystals.

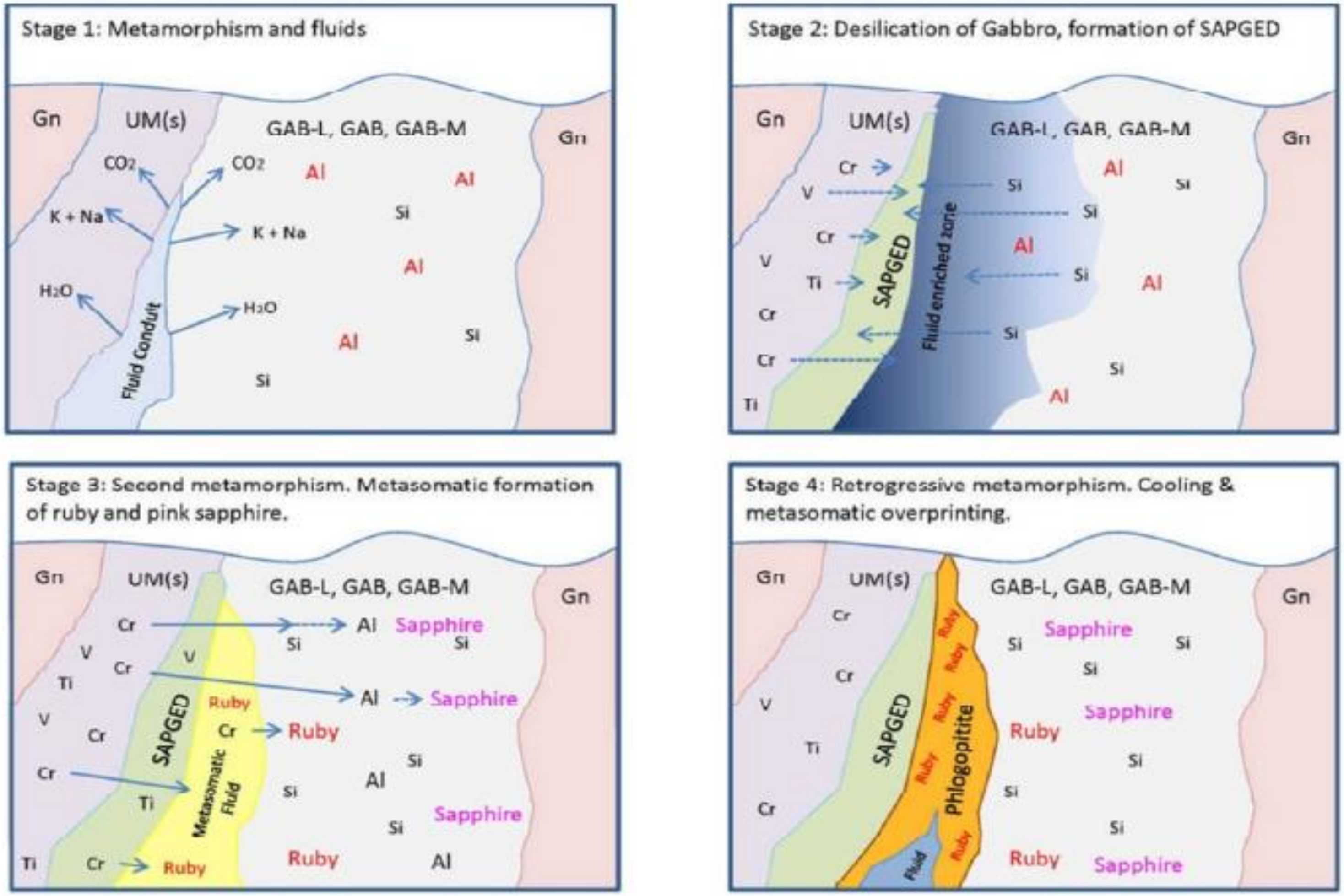
The ultramafic unit is rich in Cr, V, Ti and Fe (all chromophore elements that change the colour of corundum) these elements would dissolve into the fluid and leach out of the ultramafic and into the gabbro. The interaction of Cr with the newly formed and forming corundum crystals facilitates the following exchange reaction:

$$Cr^{3+} \rightarrow Al^{3+}$$

This reaction clearly shows the trivalent Cr is substituted into the corundum crystal structure in-place of trivalent Al; turning the crystal red when parts-per-million Cr is introduced. The more substitutions occur in the crystal the deeper the red colouration becomes. The only limiting factor in this reaction is the availability of Cr^{3+}, this directly corresponds to the Cr concentration in the mineralizing fluids. V and Ti can both substitute in a similar manner and will turn the corundum blue, while Fe substitution will give a yellow hue. Given the high concentration of these elements in the ultramafic unit one would expect blue or yellow sapphire to accompany the red in the Aappaluttoq deposit. However, the presence of secondary ilmenite in the Aappaluttoq mineralogy shows that the Ti has probably been locked and was unable to mobilize into the metasomatic/corundum forming areas. The presence of the sapphrine-gedrite zone between the ultramafic source and the fluid/gabbroic as all of the Fe, V & Ti may be absorbed into the sapphirine bearing unit; thus leaving only the Cr to pass through the SapGed and enter the phlogopitite/Gab.L, thus colouring the waiting corundum crystals hues of pink and red. The highest concentration of Cr outside the ultramafic is within the phlogopitite unit where we see a correspondingly high concentration of red ruby. The further the Cr-rich mineralizing fluid travels from the ultramafic the less Cr is present; thus we see the majority of pink sapphire in the leucocratic gabbro. The main mineralization appear to lie along the metasomatic contact boundary between the UM and Gabbroic units, and we currently do not know how far corundum mineralization reaches in the leucocratic gabbro zones. Further work is required to assess the actual extent of mineralization within the complex.

Retrogressive metamorphism occurred between 1775-1676 Ma at greenschist to lower amphibolite facies (200-600°C, 1-5 kbar). We believe this had a significant effect on the quality and preservation of corundum crystals within the Fiskenæsset igneous complex. This phase of metamorphism was accompanied by a regional folding event, creating the fold patterns and complex geology we see today. The low temperature remobilisation of incompatible elements concentrated them in zones of low pressure (fold hinges, decompressive bends etc.). This allowed any corundum present within the fold to get an influx of chromophore elements and allow them to recrystallize slowly in a hot fluid-rich environment. The corundum left outside these low strain zones was subjected to shearing and regional metamorphic forces. Many of the corundum surfaces began altering to alumina-silicate minerals such as kyanite. However, once completely formed, this kyanite coat can act as a protective armour for the enclosed corundum crystal, preventing any of the caustic metasomatic fluids from reaching the gem corundum material in the core, thus preserving the corundum crystals. This connection between the kyanite and alumino-silicate assemblages the corundum has been noted in numerous other corundum localities within the Fiskenæsset igneous district (Davison, 2007).

The production of corundum by multi-phase metamorphism and metasomatism has been documented elsewhere including (Raith, Rakotondrazafy and Sengupta 2008) who described a similar reaction in rocks from Madagascar. The 'armouring' effect of alumina-silicates is unusual, and has been noted in few other corundum deposits, most notably at the Revelstoke sapphire deposit in BC, Canada (Dzikowski 2010). The main Aappaluttoq deposit contains folded units at its core allowing for the potential generation of high quality ruby and pink sapphire crystals in the low pressure zones. It also contains corundum rimmed in kyanite and other alumina-silicates showing the higher strain zones and armouring effect. Further geological structural analysis and geochemistry is required to understand this phenomenon, how it relates to the local geological stress fields and how this can be used for locating future zones of high-quality high-grade corundum mineralization at Aappaluttoq, and throughout the Fiskenæsset complex. The mineralization genesis is shown below in Figure 7.



LEGEND

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems greenland

TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Aappaluttoq Mineralization History

PROJECT NO.	DWN	CKD	APVD	REV	
704-V15103083-01	CS		MH		**Figure 7**
OFFICE	**DATE**				
EBA-VANC	February 13, 2015				

The ruby and pink sapphires from Aappaluttoq show several distinctive features and have been analysed in detail by Professor L.A. Groat of the University of British Columbia, a recognised authority on gemstones and gemstone deposits. In his report entitled “A mineralogical and geochemical study of untreated ruby samples from Greenland” he stated that:

“The Aappaluttoq ruby samples, showed average values of 1.14 wt % Cr_2O_3 and 0.45 wt % Fe_2O_3, and one analysis shows 0.34 wt % TiO_2. The ruby sample contained a number of inclusions with irregular outlines. Most of the inclusions were filled with albite and/or hercynite-chromite spinel (sometimes containing Ni). One inclusion showed a core of spinel, approximately 60 × 10 µm in size, which was surrounded by albite feldspar. Other smaller spinel and Fe-oxide inclusions occur in the body of the ruby sample. The Aappaluttoq pink sapphire sample showed much less Cr than in the ruby sample; with microprobe calculated average values of 0.26 wt% Cr_2O_3 and 0.21 wt% Fe_2O_3. This latter sample showed one large inclusion of an Mg-Al-Ca-silicate mineral, most likely an altered amphibole or garnet, and a few smaller inclusions of Ni-bearing hercynite-chromite spinel. A number of grains of cassiterite with minor Cu were also identified.” (L. Groat 2005) The Major elemental analysis of rubies and pink sapphires from Aappaluttoq is presented in Table 12.

Table 12: Major Elemental Analysis of Ruby & Pink Sapphires from Aappaluttoq

	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	Fe_2O_3
Aappaluttoq-Red	0.01	96.60	0.34	0.02	0.77	0.59
Aappaluttoq-Red	0.00	96.33	0.01	0.00	1.34	0.40
Aappaluttoq-Red	0.01	97.32	0.02	0.00	1.33	0.36
Average	0.01	96.75	0.12	0.01	1.14	0.45
Aappaluttoq-Pink	0.01	97.79	0.01	0.01	0.21	0.22
Aappaluttoq-Pink	0.00	98.31	0.01	0.00	0.31	0.19
Aappaluttoq-Pink	0.00	97.09	0.01	0.01	0.26	0.23
Average	0.01	97.73	0.01	0.01	0.26	0.21

Note: All samples $\phi(\rho Z)$ corrected.

8.0 DEPOSIT TYPES

The geology of primary gem corundum deposits is poorly understood. This is due in part to their geography as the ‘classic’ localities of Kashmir, Burma and Sri Lanka have been under tight political control for many years, and access to the gem sites by modern scientists has only recently opened up. Another major factor is the secrecy surrounding the geology of these deposits. Owners of the localities are often private companies who do not want the geology to be publically accessible. As a result, much of it remains confidential (Malik 1994). The lack of access to geological samples has driven the scientific community to focus on the gemstones isotopic signatures (Upton 1999) (Giuliani, Fallick, et al. 2005) and their gemmological characteristics. Little discussion on the formation processes or geological host rocks has occurred until very recently.

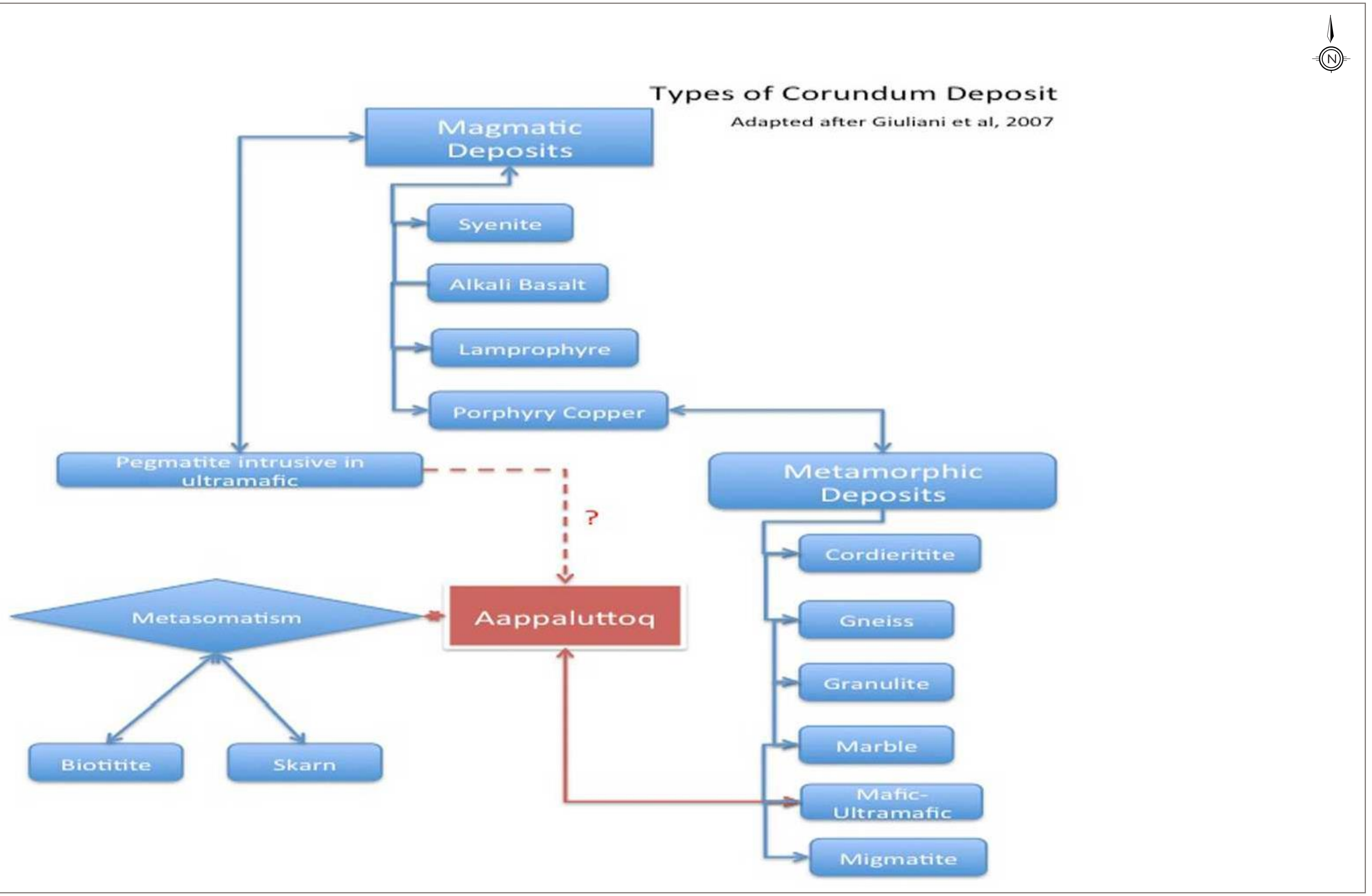
Gem corundum deposits are linked to collisional, rift & subduction zone settings; where fluids are available and the high pressure & temperatures required can easily be (Giuliani, Ohnenstetter, Fallick, Groat, & Fagan, 2014) . The formation of gem corundum requires a specific set of rare geochemical circumstances, including a low silica content, a correspondingly high aluminum content, and the presence of Cr, Fe, Ti or V as chromophore elements. As such, gem corundum deposits can be formed in a wide range of rock-types including marble (Mogok, Burma – (Kammerling, et al. 1994)), calc-silicate (Beluga, Canada – (Cade, Dipple and Groat 2005)), gneiss (Mysore, India – (Schwartz 1998)),ultramafic (O’Brians, Zimbabwe – (Schreyer, Werding and Abraham 1981)), syenite (Ilmeny-

Urals, Russia – (Keivlenko 2003)) desilicated pegmatites (Umba River, Tanzania – (Solesbury 1967)), lamprophyres (Yogo Gulch, USA – (Mychaluk 1995)), basalt (Oberon, Australia – (Sutherland 1996)), granitic skarns (Andranondambo, Madagascar – (Schwartz, Petsch and Kanis 1996)), and others (Keivlenko 2003).

There are numerous classification schemes for gem deposits; but because the base deposits are so poorly understood, genetically linking one deposit model to another is challenging. This has led to a fairly complex set of overlapping classification criteria. Deposits can be classed by the corundum morphology (Ozerov 1945), geological context (Hughes 1997), lithology of the host-rock (Schwartz 1998), the tectonic process required to form the deposit (Simonet 2000) and others (Giuliani, Ohnenstetter, Fallick, Groat, & Fagan, 2014) and (Giuliani, Ohnenstetter, et al. 2007)).

TNG prefers to classify their gem corundum deposits using the methods outlined by Kievlenko in 2003 and Giuliani et al, 2014. This scheme uses the genetic type of the deposit to classify and sub-classify. This gives several basic categories – metamorphic, metasomatic, igneous, and sedimentary; and then sub-classifies these further depending on the rock-types involved. This simplified geological model does not account for the possibility of multiple formation methods or the interaction of several genetically linked methods. For example, regional metamorphism can lead to localised metasomatism – thus two areas of the classification scheme affect the gem corundum.

Further scientific study needs to occur to better classify and understand the complex and the unique processes involved in the development of gem corundum deposits. This is especially true in regards to retrogressive metamorphism and its effect on the development or ‘upgrading’ (Fagan & Groat, 2014). Figure 8 shows the classification scheme of Guiliani, 2007 – this corresponds with the earlier Kievlenko scheme and is included for illustration purposes. The classification of the Aappaluttoq deposit is shown for reference.



LEGEND

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems Greenland

TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Mineral Deposit Type

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	
OFFICE	DATE			
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Figure 8

9.0 EXPLORATION

Exploration has been ongoing at Aappaluttoq since its discovery in 2005. From 2005 until 2013 exploration included the collection of bulk samples, prospecting, surficial mapping, and exploration diamond drilling. Details of the exploration programs from 2005-2006 are described in detail in the “Report of Activities for the Fiskenæsset Ruby Project, West Greenland (Davison 2008).

The work in 2005 and 2006 included surface mapping and sampling of the prospect, and a small 30 t bulk sample was collected in 2006.

The 2007 exploration program focussed on delineation of the prospect, through diamond drilling, and expanded upon bulk sampling programs from previous years.

The 2008 exploration program continued with further diamond drilling and mapping and aimed to define thickness and lateral extent of the mineralization at the Aappaluttoq prospect. Drilling in 2008 tested an area of the mineralization zone to the north and west of previous drilling, and to the east along the projected strike of the Aappaluttoq Deep Zone. This drilling of the Aappaluttoq Deep Zone succeeded in identifying significant concentrations of mineralization and confirming the continuity of mineralization at depth (Weston, 2009).

Exploration activities were put on hold in late 2008 with the downturn in industry and the tightening of finances.

In 2009, TNG exploration at Aappaluttoq completed a review of drilling and mapping and interpretation of geology and corundum occurrences. Geologists completed re-logging of available core (from 2007 and 2008) for geological and geotechnical data. In addition, a reassessment of drill samples sent for assays and detailed 1:500 mapping occurred over the prospect to tie in new geological interpretations and track mineralization to surface from drill intercepts.

In 2010, a detailed ground magnetic survey was completed at Aappaluttoq to trace the extent of the UM unit in the subsurface.

2011 to 2013 focussed on permitting, the environmental baseline and the social inclusion study; however, new geological mapping and extensive set of geochemical and mineralogical samples were removed and are currently under assessment.

In 2014, the final permits and IBA was completed; fieldwork focussed on new ARD-ML testing, locating ideal borrow-pit and construction gravels and surveying the infrastructure for the Aappaluttoq Mine area.

9.1 Surface Sampling

Surface sampling at Aappaluttoq has consisted primarily of mini-bulk to bulk sample collection. Some field records for bulk sampling were found to be lacking detail with respect to sample location, characterization and collection methodology, specifically those relating to the 2008 field season. General locations are recorded in field records and precise locations are obvious in the field but have not been surveyed. The location of the bulk samples is shown in

Figure 9 complete breakdown of bulk samples by year is provided in Table 13.

During the 2006 exploration program a bulk sample was collected consisting of a total of 30 tonnes of material from phlogopite ore in the central area of the showing. This sample underwent field, lab and optical based sorting to evaluate distribution of grade and size distribution of corundum.

During the exploration program in 2007, a total of four bulk samples were collected and numbered sequentially, B1, B2, B3, and S (soil). Sample B1 weighed 25.5 t and was cut using diamond-chainsaws from in-situ bedrock across a significant ruby and pink sapphire-bearing interval at Aappaluttoq. The sample was collected to confirm grade and distribution data from the 2006 sampling.

Sample B2 was collected to provide an analysis of gemmological criteria that would occur under typical mining conditions. It weighed approximately 27.9 t and was collected using focused blasting from an area of bedrock with exposed ruby and pink sapphire. The sample was taken directly along strike from the B1 sample, thus the grade and gemmological characteristics should be comparable – any significant fracturing in B2 could thus be attributed to the extraction method.

Sample B3, was a large 741.2 kg corundum bearing boulder. It was shipped to SGS Lakefield for storage for future processing; however, since this was a surficial boulder it forms no part of the resource estimate, nor any corundum grading scheme.

The fourth sample (S) was collected from overlying weathered bedrock and weighed 25.9 t. The sample was collected from the area directly above ruby-bearing bedrock units within the folded and altered ultramafic rocks. The area measured 5 meters by 20 meters and had to be removed to allow the extraction of B1 and B2. This overburden was not intended for surface grade calculations; instead it allowed easy residual corundum recovery from soils.

In 2008, two bulk samples were collected at the Aappaluttoq site. The first was a 125 t sample collected from bedrock. The material was removed in blocks 20-40 cm or larger, along a strike length of nearly 15 m and a depth of up to 2 m. The bedrock samples were loaded into 1 t supersacks and were corralled via helicopter at the flat area next to the outer port. It is at this location that they were left for the winter of 2008 and some were plundered by locals. TNG returned to the site in 2009 with government representatives and put the samples back under company control. They were shipped from site to Qeqertarsuatsiaat and placed in sealed sea cans. The sea cans were delivered to Nuuk and then shipped to SGS Lakefield via Montreal, where a TNG representative was present to ensure the shipment arrived sealed and chain-of-custody was unbroken.

A second sample weighing between 30 and 40 t was collected from regolith overlying mineralization during the process of excavating for the 2008 bedrock sample. This material was shipped in a similar manner, and arrived at SGS for preliminary sorting in order to determine the potential for corundum to occur in the eroded material. The material was washed, screened, and examined, with no significant mineralization identified.

The results of the bulk sampling results are provided in Section 13.0.

Table 13: Bulk Sample Compilation – Initial Weights (Modified From Weston, 2009)

Sample	Initial Weight
	kg
2006 Aappaluttoq Bulk Sample	30,000
2007 Aappaluttoq Overburden	25,860.9
2007 Aappaluttoq Bulk Sample B1	25,455.8
B1 QC Sample	
2007 Aappaluttoq Bulk Sample B2	27,856.0

B2 QC Sample	
2007 Aappaluttoq Bulk Sample B3	741.2
2008 Aappaluttoq Bulk Sample	125,000
2008 Aappaluttoq Overburden Sample	30,000 – 40,000

9.2 Mapping

In 2006 initial mapping of the Aappaluttoq was completed by Megan Ritchie, as part of a Master's thesis at the University of Cambridge in England.

In 2009, detailed re-mapping was conducted by Ian Groves, TNG's Senior Exploration Geologist, over a three day period at 1:500 scale using ortho-rectified aerial photos (WGS84 Zone 22N) as a basemap. Rock-type classifications were based on those defined in Windley (Windley 1971) using standard USGS classifications for gabbroic intrusive rock suites. Locational data was collected using a Garmin 60CSx map GPS. Structural data was collected manually and converted to UTM WGS 84 zone 22N to match the regional datasets. The geological mapping was digitized using MapInfo. A declination of 28° to the west was used to correct the structural measurements.

9.3 Geotechnical Work

Geotechnical logging, including core recoveries, RQD, fracture density and rock strength was completed during re-logging of 2007 and 2008 drill core in 2009. Sections of core were missing due to whole-core assay sampling, so complete logging of the drill-holes was not possible. In addition structural geology data noting faults and jointing in core was collected by geologists in 2007 prior to sampling and is recorded in their core logs.

10.0 DRILLING

Diamond drilling was completed at Aappaluttoq in 2007 and 2008. Prior to this no drilling had taken place at the site. Diamond drilling was completed using a small fly rig and associated support equipment. All holes have been drilled as NTW thin wall core. Drilling was carried out under the direction of Kluane Drilling based out of Whitehorse, YT. Down-hole drill surveys were not completed at the time of drilling, but results from a downhole logging exercise was completed in 2011. Collar locations were recorded using a handheld GPS unit in 2007-2008, and re-checked in 2009 using multiple GPS units over a period of days.

The drillhole orientations are variable; however they have typically been drilled perpendicular to the known geologic trend (across the layered sequence) and reaches beneath Lake Ukkaata Qaava. Typically, the drillholes were drilled from one collar location, with same azimuth and dips of -45°, -60° and -75° to provide a fan of data in cross section.

In 2007, 46 drill holes were completed at Aappaluttoq totalling 4,622.1 m. In 2008, 19 drill holes were drilled totalling 1,834.7 m (see Table 14).

Visible rubies and pink sapphires were identified in drill core. A total of 634 drill core samples from the 2007 and 2008 drilling were selected to be sent to the Saskatchewan Research Council (SRC) for gem assay.

Table 14: Collar Information For 2007-2008 Diamond Drilling (From Weston, 2009)

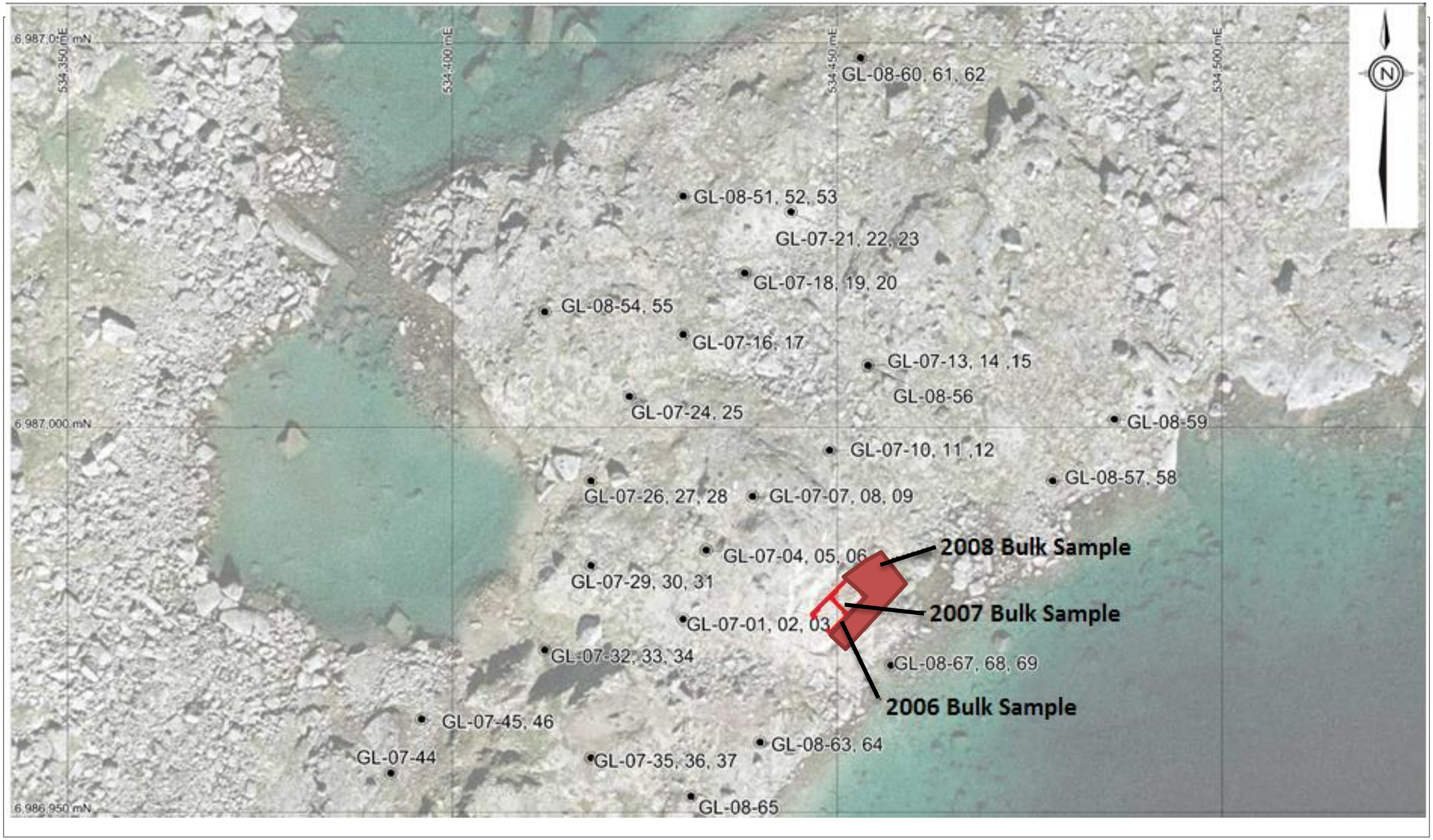
Hole ID	Easting	Northing	Elevation	Azimuth	Dip	Depth
	m	m	m	°	°	m
GL-07-01	534430	6986975	234	135	-45	50.3
GL-07-02	534430	6986975	234	135	-60	75.6

Table 14: Collar Information For 2007-2008 Diamond Drilling (From Weston, 2009)

Hole ID	Easting	Northing	Elevation	Azimuth	Dip	Depth
	m	m	m	°	°	m
GL-07-03	534430	6986975	234	135	-75	106.4
GL-07-04	534433	6986984	235	135	-45	53.5
GL-07-05	534433	6986984	235	135	-60	74.7
GL-07-06	534433	6986984	235	135	-72	140.2
GL-07-07	534439	6986991	237	135	-45	68.6
GL-07-08	534439	6986991	237	135	-60	88.4
GL-07-09	534439	6986991	237	135	-75	108.2
GL-07-10	534449	6986997	233	135	-45	58.5
GL-07-11	534449	6986997	233	135	-60	77.7
GL-07-12	534449	6986997	233	135	-75	101.4
GL-07-13	534454	6987008	233	135	-45	50.3
GL-07-14	534454	6987008	233	135	-60	56.3
GL-07-15	534454	6987008	233	135	-75	80.8
GL-07-16	534430	6987012	232	127	-60	108.2
GL-07-17	534430	6987012	232	127	-75	79.3
GL-07-18	534438	6987020	234	127	-60	187.5
GL-07-19	534438	6987020	234	127	-45	50.3
GL-07-20	534438	6987020	234	127	-75	230.7
GL-07-21	534444	6987028	234	127	-45	106.7
GL-07-22	534444	6987028	234	127	-60	108.3
GL-07-23	534444	6987028	234	127	-75	131.9
GL-07-24	534423	6987004	233	125	-60	111.3
GL-07-25	534423	6987004	233	125	-75	140.2
GL-07-26	534418	6986993	230	125	-60	214.9
GL-07-27	534418	6986993	230	125	-75	149.4
GL-07-28	534418	6986993	230	125	-45	50.3
GL-07-29	534418	6986982	231	135	-60	109.8
GL-07-30	534418	6986982	231	135	-75	128.0
GL-07-31	534418	6986982	231	135	-45	40.0
GL-07-32	534412	6986971	231	143	-60	122.0
GL-07-33	534412	6986971	231	143	-75	125.0
GL-07-34	534412	6986971	231	143	-45	25.9
GL-07-35	534418	6986957	239	143	-60	155.5
GL-07-36	534418	6986957	239	143	-45	105.2
GL-07-37	534418	6986957	239	143	-75	113.4
GL-07-38	534411	6986947	238	143	-60	97.5
GL-07-39	534411	6986947	238	143	-45	84.9
GL-07-40	534401	6986937	235	119	-45	50.3
GL-07-41	534401	6986937	235	119	-60	71.6
GL-07-42	534387	6986945	234	126	-60	97.5
GL-07-43	534387	6986945	234	126	-75	47.2

Table 14: Collar Information For 2007-2008 Diamond Drilling (From Weston, 2009)

Hole ID	Easting	Northing	Elevation	Azimuth	Dip	Depth
	m	m	m	°	°	m
GL-07-44	534392	6986955	234	129	-60	100.6
GL-07-45	534396	6986962	230	96	-60	125.0
GL-07-46	534396	6986962	230	96	-75	163.1
GL-08-51	534430	6987030	232	125	-60	50.3
GL-08-52	534430	6987030	232	0	-90	77.7
GL-08-53	534430	6987030	232	125	-75	53.4
GL-08-54	534412	6987015	233.9	125	-60	76.2
GL-08-55	534412	6987015	233.9	125	-75	108.2
GL-08-56	534454	6987008	233.9	125	-45	120.4
GL-08-57	534478	6986993	230	125	-45	62.5
GL-08-58	534478	6986993	230	125	-60	120.4
GL-08-59	534486	6987001	231.6	125	-60	100.6
GL-08-60	534453	6987048	230.8	125	-45	109.8
GL-08-61	534453	6987048	230.8	125	-60	19.8
GL-08-62	534453	6987048	230.8	125	-85	19.8
GL-08-63	534440	6986959	233.5	125	-70	161.6
GL-08-64	534440	6986959	233.5	125	-60	103.7
GL-08-65	534431	6986952	233.5	125	-80	176.8
GL-08-66	534428	6986938	232.1	125	-70	154
GL-08-67	534457	6986969	230	125	-60	102.1
GL-08-68	534457	6986969	230	125	-75	164.6
GL-08-69	534457	6986969	230	125	-45	52.8
Total						**6457.1**



LEGEND

0 m 50 m

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

True North Gems greenland

TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Aappaluttoq Project Drillhole & Bulk Sample Locations

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	
OFFICE	DATE			
EBA-VANC	February 13, 2015			

Figure 9

Logging of drill core was completed on site under the direction of TNG's qualified person during the 2007 and 2008 field program. However, mineralized core intervals during January and February 2008 were logged under the supervision of an independent QP. Diamond drill core was field-logged at the drill and detail logged at the Aappaluttoq base camp. Sampling of the drill core in 2007 and 2008 targeted intervals displaying visible corundum mineralization and intervals exhibiting alteration assemblages that are consistent with that seen in ruby and pink sapphire occurrences exposed in the surface trenches at Aappaluttoq. Table 15 presents a summary of significant mineralized intercepts from drill core. Significant intervals include areas of continuous and non-continuous sampling within the mineralized solid. In areas of non-continuous sampling within the mineralized zone a grade of zero has been applied to any intervals without assay values.

Table 15: Summary of Significant Mineralized Intercepts

Hole ID	From	To	Grade	Interval	True Thickness
	m	m	g/t (Corundum)	m	m
GL-07-07	9.25	10.8	4,463.3	1.55	1.096
GL-07-07	16.5	19.6	432.6	3.1	2.192
GL-07-12	9.3	11.3	1,397.1	2	1.932
GL-07-42	70.1	70.75	665.1	0.65	0.563
GL-08-51	29.9	31.9	786.0	2	1.732
GL-08-56	73.05	78.4	740.3	5.35	3.783
GL-08-58	54.2	60.2	1,704.6	6	5.196
including	34.5	36.5	1,063.3	2	1.732
GL-08-66	77.3	94.9	8,216.00	17.6	16.539
including	77.3	79.3	46,728.30	2	1.879
GL-08-66	12.8	16.2	5,433.3	3.4	3.195
including	13.6	15.2	11,000.6	1.6	1.504
GL-08-66	98.75	111.8	195.9	13.05	12.263
GL-08-67	46	48.5	2,048.8	2.5	2.165

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

Rock and till sample assays from Aappaluttoq have included bulk samples collected on site in 2006, 2007, and 2008, and samples selected from drill core during the 2007 and 2008 drill programs.

11.1 Sample Preparation and Methodology

11.1.1 Drill Core

Selective mineralized drill core samples were collected with a maximum length of 1 m, were assigned unique sample numbers, and were sealed in plastic sample bags. Sample bags were placed together in sealed drums for shipping to SGS Lakefield/ Saskatchewan Research Council (SRC) in Canada to undergo assay for determination of total contained corundum. Chain of custody procedures were put in place to prevent contamination or tampering with the samples, including tamperproof seals on the shipping drums and supervision when opening the drums upon arrival in Canada.

Whole core sampling procedures were utilized for ruby and pink sapphire assay within mineralized zones on the recommendation of the project QP. No representative sample was retained as a record; however, extensive and detailed core photographs were taken prior to shipment. Selective sampling from mineralized zones was undertaken and there is no continuous assay information throughout all core.

In 2008, samples were collected during drilling under the supervision of Greg Davison, P.Geo. Due to financial challenges, the program was shut down early and all drill samples remained in Greenland. Samples were securely stored in Qeqertarsuatsiaat in TNG's sea cans along with other camp supplies. In 2009, Iain Groves selected approximately 300 of the most relevant and applicable core samples from the 2008 program and sealed them in a small shipping container to be sent with the 2008 bulk sample bags from Greenland to SGS Lakefield.

There are currently a few hundred samples of low-priority core in storage in Qeqertarsuatsiaat. The priority core samples that were shipped were stored at SGS until 2010 when Andrew Fagan opened the sealed storage containers and cut the core samples, retaining ¼ of the core for QA/QC. Mr. Fagan sent the remaining ¾ sample in a sealed container to SRC for gemstone assay and processing. The ¼ core is currently at the Company's secure storage in Vancouver.

11.1.2 Bulk Sample

Ruby-bearing material was collected in contiguous blocks from measured geologic targets sampled normal to texture, foliation, stratigraphy, and structure. Bulk samples were collected by standard techniques and recovery procedures including cutting with chain saws, chisels, and blasting. Bulk sample sizes increased from 30 t in 2006, to 54 t (28 t rock, plus 26 t of regolith) in 2007, and 160 t (125 t of rock, ~35 t of regolith) in 2008.

The in-place bedrock sample (2007 B1) represents the main ruby and pink sapphire-bearing interval (phlogopite) at the Aappaluttoq occurrence, typically measuring 1-2 metres in width. The trench exposed by bedrock sampling is located from 1-2 metres down dip and up to 4 metres along strike in the area of the 2006 bulk sample.

The weathered sample of soil and broken rock (2007 Overburden) was collected from an area measuring 5 metres by 20 metres directly above several ruby-bearing intervals within the folded and altered ultramafic rocks at Aappaluttoq.

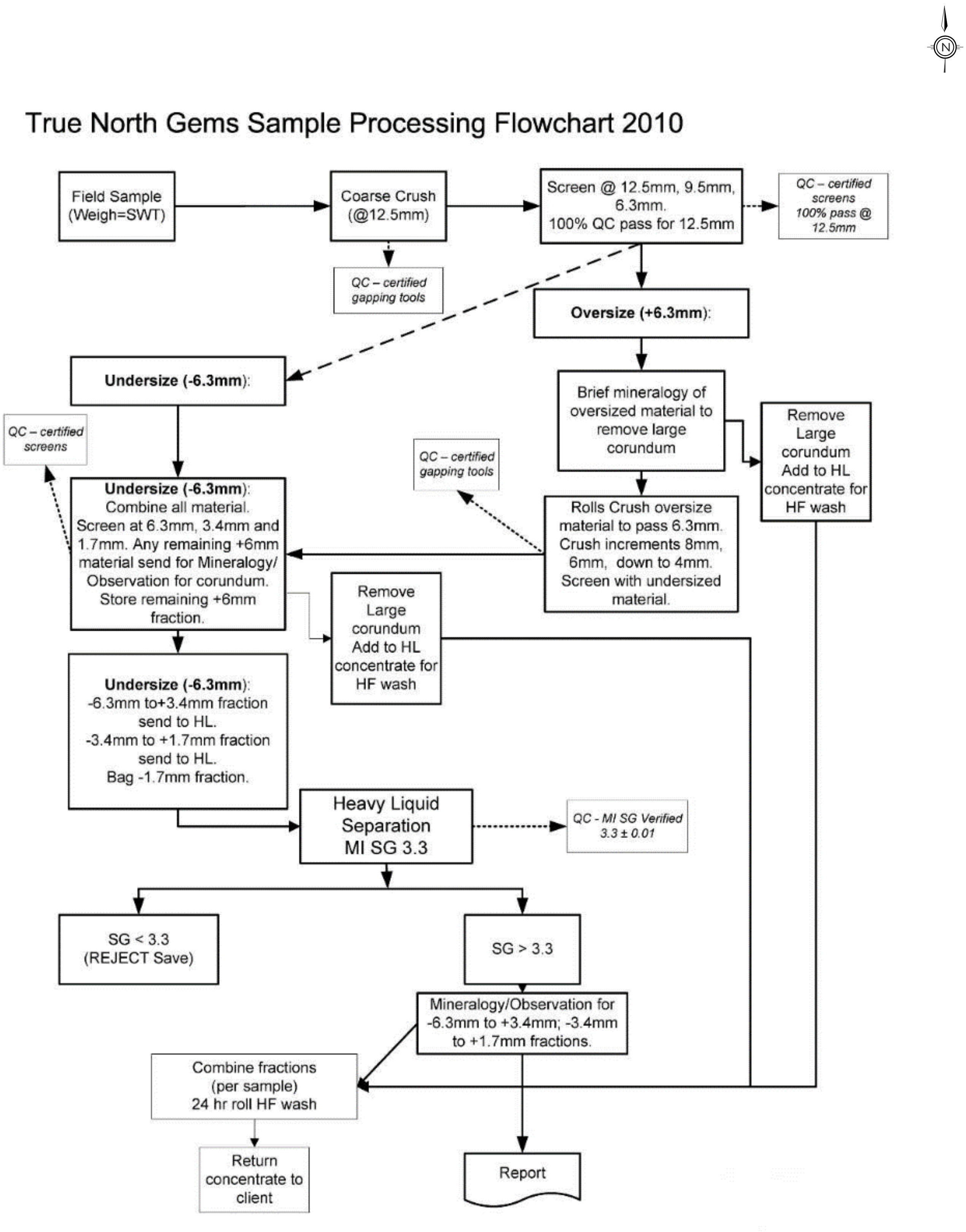
The third bulk sample (2007 B2), had a total weight of 27.8 tonnes and was collected from the bedrock exposure of the ruby and pink sapphire-bearing interval was collected from bedrock using focused, low intensity blasting with spaced charges of dynamite sticks to ensure grade and width control. The trench exposed by the 2006 and 2007 bulk sampling measures up to 3 metres in both depth and width, and up to 7 metres along strike; additional stripping has exposed the mineralized contact to 24 metres and along adjacent mineralized layers to 34 metres. Sample B1 from the 2007 program was processed at the Company's facilities in Qeqertarsuatsiaat. Low intensity blasting techniques does not appear to have resulted in a significant amount of stone breakage when compared with chain saw methods.

The 2008 bulk sample was processed at SGS through a pilot scale plant (160 tonnes) results from which informed the design of the processing facility for the mine site as discussed in section 17.

11.2 Sample Analysis

11.2.1 Drill Core

Diamond drill core from the 2007 and 2008 exploration programs was processed at the Saskatchewan Research Council (SRC) Laboratories in Saskatoon, SK. The SRC analysis and methodology of the samples from the diamond drill core is presented in the processing flowchart in Figure 10. The diamond drill core samples are run through the assay process in batches. Each batch consists of approximately 60 to 70 samples, and corresponds to one super sack per batch.



LEGEND

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

STATUS

CLIENT

true north gems greenland

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

True North Gems Sample Processing Flowchart 2010

TETRA TECH

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	
OFFICE	**DATE**			
EBA-VANC	February 13, 2015			

Figure 10

The 2007 samples were sent for whole-core processing, a technique widely used in the diamond exploration sector; while the 2008 core samples were cut by TNG's geologist and a ¼ core section retained as a QA/QC representative sample. The remaining ¾ core was processed the same as 2007.

As no standard procedures exist for assaying corundum from core, procedures were developed by Tetra Tech, TNG, and engineers from the Saskatchewan Research Council in Saskatoon, SK, an ISO 17025 certified analytical laboratory. This focussed on the recovery of a total corundum weight in grams; only crystals above 1.7 mm (nominally larger than the minimum size of rough gemstone that can be commercially polished) were included and efforts were made to minimise the weight of matrix rock in the final concentrated product. This assay value is referred to as Total Clean Corundum and forms the basis of the assay values for the resource evaluations.

The core samples were crushed in a jaw crusher set at 12.5 mm, products were then screened at 12.5 mm, 9.5 mm and 6.3 mm, and a quick visual analysis of the +6.3 mm material was completed. A lab QC check would ensure 100% of the 12.5 mm material passed through onto the lower screens. If any large corundum crystals were observed then they would be picked out of the material and placed back into the concentrate directly after heavy liquid separation (avoiding further crushing but allowing HF cleaning of the crystals).

The +6.3 mm material was then crushed using high pressure grinding roll (HPGR) at nominal increments of 8 mm, 6 mm and 4 mm and the products were recombined with the -6.3 mm undersize material from the primary jaw crusher. All material was then screened at 6.3 mm, 3.4 mm and 1.7 mm on a standard Tyler mesh. Any remaining +6.3 mm material was sent for visual analysis, mineralogy, documentation and subsequent storage. The -6.3 mm undersize was split into three size fractions: (-6.3 mm +3.4 mm) & (-3.4 mm +1.7 mm) were both sent for heavy liquid separation, the -1.7 mm undersize reject was bagged, weighed, documented and stored.

Heavy Liquid separation was completed in a methyl-iodide liquid set at a specific gravity of 3.3; the consistency of this fluid was constantly checked to ensure the fluid maintained its correct specific gravity throughout the test-work. All material <3.3 SG ''floats" and was collected, washed, weighed and stored. The >3.3 SG material "sinks" and was collected and washed to remove the MI liquid, recombined with any large corundum crystals saved as +6.3 mm material and made ready for crystal cleaning. Each size fraction was processed separately to ensure TNG could assess the effects of processing on all the gem material, and allow a direct comparison to the numerous bulk sample grades and distributions collected from the same mineralized locality. QA/QC for checking and maintaining the specific gravity of the heavy liquid in the heavy liquid separation process is done using a hydrometer.

All rough corundum was then cleaned using hydrofluoric acid (HF). This acid does not attack the ruby or pink sapphire but dissolves the silicate matrix left attached to the stones. Each sample was inserted into PVC bottles and HF acid added. Each bottle was rolled for 24 hrs, allowing the HF to dissolve most of the available silicate matrix. Some samples required up to three days in the HF bath. The bottles were then emptied, the HF drained and the corundum washed to remove residue. Each sample was weighed as a 'clean corundum' concentrate. Most of the matrix was removed by this process, but a minor amount remained. For the particularly dirty samples a second HF bath was used to assist in matrix removal. Once cleaned, a final 'clean' concentrate weight was recorded and the sample bagged for shipment and assessment. SRC would produce an assay certificate showing the collective weights of each processing step for each sample. The corundum bearing samples and certificates were then sent to TNG's lab in Vancouver for further gemmological analysis.

The samples were securely shipped in sealed buckets by tracked parcel service between Saskatoon and TNG's laboratory in Vancouver. Upon delivery, each sample was photographed to show the sample number and the 'clean' corundum assay weight written on the bag. A geologist performed a visual estimate on the bags, recording how much of the bag was clean corundum and how much was matrix or non-corundum (despite the HF baths). The senior TNG gemmologist then performed a QA/QC check on the recorded lab weights to ensure no mix-up had occurred, and then sieved the material on a 1.7 mm Tyler screen. Everything -1.7 mm was bagged and weighed, the remaining +1.7 mm material was split by colour (red or pink) and split again by quality (translucent or opaque). The weight of all fractions was recorded in the central secure assay database. The corundum bags themselves were documented and stored in TNG vault-room.

The following sample preparation and QA/QC procedures was implemented by TNG while working with the samples:

1. QA/QC is performed to confirm the bag number.
2. The sample is weighed and compared to the reported weight from the lab. The recorded sample weight is written on the bag.
3. A photo of the sample is taken inside a light box with a mm scale visible.
4. A visual estimate of the amount sample is recorded and entered into a spreadsheet.
5. Check the sieves with the 1.7 mm and 0.85 mm screens.
6. Sieve material through the 1.7 mm screen on white paper in a well-lit area.
7. Material is sorted based on color, from pink to red.
8. Material is sorted based on clarity, from translucent to opaque.
9. The sample set is weighed.
10. Sample is packaged in small sealed bags. The bag is labelled with weight, original sample number, color, quality.
11. Material is screened through 0.85-1.7 mm. The weight is recorded and sample is bagged.
12. Weights and sample information are entered into the master database.

Steps 1-4 described above were carried out by TNG's geological consultant Andrew Fagan, M.Sc. FGS. Steps 5-12 were carried out by geologist and gemmologist, John Mattinson, B.Sc. G.G., TNG's Senior Gemmologist.

This database was then transferred to Tetra Tech for internal QA/QC checks and to create a 'factored total corundum'. This figure is a statistical calculation based on the total corundum weight, the visual estimate of the remaining volume of matrix and takes into account the small amount of matrix material still attached to the corundum crystals (i.e. the clean corundum weight included minor matrix). This weight is the final assay weight for the total corundum in the sample and was used to calculate the total clean corundum grade in the geological resource model.

11.2.2 Bulk Sample

Bulk samples from the 2006 and 2007 exploration programs were processed at the Company's own gravity plant processing facility in Qeqertarsuatsiaat. The only two exception's from these programs was for sample B2 collected in 2007 and the 2008 bulk sample, both of which were processed at SGS Minerals Services in Lakefield, Ontario, Canada. Further details of the sample preparation and analysis of the bulk samples is presented in the report on field activities prepared by Weston (Weston 2009). The 2008 bulk sample was shipped to SGS Lakefield for processing in 2009, where it was stored until it underwent engineering testwork, flow sheet development and gemstone processing between fall 2009 and winter 2014.

11.3 Quality Control

Various levels of QA/QC checks were performed on the core samples in the field, in the assay laboratory and in TNG's gemstone lab. Slightly different procedures were utilized between the 2007 core and the 2008 core. Quality control procedures for the 2007 and 2008 sampling and results available to Tetra Tech include documentation of inter-laboratory checks and lab procedures.

In 2007 whole-core processing techniques were used to extract the corundum (as is standard in diamond and gemstone exploration and mineral processing). Field blanks were inserted every 25 samples – these comprised country rock (gneiss) from the base of the drill-holes, taken well away from the nearest mineralization. All but one of these samples passed the QA/QC (i.e. no corundum was recovered); the one fail (sample 144225) returned a value of 0.06 g corundum in the +1.7-3.4 mm size fraction. This sample could represent two things; either the gneiss contains very small amounts of corundum, or a single small corundum grain was caught up inside the crusher between samples. All samples were carefully weighed in and out, all size fractions recorded and industry standard hand-off procedures and chain of custody were followed at all times.

In 2010, TNG produced its own series of blanks, standards and spikes for insertion into the 2008 core material to ensure a more rigorous QA/QC protocol than was completed in 2007. In total 28 samples were prepared, half of these were blanks – comprised of chipped granite material, a felsic volcanic rock and sandstone pebbles. A 500 g batch of natural non-gem quality corundum was acquired by TNG from Indian sources. These crystals were broken up using a hammer so all of the relevant size fractions were included. 14 spikes were produced, each with a specific weight of corundum; these bags were labelled and photographed. Each spike was added to a sample bag alongside a blank sample, thus creating 14 spiked standards, each containing a known weight of corundum.

Upon processing, all but 2 of these samples passed QA/QC checks. These two samples were blanks that returned 0.02 g and 0.04 g of corundum respectively. Like the 2007 QA/QC sample, TNG believe the 2008 failures were single crystals of corundum that were entrained in the crusher and were transferred between samples. These were noticed early and the lab was instructed to ensure all of the crusher and jig was cleaned between samples. No further cross-contamination was noted. All of the standards returned corundum weights within 95% of the original spike weight. The slight weight loss was expected and concentrated in the -1.7 mm fraction. All samples were carefully weighed in and out, all size fractions recorded and industry standard hand-off procedures and chain of custody was followed at all times.

Upon receipt of the results from the 2007 program samples it was determined that the sample preparation and processing steps taken by SRC Laboratories were inadequate to clean the corundum completely. QA/QC of the sample database and of the sample concentrates returned to TNG revealed that select samples contained a significant amount of matrix material surrounding the gem material. The recorded weights were determined to include both corundum gem material as well as matrix material. TNG's geologists reviewed all material from 2007 in the +1.7 mm size fraction and identified any samples containing greater than 10% matrix. A total of 33 sample subsets were identified and sent back to SRC for a second round of HF washing. SRC was advised to run future HF washes for as long as was necessary to remove the matrix, generally 24-48 hours.

Quality control samples were collected for both of the bulk samples B1 and B2 samples to test the efficiency of processing. According to (Weston 2009), both of the QC samples for the B1 and B2 bulk samples were collected from tailings material and processed.

Tetra Tech is satisfied that there is minimal risk of contamination and that sample handling was carried out in a sufficient and professional manner by TNG and the laboratories involved in the sample analysis.

11.4 Security

Export permits are required for all gemstone and rock sample material leaving Greenland. All export permits are up to date and have been submitted by TNG's staff and approved by MLSA (formerly BMP). MLSA performs spot check audits on samples leaving Greenland that details tracking, processing and inventory from collection to production of jewellery.

All samples are numbered, tagged and packaged at the Aappaluttoq base camp. Oversight of all sample preparation and storage is audited by MLSA.

Material was shipped in sealed containers with documented chain of custody for all routes of travel. Shipping was completed using secure shipping companies. All chain of custody processes were monitored by William Rohtert, TNG's Qualified Person for the 2006 field program, and J. Gregory Davison, TNG's Qualified Person for the 2007 and 2008 field program, by Bonnie Weston from 2008 to 2011, and Andrew Fagan from 2011 to current.

All products leaving the Vancouver office are listed in transmittal letters and tracked from source to third party facility and on return to source. Every effort is maintained to provide full material balances for each product.

Security procedures passed independent audit in consultation with security experts active in the gemstone industry (Rohtert 2006), and were reviewed and strengthened by ISS-Securitas in 2014.

Following the collection and on-site storage of the 2008 bulk sample there is evidence that some of the storage sacs were sifted through and material removed; compromising the sample and potentially resulting in grades lower than actual. The sample was shipped to SGS in Canada for metallurgical testing and on to SRC for final gem processing in 2014. The 2008 bulk sample is not utilized in the resource estimate for the property; however it is used a reference for size distribution and gem colour characterization in the deposit.

Tetra Tech believes that sampling conducted by TNG was carried out in accordance with NI 43-101 standards and that the samples tested are representative of the material that will be processed from the Aappaluttoq prospect.

12.0 DATA VERIFICATION

Data was provided by TNG in the form of MS Excel spreadsheets and reviewed by Tetra Tech prior to use. Lara Reggin and Mark Horan of Tetra Tech conducted site visits in November 2010 and October 2014 respectively, during which time they reviewed sampling and storage procedures. There were no mineralized sections of core retained on site, as it had all previously been sent for assay, or was in storage in Vancouver (1/4 core). In addition a general site tour with TNG's geologists was carried out including a review of significant surface showings on the property and a review of the mineralization and structural controls within the deposit. Representative core samples stored at TNG's Vancouver office were inspected by Tetra Tech, and core logs were reviewed and compared to assay results.

Lara Reggin completed a review and tour of the SRC Assay facility in Saskatoon in February 2011 to review assay procedures and reporting procedures. In addition sample handling and records keeping procedures at TNG office in Vancouver was reviewed in detail with Company consulting geologist Andrew Fagan, and gemmologist John Mattinson.

In addition to assay certificate verification, Tetra Tech verified the database for standard errors including:

1. Check for duplicate collars;
2. Check for twin holes;

3. Check for overlapping assay intervals;
4. Check for zero-length assay intervals;
5. Check for assay spikes; and
6. Check locations for bulk samples.

During the data verification it was noted that down-hole survey data was not available for all drill-holes, and drill-hole collars and bulk sample locations were collected with handheld GPS.

Initially the SRC lab had reported assay data as a blank or a "-" where there was no corundum recovered from the sample, this was clarified with the lab and the database was modified to reflect a zero (0.00 g) value.

Tetra Tech is comfortable with the data provided on this project, and did not find any significant issues.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Past Testwork Summary

There have been varied metallurgical and gemmological test programs completed on the Aappaluttoq project in the past several years. Of these, the field pilot plant work conducted in 2007 by TNG shows that extraction of gem quality corundum material from Aappaluttoq is technically feasible. The following is a list of past work that has been done on extraction of corundum and further cutting/polishing testwork:

- An investigation into optical sorter trials on pre-concentrated crushed samples of ruby ore (SGS, editors 2005a).
- An investigation into bulk sample trials on five individual pre-concentrated samples of ruby ore (SGS, editors 2005b).
- Recovery of rubies from five samples from the Fiskenæsset project (SGS, editors 2006a).
- Plant operations summary report (Gilroy 2007).
- Optical sorting of DMS concentrates for ruby recovery (SGS, editors 2008).
- National Instrument 43-101 Report of Activities for the Fiskenæsset Ruby Project, West Greenland. (Davison 2008).
- Recovery of rubies from the Fiskenæsset Ruby Project (SGS, editors 2009).
- NI 43-101 Report On Field Activities For The Fiskenæsset Ruby Project, Greenland (Weston 2009).
- True North Gems Development Ideas Greenland Project (Gilroy 2009).

All of the testwork reports have been reviewed by the author, and the author is satisfied that the reports are complete and accurately represent the scope and results from the Fiskenæsset samples. Additionally, the author has no reason to believe that any of the testing activities will not withstand scrutiny.

13.2 Aappaluttoq 2006 Bulk Sample

Details of processing of the 2006 Aappaluttoq bulk sample have been disclosed in previously published reports (Davison 2008) (Weston, 2008 Report on Field Activities for the Fiskenaesset Ruby Project, Greenland 2008). They are summarised here for completeness. Testwork from the 2006 sample has been used for key parameters to estimate the Mineral Reserve including gem colour distribution, valuations and process plant design criteria.

13.2.1 Rough Dirty Concentrate Extraction and Sorting of 2006 Bulk Sample

The 30 t 2006 Aappaluttoq bulk sample was processed in the village of Qeqertarsuatsiaat using a conventional gravity wash plant producing a dirty jig concentrate of 717 kg and 455 kg of rock and mineral specimens respectively. Of the jig concentrate, 186 kg was further hand cobbed and sorted to produce a secondary concentrate of 61 kg.

A total of 592 kg of material was exported to Vancouver and Germany for further sorting and processing.

27.5 kg of material was removed by hand picking during field operations and sent to Vancouver. The rest was sorted by hand in the lab or during optical sorting tests in Germany. This resulted in a total dirty corundum weight of 191 kg).

At the time optical sorting tests proved inconclusive , however, further evaluation utilizing material from the 2008 bulk sample has proved that optical sorting works well and it has been featured in the current mineral processing flow sheet.

Figure 11 shows the mass balance of the 2006 bulk sample dirty rough concentrate production.

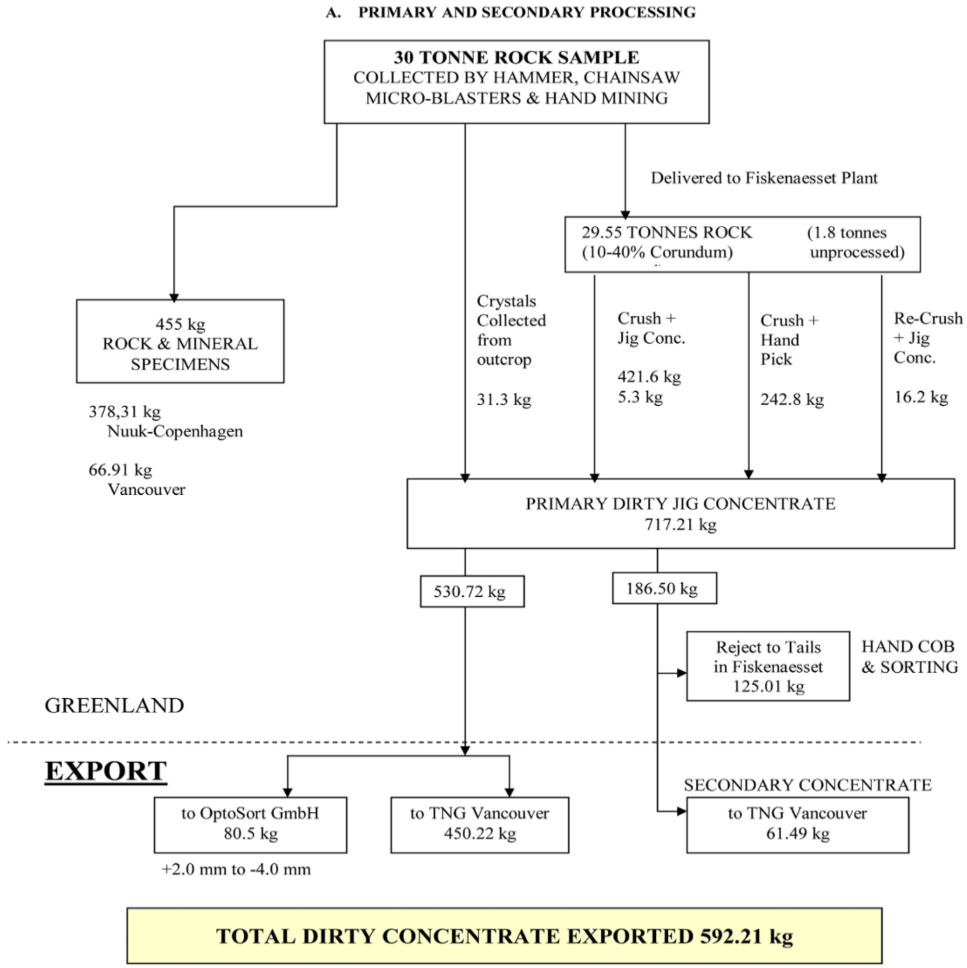


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Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

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Figure 11

Material was first sorted into three size fractions, +1.7 mm, +4.0 mm, and +6.0 mm. It was then sorted by quality into high-quality gem, gem, and near-gem. The high-quality gem and gem components were then separated into red and pink varieties (this colour split was not performed on near-gem material). These sorts resulted in 15 different categories of material.

The laboratory and optical sorting of the 2006 Aappaluttoq final dirty concentrate resulted in the generation of approximately 135 kilograms of gem and near gem rough ruby and pink sapphire. This material was not cleaned or processed in any way beyond initial crushing and jigging in the field (Table 16).

Table 16: Crushing and Jigging Field Data – 2006 Bulk Sample

Sort Method	**Size Fraction**				**Weight**
Colour	**mixed**	**+1.7 mm**	**+3.4 mm**	**+6.1 mm**	**Grand Total**
	g	**g**	**g**	**g**	**g**
Field Sort (total)	**27,516.55**				**27,516.55**
Gem (High-Quality)					
Red	222.20				222.2
Pink	627.01				627.01
Lilac	46.76				46.76
Total	895.97				895.97
Gem	10,351.19				10,351.19
Red	3,049.31				3,049.31
Pink	6,661.62				6,661.62
Lilac	640.26				640.26
Total	10,351.19				10,351.19
Near-Gem	14,407.12				14,407.12
Specials	236.71				236.71
Dentes	575.69				575.69
Carving	1049.87				1049.87
Lab Sort (total)		**11,555.47**	**82,531.58**	**43,791.79**	**137,878.84**
Gem (High-Quality)					
Red		345.66	761.97	93.32	1,200.95
Pink		798.71	1,610.54	792.84	3,202.09
Lilac		41.79	118.65	179.13	339.57
Total		1,186.16	2,491.16	1,065.29	4,742.61
Gem					
Red		825.72	5,587.78	3,572.31	9,985.81
Pink		1,747.63	15,285.62	5,085.06	22,118.31
Lilac		50.13	467.02	571.08	1,088.23
Total		2,623.48	21,340.42	9,228.45	33,192.35
Near-Gem					
Tumbled		0	0	3,684.88	3,684.88
Rough		4,665.98	28500.00	16,004.61	49,170.59
Total		4,665.98	28500.00	19,689.49	52,855.47
Non-Gem					
Tumbled		0	0	1,408.56	1,408.56

Table 16: Crushing and Jigging Field Data – 2006 Bulk Sample

Sort Method	Size Fraction				Weight
Colour	**mixed**	**+1.7 mm**	**+3.4 mm**	**+6.1 mm**	**Grand Total**
	g	**g**	**g**	**g**	**g**
Rough		3,079.85	30200.00	12400.00	45,679.85
Total		3,079.85	30200.00	13,808.56	47,088.41
Optic Sort (total)		**25,634.13**			**25,634.13**
Gem (High-Quality)					
Red		700.05			700.05
Pink		1,219.62			1,219.62
Lilac		990.24			990.24
Total		2,909.91			2,909.91
Gem					
Red		263.13			263.13
Pink		2,299.88			2,299.88
Lilac		2,640.12			2,640.12
Total		5,203.13			5,203.13
Near-Gem		8,571.09			8,571.09
Non-Gem		8950			8950
Gem (High-Quality)	4,096.07	2,491.16	1,065.29	895.97	8,548.49
Gem	7,826.61	21,340.42	9,228.45	11,163.59	49,559.07
Near-Gem	13,237.07	28,500.00	19,689.49	15,456.99	76,883.55
Non-Gem	12,029.85	30,200.00	13,808.56	0	56,038.41
Grand Total	**27,516.55**	**37,189.6**	**82,531.58**	**43,791.79**	**191,029.52**

Corundum recovered from the 2006 bulk sample was inspected and classified by a certified gemmologist. Field sorting did not distinguish sizes of material, but rather classified the material by colour and quality. Three colour classes were identified and included red, pink and lilac. The quality was classified as High Quality Gem, Gem, Near Gem, Specials, Dente and carving. The material sorted by lab included size distribution of corundum, as well as colour and quality. Colour and quality descriptions were consistent across the field and lab sorted materials, with lab sorted materials also providing category of non-gem materials.

Material sent for optic sorting was limited to the smaller size fraction which is difficult to sort by hand. These materials were classified by colour and quality similar to the lab sorted materials. Corundum produced from all three sorting methods in 2006 was inspected and sorted by the same gemmological team.

13.2.2 Summary of mineral processing recoveries and yields

Based on the bulk samples to date, recovery of +1.7 mm fraction of 95% is deemed reasonable for use for economic forecasting. It is further estimated that the process concentrate would contain roughly 80% corundum, thus the process is estimated to have yields of corundum concentrate from 0.01% through to 0.2% averaging around 0.04%. Dirty corundum concentrate will be shipped to Nuuk for further processing with saleable gems yielding in accordance with gem evaluation discussed below.

13.2.3 Gemstone valuations

13.2.3.1 Rough Gemstone Splitting and Cleaning of 2006 Bulk Sample

Due to the abundance of gem and near-gem material collected as part of the 2006 sample, it was decided to generate statistically representative splits using a Jones splitter which could be used for cutting and valuation experiments. This would create smaller, more manageable parcels but because they are representative splits, the data generated from them could be applied to the entire sample.

The gem and near-gem material was split into 8 equal parts, the first two were kept separate as individual samples and the remaining 6 were recombined. The first 1/8th split contained 16,188 g of material and the second 1/8th split contained 16,387 g. The remaining six splits were recombined into the 6/8th working split.

All of the 1/8th splits of rough material were considered 'dirty' due to the presence of matrix still attached to many of the crystals. Material within each +4.0 mm and +6.0 mm bag was further sorted into rough material that was either naturally clean or dirty rough material that needed further cleaning. The material needing further cleaning was sent to Saskatchewan Research Council (SRC) for HF cleaning and when returned was tumbled in TNG's lab using vibratory tumblers to remove the white Calcium Fluoride (CaF) residue coating some of the stones. All +1.7 mm material was sent to SRC for HF cleaning and was tumbled upon return. No additional work was done to try and clean the dirty material, so it was shipped out for cutting 'as is'.

Final total weight of the first 1/8th split was 11,184.26 g resulting in the total loss from HF cleaning of approximately 31%.

Material from the second 1/8th split which weighed 16,265 g was sent to SRC for HF cleaning and subsequently tumbled upon return with the final weight at 10,572 g. The loss from cleaning the matrix off the crystals was approximately 35%.

Figure 12 shows the mass balance of the 2006 bulk sample gem and rough gem production.

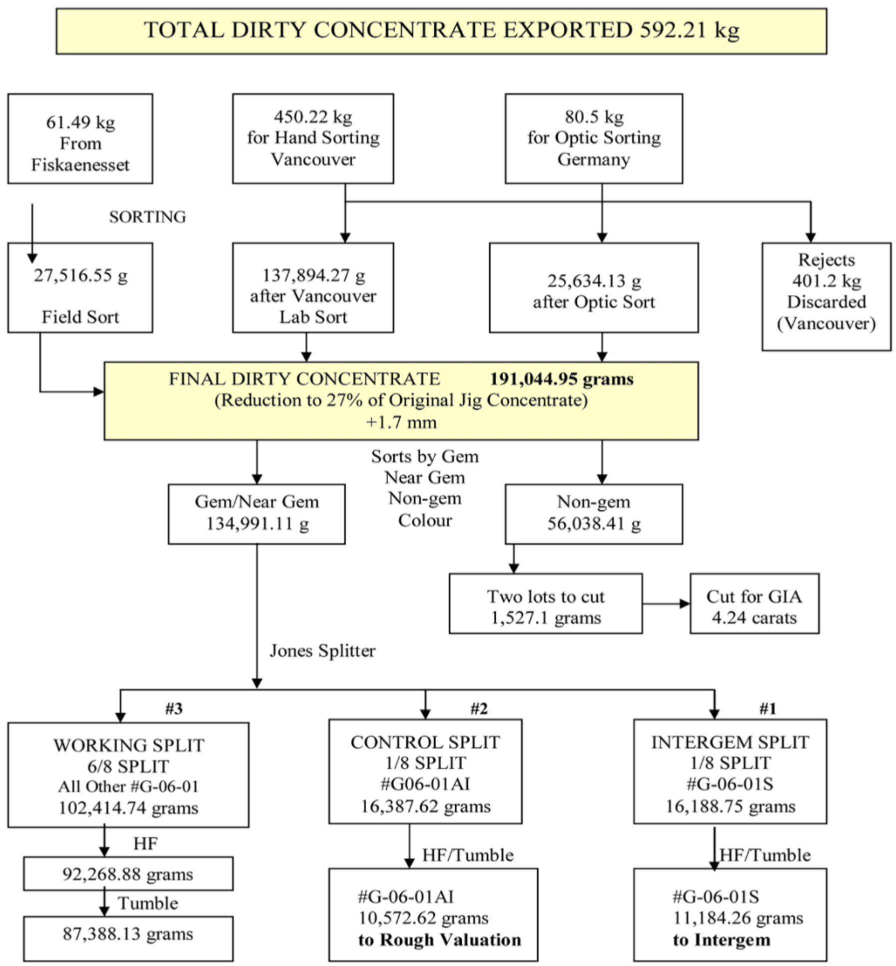

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Figure 12

13.2.4 Cutting and Valuations of 2006 Bulk Sample

13.2.4.1 First 1/8th Split of 2006 Bulk Sample

In order to provide an assessment of the value and potential use of the Aappaluttoq ruby and pink sapphire material, manufacturing testwork was conducted on the first 1/8th split which was polished and valued as a finished parcel. In order to ensure chain of custody, and address issues of security, sample tracking and logistics, restrictions were placed on the methodology of the manufacturing experiment such that all of the material was to be processed through a single cutting factory with the capability to cut the volume of material in a reasonable amount of time.

Intergem Exports, a cutting facility in Sri Lanka, was identified as the supplier of polishing services for the parcel. The material was shipped to Intergem Exports on April 16, 2007. Return shipments were received in increments on June 20, July 6, July 24, August 17, and October 1, 2007.

Yield was calculated by dividing the final finished carat weight of each lot by the initial shipping weight. The overall yield for the entire shipment is 9.3%. This is comprised of 0.8% yield for faceted stones and 8.5% yield for cabochons.

No pre-forming or physical trimming of the marketable ruby and pink sapphire concentrate was completed after cleaning. The parcel of marketable clean rough represents a natural product. Like all other gem samples that TNG has extracted, no value added processes or treatments such as heat treatment or flux filling were applied to this first 1/8th split, and therefore, it is representative of a clean marketable product that would be expected from any potential mining operation at the Aappaluttoq prospect.

The faceted and cabochon gemstones from the first 1/8th split of the 2006 sample were submitted for valuation with Mr. John Mattinson, B.Sc., G.G. Mr. Mattinson has been involved in the gemstone and jewellery business since 1984. Mr. Mattinson was considered an independent person at the time, although has subsequently become TNG's Senior Gemmologist.

The value attributed to 9,327 faceted rubies and pink sapphires weighing 471.83 carats is USD 26,188 (average US 56/carat). The value attributed to 15,970 ruby and pink sapphire cabochons weighing 4,752.27 carats is USD 97,079 (average USD 20/carat). The combined total is USD 123,266 for the entire 5,224.10 carat sample (Mattinson 2007).

For verification purposes, two sample lots, #3 and #17, from the 2006 sample were sent to two other independent facilities for valuation. The purpose of this exercise was to compare the results of all three valuations for consistency. All values reported are US wholesale.

Mr. Duncan Parker, FGA, FCGmA, of the Harold Weinstein Ltd. Gemmological Laboratory performed the first valuation audit.

Mr. Stuart Robertson, G.G., is Research Director for Gemworld International, Inc. Gemworld International is a research and consulting firm that monitors relevant developments regarding the worldwide diamond and coloured gemstone trade. Mr. Robertson performed the second 2007 valuation audit.

Table 17 below shows a summary of the audits performed. Results from Parker show an increase in value, from those reported by Mattinson. Results from Robertson show similar values to those reported by Mattinson for faceted stones but slightly higher values for cabochons.

Table 17: Summary of Valuation Audit of Faceted and Cabochon Gemstones

Valuer:		John Mattinson			Duncan Parker		Stuart Robertson	
Lot #	Material	Parcel Weight	Parcel Value	Value	Parcel Value	Value	Parcel Value	Value
		ct	$	$/ct	$	$/ct	$	$/ct
Lot 3	Faceted Ruby	3.37	201	59	404	120	487	55
	Faceted Pink Sapphire	4.53	112	25	407	90	141	31
	Cabochon Ruby	341.95	6,949	20	20,517	60	8,438	25
	Cabochon Pink Sapphire	168.35	1,684	10	8,417	50	2,716	16
Lot 17	Faceted Ruby	2.48	153	62	496	200	146	59
	Faceted Pink Sapphire	0.44	36	82	88	200	19	44
	Cabochon Ruby	84.47	1,689	20	5,068	60	1,520	18
	Cabochon Pink Sapphire	3.98	60	15	159	40	100	25
Total		609.57	$10,884	$18	$35,556	$58	$13,567	$22

13.2.4.2 Second 1/8th Split of 2006 Bulk Sample

The second 1/8th split was shipped to TNG's Bangkok office in December 2007 where it was re-sorted into lots consistent with typical rough valuation procedure and protocol. Material was kept in the same size (+1.7 mm, +4.0 mm, and +6.0 mm) and clarity (transparent and translucent) classes as it was sent, but it was further sorted by local gemstone graders into different colours (red, red/pink, and pink) and reject (due to poor colour, broken or uncuttable stones) categories.

This re-sorted material was then made available for "rough" valuation purposes.

The second 1/8th split was submitted for rough gemstone valuation in January 2007. After resorting in Bangkok, 8.1 kg of material was considered amenable to cutting and polishing and only that material was valued. The material was independently valued by Mr. Anura Wijemanne of Anura Wijemanne Associates of Sri Lanka. Mr. Wijemanne is a well-regarded coloured stone trader that specializes in the sale and purchase, as well as cutting and polishing of rough coloured gem material, especially ruby. The balance of sample, 2.5 kg, was discarded as waste material.

The final valuation for the 8.1 kg of clean rough corundum from the second 1/8th split was USD 4,167. This averages USD 517/kg for ruby and pink sapphire rough, ranging from USD 175/kg for low quality rough to USD 2,875/kg for higher quality rough. (Weston, 2008 Report on Field Activities for the Fiskenaesset Ruby Project, Greenland 2008).

13.3 2007 Aappaluttoq Bulk Sample

The 2007 bulk sampling program at Aappaluttoq was designed to confirm the grade and distribution results from the processed 2006 bulk sample. Processing took place using a new plant re-designed to increase capacity of the existing test plant, permitting enhanced processing in terms of time, process optimization and sample handling protocols. The wash-plant was completely redesigned with new electrical (generator power source), new primary and secondary crusher, jigs, rebuilt screens and tertiary crushers. All of the equipment other than the large primary crusher was housed in sea containers and fully wired for electrical hook-ups for equipment and lighting. Portable security cameras were located at three points of oversight at the plant area.

The field processing plant was comprised of a large capacity jaw crusher for two stage reduction to nominal -30 cm (-12 inch) feed, hand cobbing of the oversize material for large rubies and pink sapphires, jaw and roll for secondary and tertiary crushing, two double-deck washing and sizing screens, and two Denver duplex mineral jigs which concentrate the ruby and pink sapphire by gravity separation. Primary drying, screening and sorting of selected concentrates was carried out in secure facilities in Fiskenæsset.

The 2007 bulk sample was processed and sorted by colour and quality by a series of gemmologists hired by TNG to complete the assessment of corundum materials. Colour was reported as either red or pink, and quality was defined as Gem, Near Gem and Non-Gem.

For full details of the 2007 bulk sample results refer to Weston, 2009 appendix 1 to 4.

13.4 2008 Bulk Sample

The 2008 bulk sample was shipped from a storage location on-site (near the current outer port locality) to SGS Lakefield in 2009. It was utilized in full to complete a more accurate flow sheet and process engineering circuit. Testwork was actively underway upon release of the last PFS in 2011, and concluded with the shipment of dirty concentrates to the SRC laboratory in Saskatoon, Saskatchewan where final cleaning and processing was undertaken in the fall of 2014. The resulting processed corundum was shipped to TNG in Vancouver in 5 separate shipments, based on process capacity. The resulting materials were then hand sorted under the supervision of TNG Gemmologist, John Mattinson. Materials were classified based on size, colour and quality. The more detailed size fractions are primarily to assist with the valuation of materials, however these are twice as many size fractions as previously examined in bulk samples. Thus for the purposes of comparison between samples, the sizes were recombined into 4 overall size classes used in the original the 2006 bulk sample (Table 18). Colour is classified into 5 colour classes, and quality is divided in two classes, gem/near gem and opaque (non-gem).

Table 18: Results of 2008 Bulk Sample

Size Distribution	grams						
Colour	**Total**	**Red**	**Dark Pink**	**Med Pink**	**Light**	**Mauve**	**Opaque**
+1.7 - 3.3mm	**31146.10**	3723.00	1055.9	2456.7	3938.1	522.9	19449.5
+3.3 - 6.3mm	**22219.04**	1438.5	730.2	671.6	2565.4	612.24	16201.1
+6.3 - 9.6mm	**6618.3**	72.4	102.6	45.5	412.7	907.6	5077.5
+9.6mm	**1002.45**	19.85	0	0	59.8	13.5	909.3
total	**60985.89**	9%	3%	5%	11%	3%	68%

13.5 Classification of Corundum Materials

Classification of corundum materials in the deposit are based upon data obtained from the bulk samples and assay data derived from drill-core. There are essentially three categories of classification which has been reviewed for the project including colour, gem quality and size distribution of corundum crystals.

It is noted that through the development of this project, from the core samples, to the bulk samples which have been processed and evaluated over a period of 9 years from 2006 until 2015, the classification and understanding of the quality and colour variations of the corundum has altered as the deposit characteristics have become better understood. As such the classifications of colour, quality and size fractions have evolved to include more colour classes, and this has assisted with valuation of the product for this report. It is also noted that the distinction between some of the colour and quality classes may be somewhat subjective, and variability will occur within classes of quality. Table 19 makes a correlation between core and bulk sample classifications of colour and quality of materials to allow comparison between the various sample sets.

Table 19: Comparison of sample sets from Bulk Sample and Core Data 2006 through 2008

Sample Set	Colour					Quality				Size
2006 Bulk Sample-Field	Red	Pink			Lilac	High Gem	Gem	Near Gem		No
2006 Bulk Sample-Lab	Red	Pink			Lilac	High Gem	Gem	Near Gem	Non-Gem	Yes
2006 Bulk Sample-Optic	Red	Pink			Lilac	High Gem	Gem	Near Gem	Non-Gem	Yes
2007 Bulk Sample	Red	Pink				Gem		Near Gem	Non-Gem	No
2008 Bulk Sample	Red	Dark Pink	Medium Pink	Light Pink	Mauve	Gem			Opaque	Yes
Core 2007-2008	Red	Pink				Translucent			Opaque	No

13.5.1 Size Fraction

For evaluation of size distribution of corundum within the deposit host-rocks, the most complete and reliable data is available from the 2008 bulk sample (Table 20). Although the 2006 bulk sample completed size fraction analysis for the lab portion of the analysis, the sample was divided and the field portion of the sample does not contain size fraction data and therefore the lab and optic sorting portions of the bulk sample may be bias with respect to sizes.

The 2007 bulk sample does not contain size fraction data, and while the core sample data does contain analysis of size, the process of drilling will cut, fracture or break any corundum along the surface of the core and skew the actual results. The core was also crushed during the processing and corundum assay procedures in 2007 and 2009.

Table 20: Distribution of Size Fraction in 2008 Bulk Sample

Size Distribution	grams	
+1.7 - 3.3mm	**31146.10**	**51%**
+3.3 - 6.3mm	**22219.04**	**36%**
+6.3 - 9.6mm	**6618.3**	**11%**
+9.6mm	**1002.45**	**2%**
Total	**60985.89**	

13.5.2 Colour Classification

Overall colour distribution of the corundum has been evaluated in core as well as in the bulk samples. The primary colour distinction that is relevant to the economics of the project is the red colour in gem quality materials classifies it as a ruby. All other colour variations within gem quality materials are classified as sapphires. All bulk samples and core have recorded colour variations within the corundum materials, and have further distinguished if the materials are gem or non-gem quality. Samples from the core provide the greatest spatial distribution of data in the deposit as they penetrate host-zones at depth and across various host lithologies; as such Tetra Tech consider these the most representative analogue of colour distribution within the deposit as a whole.

The assays from core were evaluated based on weight of total clean corundum. The split in colour from all core assays in the available database are 8.56% red, and 91.44% pink. Tetra Tech recognise that significantly more pink intersections were recorded in the drill-core than red, and this contradicts the surface bulk sample results of 2006 and 2007. However, the company believe that this simply demonstrates the wide variation in colour depending on the host rock – with higher Cr phlogopite containing more red ruby, and the lower (0.02%) Cr sapphires mostly located within the leucogabbro ore. The 92:8 split is considered to be highly conservative as areas within the deposit have recorded a 60:40 ratio. Since pink stones are currently valued less than red ones the colour distribution may impact project economics. This study utilizes the 92:8 split to ensure conservative economics.

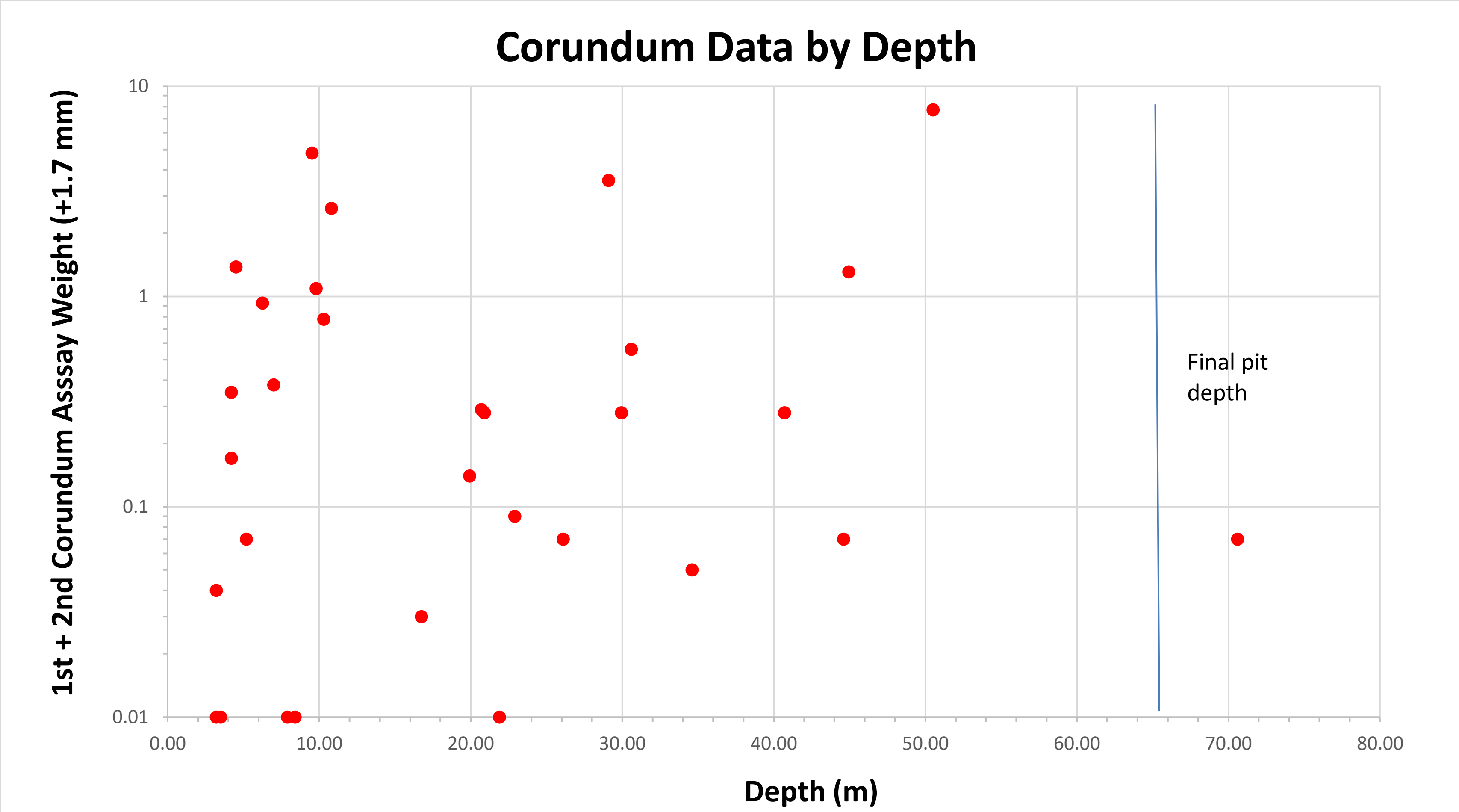
13.5.3 Quality Classification

Gem quality classification of corundum materials was evaluated in all bulk samples and core samples by certified gemmologists. As to be expected, the classification and gem grading categories has evolved throughout the duration of the project, and has varied for each of the bulk sample and core assays. Table 21 presents a summary of corundum quality from all sample sets.

Table 21: Gem Quality Classification From Data Sets 2006 to 2008

<table>
<tr><th>Sample Set</th><th>High Gem</th><th>Gem</th><th>Near Gem</th><th>Non-Gem</th></tr>
<tr><td>2006 Bulk Sample- Field</td><td>3%</td><td>38%</td><td>52%</td><td>7%</td></tr>
<tr><td>2006 Bulk Sample- Lab</td><td>3%</td><td>24%</td><td>38%</td><td>34%</td></tr>
<tr><td>2006 Bulk Sample- Optic</td><td>11%</td><td>20%</td><td>33%</td><td>35%</td></tr>
<tr><td>2006 Bulk Sample- Full sample</td><td>4.5%</td><td>25.9%</td><td>40.2%</td><td>29.3%</td></tr>
<tr><td>2007 Bulk Sample</td><td colspan="2">9.9%</td><td>29.4%</td><td>60.7%</td></tr>
<tr><td>2008 Bulk Sample</td><td colspan="3">32%</td><td>68%</td></tr>
<tr><td>Core 2007-2008</td><td colspan="2">4.47%</td><td colspan="2">95.53%</td></tr>
</table>

Scatter plots of data from core were plotted against depth to evaluate change in gem quality with depth. Plots show consistent distribution of gem and near gem materials to a depth of 40 m. Below this depth the data set is reduced which in turn reduces the occurrence of gem and near gem quality materials. Gem and near gem quality materials have been observed in core to a maximum depth of approximately 150 m. Scatter plots of gem and near gem material assays with depth are presented in Figure 13 and Figure 14. Since the core was not of a large diameter, the volume of rock sampled within it may explain the distribution differences between the bulk sample results and the overall core results in Table 19.



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Red gem and near gem distribution vs depth

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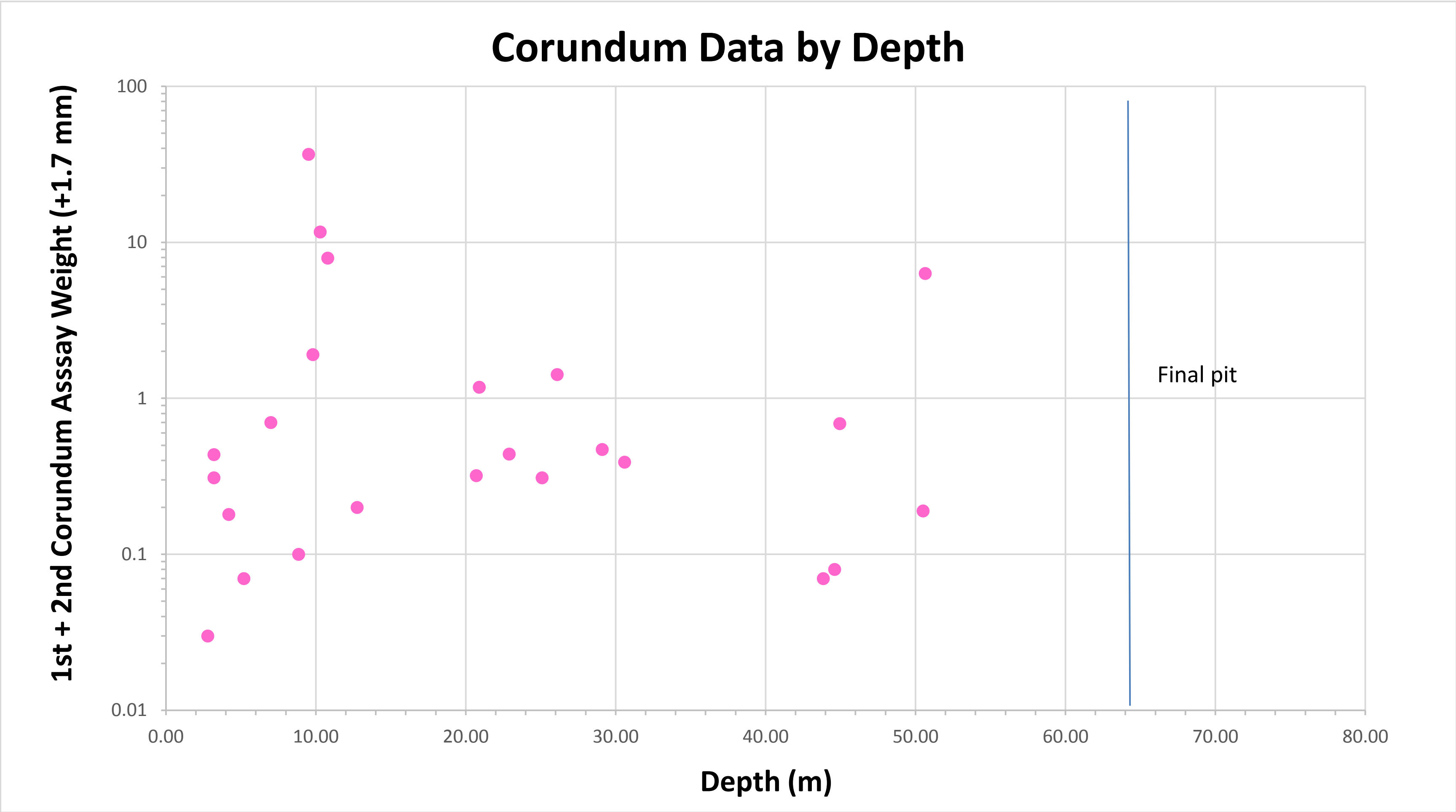
Figure 13



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Pink gem and near gem distribution vs depth

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Figure 14

14.0 MINERAL RESOURCE ESTIMATES

14.1 Geologic Modelling

Tetra Tech has reviewed and updated the three dimensional geological interpretations of the mineralized zones (prepared primarily by TNG) and the extensive project data collected since 2006. The geological model was based on observations and structural measurements collected from surface outcrop as well as from drill logs. Drill density within the deposit is at a consistent collar spacing of 8 m centers with fans of drill holes from each collar location at -45°, -60° and -75° dips giving good control to the geological model. Holes were drilled at an average azimuth of approximately 133° intercepting the mineralized zone perpendicular to the strike direction of the host lithology.

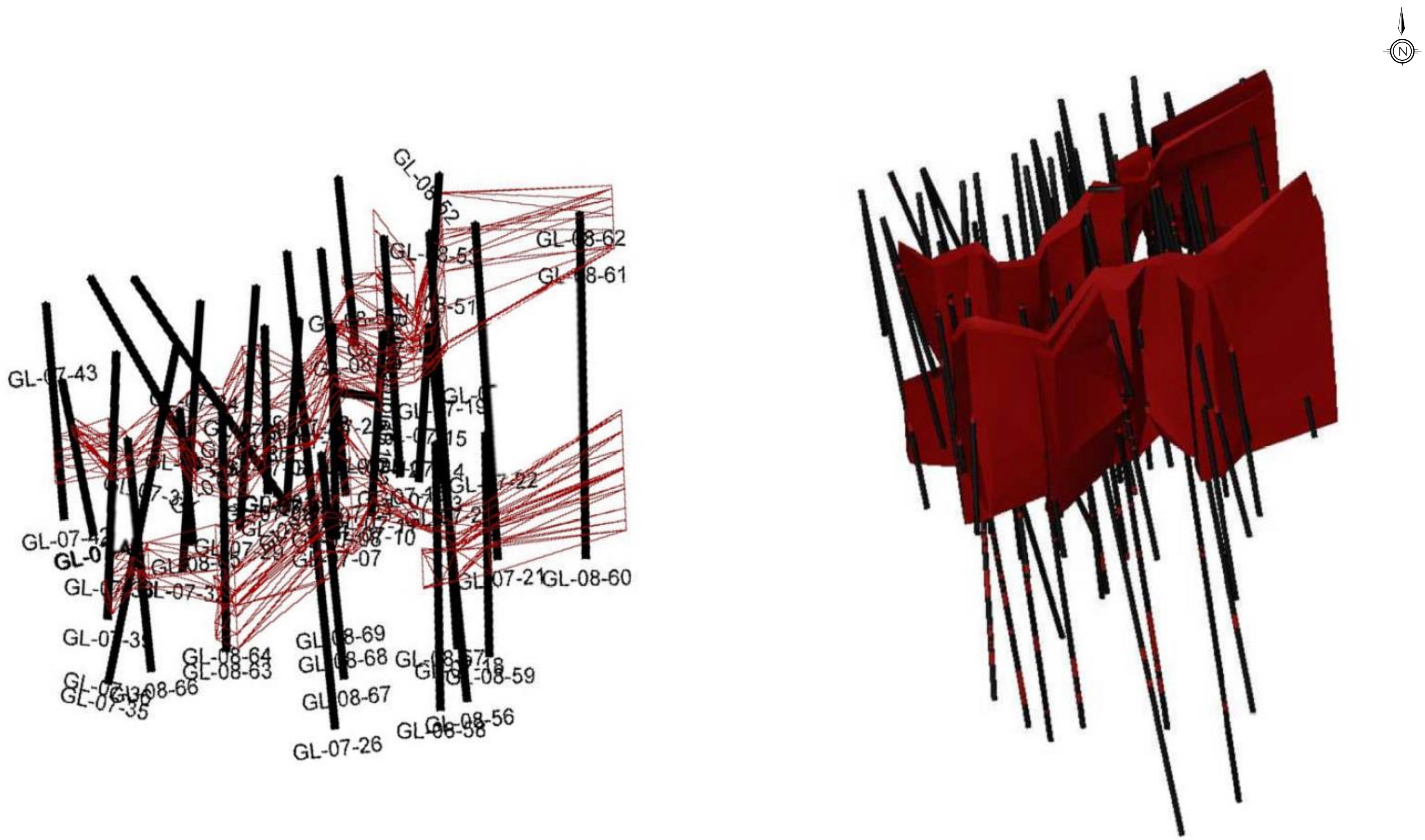
The Aappaluttoq geological model for the mineralized host zone was constructed as a solid model. Drill hole data was imported into Gemcom GEMS software (v6.3) and interpretive 3D rings linking correlated host zone rock, notably the phlogopite and contact zone between the phlogopite and leucocratic gabbro units, were digitized on 2 to 4 m spaced cross-sections. Each interpretive ring was then linked with the corresponding ring on the adjacent cross sections to create a 3D wireframe solid for the mineralized (host) zone. Corundum assay values from drill core samples were used to provide added control on the wireframe extents.

The geological model for the non-mineralized (waste rock) lithologies was constructed through interpolation of data from the drill-holes directly into the Rock Type model within the Block model. Interpretation of the lithological data was accompanied by assigning a numerical lithology code to each waste rock type and used an ID calculation between logged intervals.

14.2 Block Modelling

The block model was created by Tetra Tech using Gemcom GEMS software (v6.3). The block model consists of blocks measuring 1 × 1 × 1 m. Extents of the block model in x, y, z directions are 295 m, 280 m, and 150 m, respectively. The model is oriented to azimuth 50 and the block dimensions are orthogonal with the trend of the mineralization. The model is shown in Figure 15 along with the geological drilling.

The block size of 1 m was chosen based on the geometry of the host zone lithology, which is as narrow as 3 m in some places, and the block model takes into consideration potential mining methods for subsequent mine planning. Assay data for total clean corundum were utilized for interpolation into the block models on a geological model basis. A rock code of 200 was assigned within the mineralized zone and interpolation of the grade data was constrained to this rock code. Only data from inside the mineralized solids were used for block model interpolation. The cut-off depth of 83 m for the mineral resource categories were defined within each zone based on density of sample data and drill-hole logs including lithology and the consistency of grade data within the geological models. Resource tonnages were derived using rock volumes reported from the block model and representative specific gravity measurements for each lithology. The SG values of the 2008 drill core samples (Series 143) were calculated prior to crushing and processing. The SG values of the 2007 drill core samples (Series 144) were not calculated prior to crushing and processing 2007 core assays do not appear to have S.G's calculated on the core prior to crushing and processing. Additional sampling of the 2007 drill core was undertaken during the 2009 re-logging process both for ARD assessment and SG work. The block model was constructed using GRADE basis proximate data; interpolated values included corundum (g/t).



LEGEND

NOTES

Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Drill Plan and Mineralization Zone

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Figure 15

14.3 Geostatistics

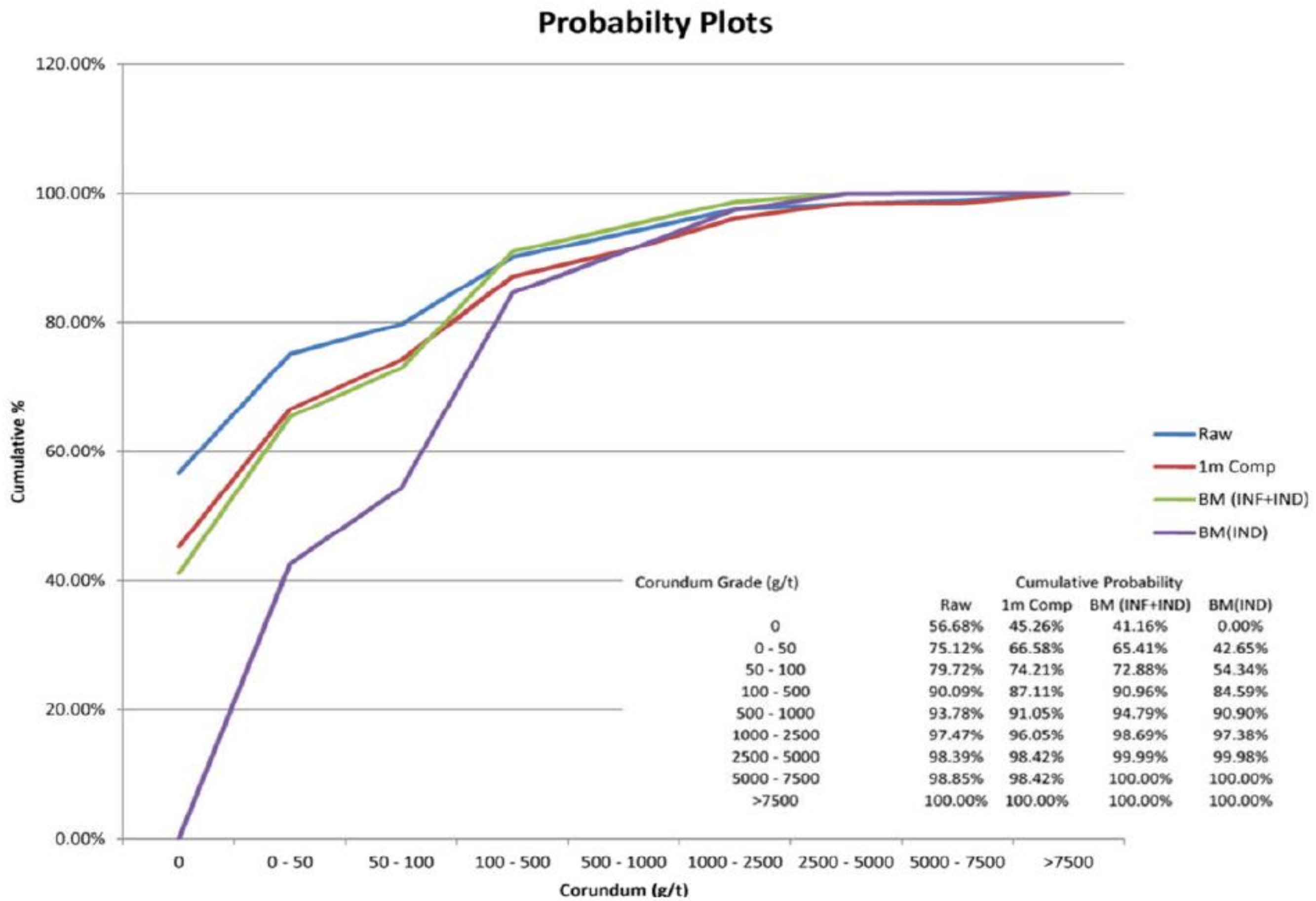
Variography and other geostatistical methods were used by Tetra Tech for the purpose of defining the search parameters for the geological and grade quality block models. Geostatistics were used to assess top cut off value of 7,325 g/t (97.5 percentile of assay data) for the block model. Variography interpretation was not successful for this data set, and appeared to be a reflection of the data distribution, indicating that the preferential direction for mineralization was parallel to drill hole azimuth. This is likely a result of the tight spacing of drill holes, with limited assay sample data within the drill holes.

Statistics were compiled for raw data, composites, and block model grades (Table 22).

Table 22: Aappaluttoq Block Model Statistics Summary

	Total Number	Mean Grade	Maximum Grade	Minimum Grade	Standard Deviation	Variance
		g/t	***g/t***	***g/t***		
Raw Assays	497	534.56	72,812	1	4,184	17,505,590
Composites	380	537.80	57,162	1	3,353	11,240,837
Indicated Blocks	73,489	302.15	6,663	1	618	381,380
Inferred Blocks	48,225	166.41	5,325	1	412	169,334

Probability plots for raw, composite and block model data were plotted and compared to ensure similar distribution of data and to identify any errors or outliers. The plot in Figure 16 shows consistent data distribution for raw, composite and total block model data, with a smoothing of data from raw to composite, and from composite to block model as would be expected.



Corundum Grade (g/t)	Cumulative Probability			
	Raw	1m Comp	BM (INF+IND)	BM(IND)
0	56.68%	45.26%	41.16%	0.00%
0 - 50	75.12%	66.58%	65.41%	42.65%
50 - 100	79.72%	74.21%	72.88%	54.34%
100 - 500	90.09%	87.11%	90.96%	84.59%
500 - 1000	93.78%	91.05%	94.79%	90.90%
1000 - 2500	97.47%	96.05%	98.69%	97.38%
2500 - 5000	98.39%	98.42%	99.99%	99.98%
5000 - 7500	98.85%	98.42%	100.00%	100.00%
>7500	100.00%	100.00%	100.00%	100.00%

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Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

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Drill Plan and Mineralization Zone

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Figure 16

14.4 Composites

Assay samples were composited on a 1.0 m down-hole composite interval within geological boundaries of the mineralized zone. During compositing process residual samples were retained regardless of length (i.e. remaining samples less than the 1 m composite length occurring at the floor of the solid). Composites were not cut.

14.5 Search Parameters

Search ellipses for the interpolation profiles are based on geology and observed continuity of the phlogopite host zone. A lower cut-off grade of 1 g/t was selected from evaluation of grade tonnage relationship at several cut off grades. The grade data was interpolated into block models using an inverse distance interpolator with a power of 2 (ID2).

The search ellipse radii used in the interpolation profile are presented in Table 23. The parameters defining the search ellipse are as follows: x Direction is along strike, y Direction is thickness, and z Direction is along depth of the mineralized zone. Further there is an axial adjustment for strike and dip of the mineralized zone of 10° around the x axis.

Table 23: Summary of Search Ellipse Parameter Radii

Classification	x Direction	y Direction	z Direction
	m	*m*	*m*
Indicated	10	5	20
Inferred	16	5	30

Search parameters and sample interpolation restrictions included a minimum of 2 samples and a maximum of 6 samples per ellipsoid. High grade was capped at 7,325 g/t, which corresponds to the 97.5th percentile value of drill core assays.

14.6 Classifications

The resource for the Aappaluttoq Property has been estimated as Indicated and Inferred resources in accordance with CIM Estimation of Mineral Resources and Mineral Reserves Best Practises Guidelines. The resource estimation is prepared in accordance with NI 43-101 guidelines. The resources for the property have not been classified as measured due to a degree of reduced confidence in the geological database; specifically the lack of specific down-hole survey data, incomplete sampling throughout the mineralized zone, and lack of oriented down-hole structural data. It is recommended that future drill programs practice continuous sampling throughout the host zone intercepts with samples on either side to provide constraints on the mineralized solid.

14.7 Mineral Resource

The initial resource estimate was prepared by Tetra Tech in 2011 from 6,457 m of drilling data and approximately 90 t of bulk samples collected on the property and uses recently updated geologic interpretations for the host zone lithology. Due to limited sampling data and the distribution of sample locations resource evaluation and resource modeling was based on geology. Resource modeling was based on the knowledge that corundum mineralization was immediately tied to phlogopite and also with the nearby leucogabbro unit. This understanding was derived from sampling that was conducted throughout the phlogopite, gabbro and units directly adjacent on the contact margins on surface. Furthermore, from visual inspection of the diamond drill core in the field and in the lab it was noted that corundum was present visually in the phlogopite and gabbro units, and not present visually in the other units.

The mineral resource estimate comprises the integration of mineralization volumes, density, petrology and Total Clean Corundum content data obtained from diamond drilling and bulk sampling. Mineral resources are presented in Table 24.

Table 24: Indicated and Inferred Resources

Category	Volume	Tonnage(1)	Average Grade(2,3)	Average Grade(2,3,4)	Contained Corundum (2,3)	Contained Corundum(2,3,4)
	m^3	*t*	*g/t*	*ct/t*	*M.g*	*M.ct*
Indicated	59,110	189,150	313.33	1,566.65	59.27	296.33
Inferred	24,110	77,160	283.46	1,417.28	21.87	109.35

Notes:

(1) Densities are derived from specific gravity measurements of host lithologies and estimated for host zone based on specific gravity of corundum and average grade.

(2) Based on a Total Clean Corundum grades greater than 1.7 mm size fraction from mineralogical lab analysis.

(3) Top cut grade of 7,325 grams per tonne (97.5 percentile), and a lower cut-off grade of 1 gram per tonne.

(4) One gram equals five carats.

Volumes and tonnages presented in the above table are rounded. Densities are derived from specific gravity measurements of host rock lithologies and are estimated for the mineralized zone based on specific gravity of corundum and average grade. This resource is based on Total Clean Corundum grades greater than 1.7 mm size fraction from mineralogical lab analysis. The top cut-off grade of 7,325 g/t (97.5 percentile), and the lower cut-off grade of 1 g/t, are based on a review of the grade tonnage curves Figure 17. One gram equals five carats.

Mineral resources that are not mineral reserves do not have demonstrated economic viability.

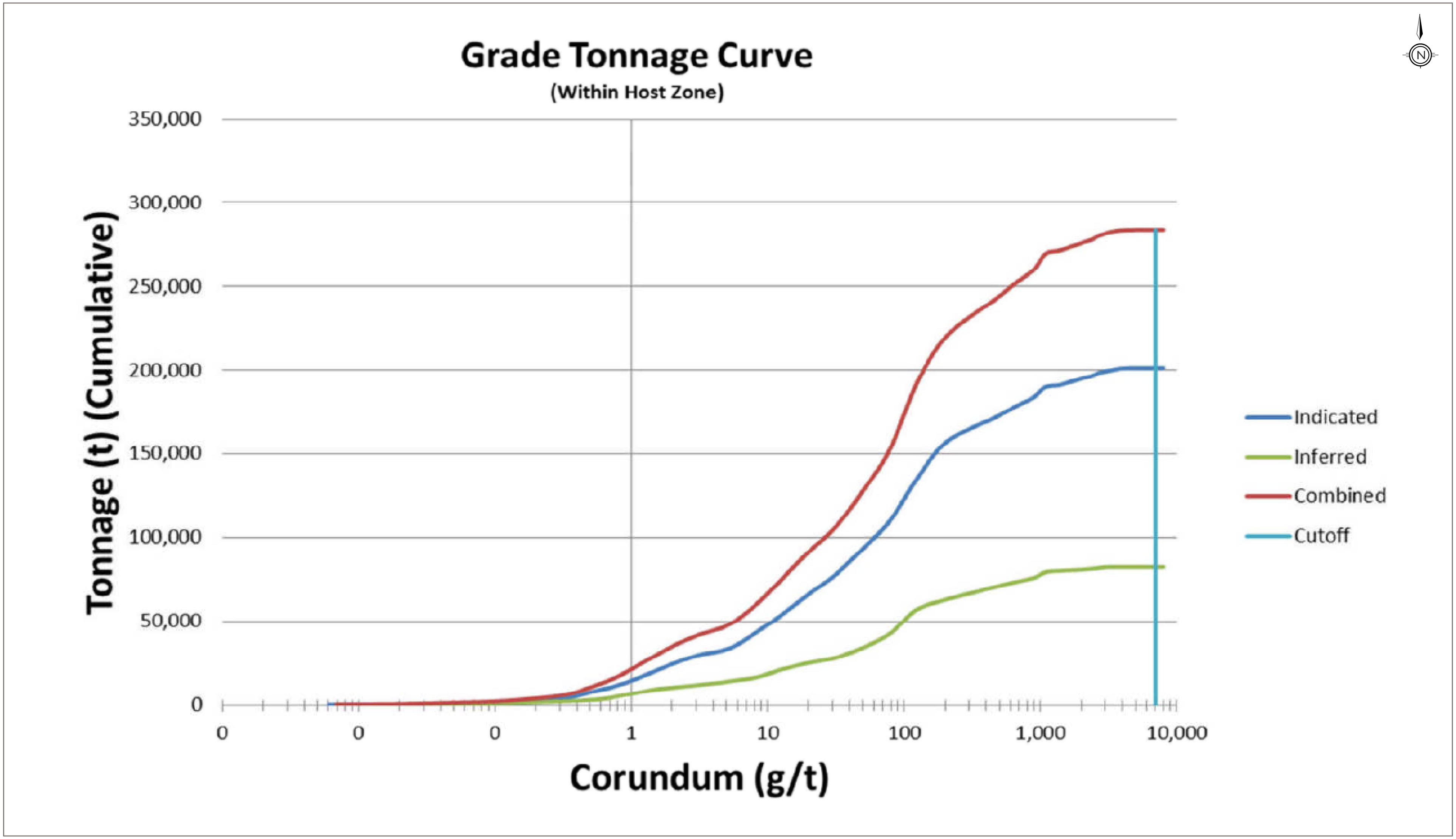

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Figure from "Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland True North Gems, 2011"

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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Grade Tonnage Curve

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Bulk samples taken at surface were used to provide discrete data points within the database; however the influence of this data is limited by the same parameters used for all other samples in the database. Tonnage from the bulk samples has not been subtracted out of the resource estimates.

All tonnages cited are for mineralized lithologies only.

Corundum resource grades are estimated for greater than +1.7 mm size fraction recovered after core sample preparation. This is nominally larger than the minimum size of gemstone rough that can be commercially polished, and which is consistent with the minimum sieve size used by TNG in evaluations reported on January 16 and 17, 2008. No distinction has been made in the calculation for variations in quality (gem, near-gem and non-gem), size or colour of the recovered corundum. No work was done on the resource to evaluate the consistency or distribution of gem or near-gem quality, and non-gem corundum within the mineralized zone intersected by drilling because of the small volume of corundum recovered from each of the drill core intercepts due to minimal core diameter.

However, the colour and quality distribution analysis of corundum and valuation of the sorted rough ruby and pink sapphire was completed on the larger bulk samples from surface. The variations of the colour and quality of corundum greatly influences the value of the Total Clean Corundum recovered. The value of sorted and recovered ruby and pink sapphire from the surface bulk samples are discussed in section 13.2.4 Cutting and Valuations of 2006 Bulk Sample.

Table 25 presents a summary of grade distribution per lithology type for 634 drill core samples collected. The majority (80%) of sampling was conducted in the phlogopite unit and displays a grade distribution of 0-72,812.4 g/t, averaging 401.1 g/t. The 17 samples collected in the gabbro display a grade distribution of 0-20,993.0 g/t, averaging 2683.7 g/t. The 77 samples collected from the SAPGED unit display a grade distribution of 0-48,067.5 g/t, averaging 1192.4 g/t. There are 345 samples with zero grade.

Table 25: Summary of Grade Distribution by Lithology Type

Lithology	Number of Samples	Zero Grade	Min of Grade	Max of Grade	Average of Grade
		#	g/t	g/t	g/t
GAB	17	7	0	20,993.0	2,683.7
GNS	4	2	0	468.0	215.6
PARG	6	0	29.3	918.3	320.6
PEG	7	5	0	13.6	3.1
PHLOG	511	285	0	72,812.4	401.1
SAPGED	77	39	0	48,067.5	1,192.4
UM	12	7	0	9,914.9	1,069.9
Grand Total	634	345	0	72,812.4	564.7

15.0 MINERAL RESERVE ESTIMATES

Tetra Tech has updated mineral reserve estimates from the 2011 PFS report. Parameters used for definition of reserves are similar to those used in 2011, however, this PFS considers recent gemstone valuations, which vary considerably from the 2011 valuations, thus resulting in increased tonnage attributable to reserves.

Tetra Tech has considered mineral reserves as corundum containing material within current economic and permitted pit limits. Due to the nature of the mineralisation the mineral reserve has been classed as indicated resources mineable within a feasible pit, which provides positive economics in an ensuing economic analysis, including consideration of capital costs, operating costs, taxes and other financial commitments.

Tetra Tech has revised the mine plan and schedule, so as to provide for staged mining, with lower stripping ratios during the first 2 years.

Tetra Tech considers the spatial distribution of the corundum would make in-pit grade control difficult prior to mining. Additional indicated material below cut-off grade will be processed, this material will dilute the reserves prior to processing, as shown in Table 26.

Table 26: Aappaluttoq Probable Open Pit Mineral Reserves

Category	Tonnage	Grade	Contained corundum above 1.7mm
Total probable mineral reserves for mining[1]	166,983	339 g/t	57 M.ct
Mill feed after dilution and mining losses[2]	189,768	292 g/t	55 M.ct

1 All corundum containing material within the open pit as designed, intended for mill feed

2 Resulting mill feed including waste dilution due to mining method of an estimated 19 % and mining loss of 4.5 %

16.0 MINING METHODS

Tetra Tech has updated mining methods for the 2014 PFS based on the agreements between TNG and LNSG, whereby LNSG will provide contract mining services. TNG and LNSG have provided details of the planned strategy for mining, which Tetra Tech has used as a basis for a revised pit design and mining schedule. Another update has been the use of “push backs” as a basis for the mining schedule, whereby smaller interim pit designs are mined in such a way to minimise waste rock stripping while targeting high grade zones early in the mine life.

16.1 Basis of pit design

True North Gems’ Aappaluttoq project has been permitted to allow mining activities to proceed to an elevation of 154 m. The mine life is also currently limited by the mine permit to nine years, although this can be amended upon submission to the Greenland Government as the overall Licence is awarded for a 30-year period. These constraints have been used as a guideline in efforts to optimize the open pit design. Tetra Tech has additionally generated an optimised pit shell using Geovia Whittle™ software. This pit shell was used as the basis for a final pit design. Table 27 below shows the parameters that have been considered in the overall pit design.

Table 27: Key Economic Parameters used for open pit designs and for PFS schedule creation

Design aspects	Value used
Working bench height waste (flinch height)	6 m
Working bench height ore	3 m
Final bench stack height	18 m
Maximum bench stacking	3 benches
Minimum berm width	8 m
Minimum haul road width	9 m
Maximum haul road gradient	12.0%
Mine life	9 years
Maximum pit depth elevation	154 m
Bench face angle	75º
Overall pit slope angle	56º

Key assumptions used for the economic analysis, scheduling and Mineral Reserve are shown in Table 28.

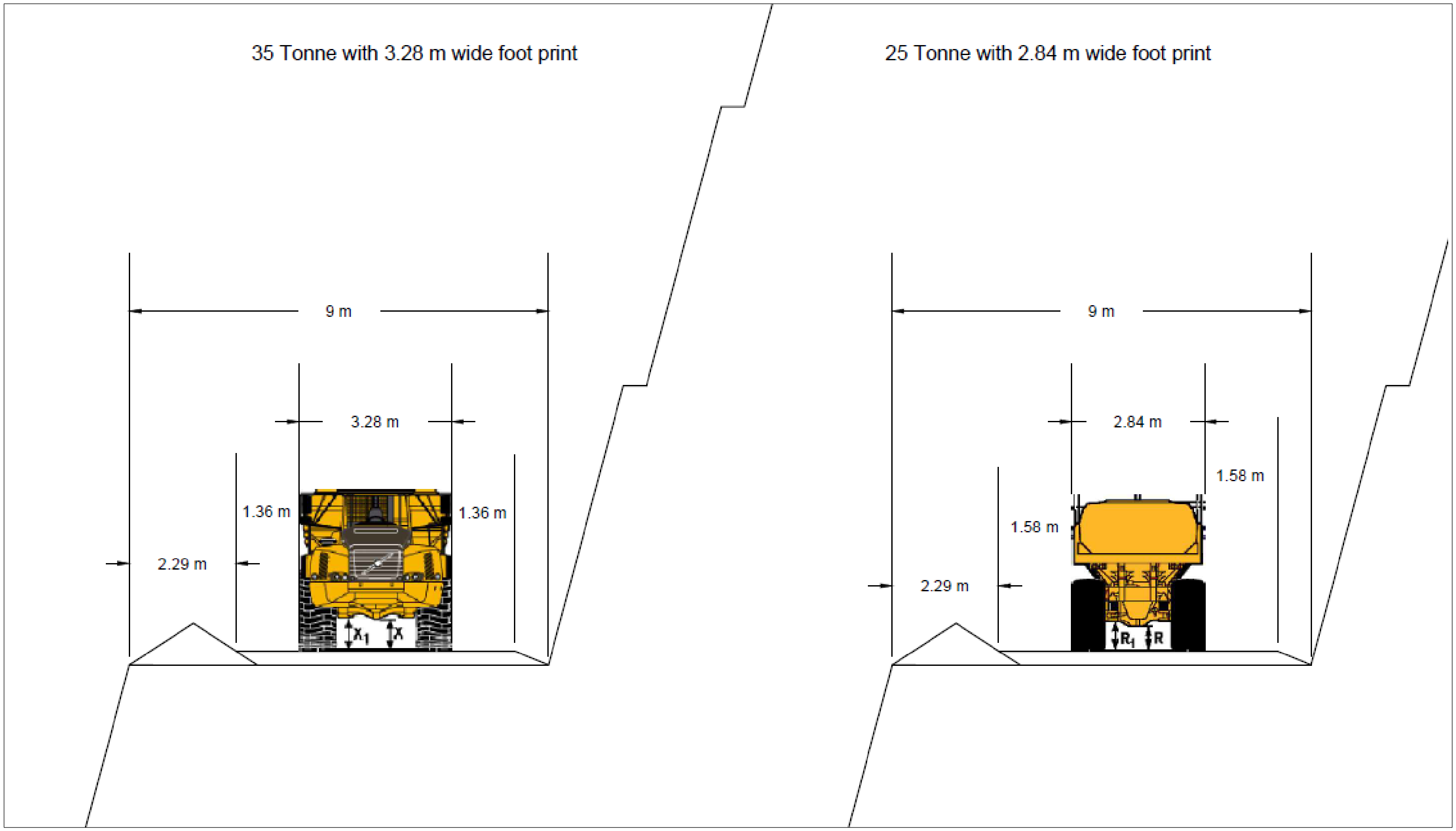
Table 28: Key Economic Parameters used for open pit designs and for PFS schedule creation

Item	Units	Value
Maximum tonnes per year	t/annum	650,000
Maximum process productivity	t/year	24,000
Mining dilution	%	19.1%
Mining recovery	%	95.5%
Process recovery	%	95%

For the Mineral Reserve, the percentages of gem quality rubies and sapphires contained in that corundum are based on the percentages determined from the bulk sampling, this information is summarised in Section 13.5. Gemstone prices are based on summaries of numerous valuations, Tetra Tech has compared the prices used to independent valuations done between 2006 and 2015, and publically disclosed auction prices. This valuation matrix is summarised in Table 62.

16.2 Geotechnical Analysis

TNG and Tetra Tech have not undertaken any additional geotechnical field work or analysis since the initial PFS was completed in 2011. As such, the current pit design is based on the geotechnical analysis conducted in 2011. As summary, the rock was classified using Rock Mass Rating as “good rock”. Based on the findings Tetra Tech has designed a final pit as discussed above. The design considers 8 m wide benches with 6 m high flinches done in stacks of three resulting in 18 m benches. This results in slopes less than that of 56° from horizontal. In pit haul roads are designed to be a minimum of 9 m wide to allow for mine trucks up to 3.38 m wide as shown in Figure 18. The in pit haul roads were designed with a maximum gradient of 12.0%.



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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Section through Pit Haul Roads as Planned with both 35 tonne and 25 tonne Truck Widths

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Figure 18

16.3 Overall Slope Stability

Although the results from the geotechnical analysis conducted for the 2011 PFS show that an overall pit slope angle of 65º can be safely achieved, Tetra Tech was advised by LNSG that the Greenlandic and/or Danish mining regulations do not allow an overall pit slope angle that exceeds 56º. For this reason, Tetra Tech has designed the final pit within this limitation.

16.4 Catch Berm Widths

In the 2011 PFS, the required catch width was adopted from the Oregon Department of Transportation (2001) Rockfall Catchment Area Design Guide (Pierson, Gullixson and Chassie 2001). Based on several factors, a 6.5 m catch berm width was recommended. However, with 18 m bench heights and a bench face angle of 75º, the overall pit slope exceeded the maximum allowable 56º slope. As a result, Tetra Tech included an 8 m catch berm for every 18 m in vertical height to achieve the shallower overall slope angle of 56º.

16.5 Dilution and Recovery

16.5.1 Waste dilution

Based on the understanding that the gemstones occur within the gabbro in the footwall, and within phlogopitite against the hanging wall, it is assumed that delineating a precise ore versus waste limit in the footwall may not be possible. On this basis, and by viewing the ore zone in planview and vertical section, Tetra Tech has estimated a zero grade dilution to be 19.1%. In practice this material is likely to contain corundum, which may not have colour or quality for classification as gemmologically significant. Monitoring of this material in years 1 and 2 of operations will define the mine waste dilution with more certainty.

16.5.2 Mining recovery

Mining recovery has been based on determining the loss of ore zone outside of 0.5 m vertical offsets from the ore zone. The recovery is all material within these offsets with the mining losses occurring in areas where ore width or dip changes resulting in ore lying outside the offset zone.

On this basis mining recovery has been estimated at 97%. Addition losses of 1.5 % due to drilling and blasting activities has been included, resulting in 95.5% mining recovery.

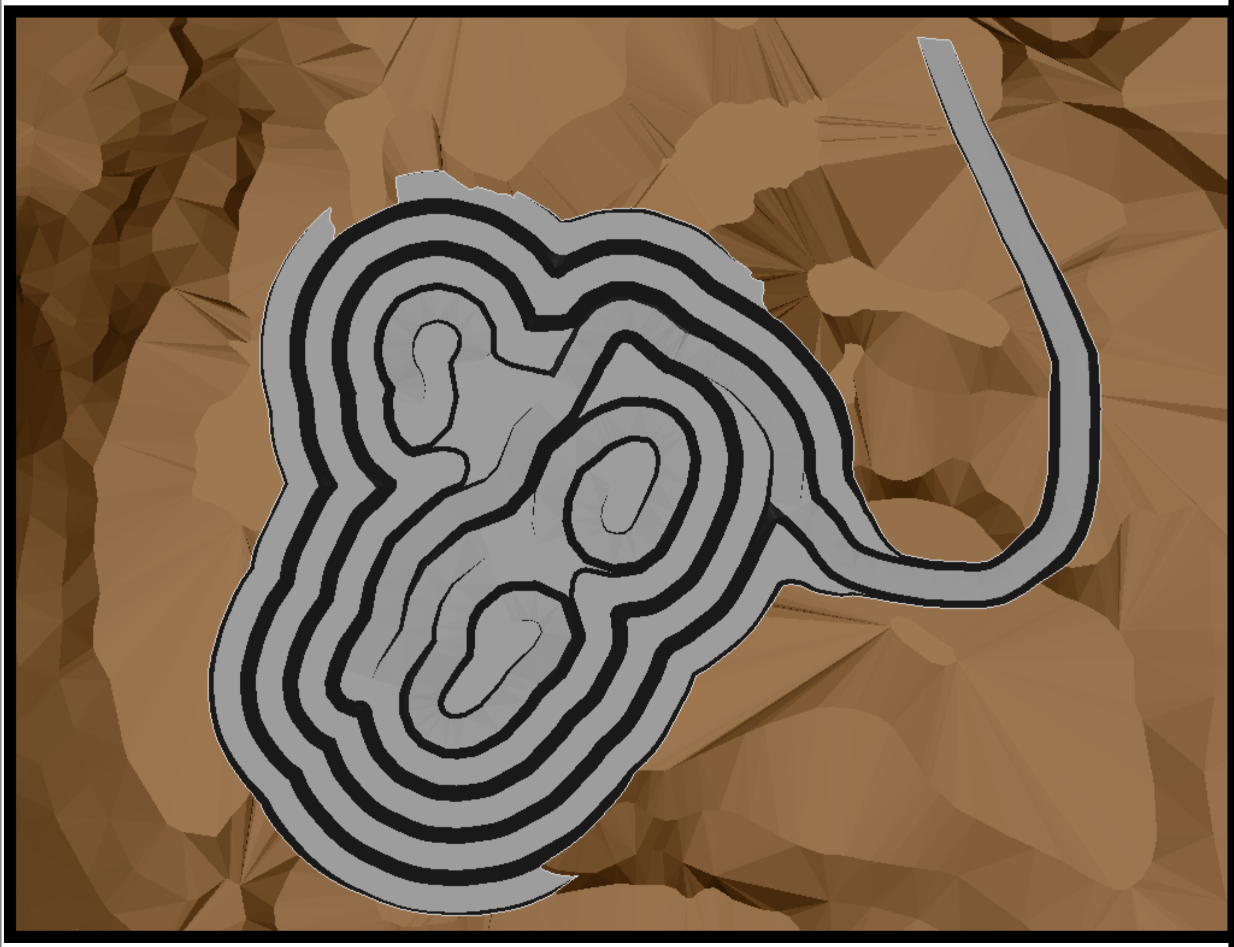
16.6 Open Pit Mine Design

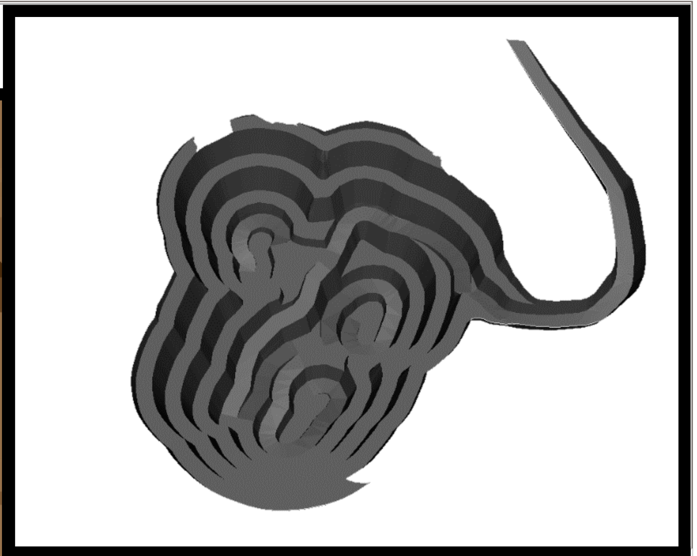
Tetra Tech generated pit shells for each year of the mine life. The phased pit designs provide TNG with a staged mining plan, which allows for the use of pushbacks to minimise waste stripping during the initial 3 years of mine life.

Geovia Whittle™ was used as the basis for the phased design. Whittle output nested shells for each year of the mine life. Pits with haul roads were then modelled around the Whittle cones and designed in Geovia GEMS™. The figures below highlight the staged pits from years 1 through 9. Pushbacks are planned from year 2 up to year 7 of the mine life to trade-off grade and stripping ratio for practicality and cash flow.

A slot entrance/egress for the pit is incorporated in the northeastern side of the pit. This reduces the amount of waste material mined as opposed to having a haul road wrap around the north side of the pit until the haul road daylights out of the pit as was planned in the original 2011 PFS model.

Figure 19 shows the final pit while Figure 20 shows staged pits and pushbacks throughout the life of mine.





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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Final Pit Design (Year 9 of Mine Life)

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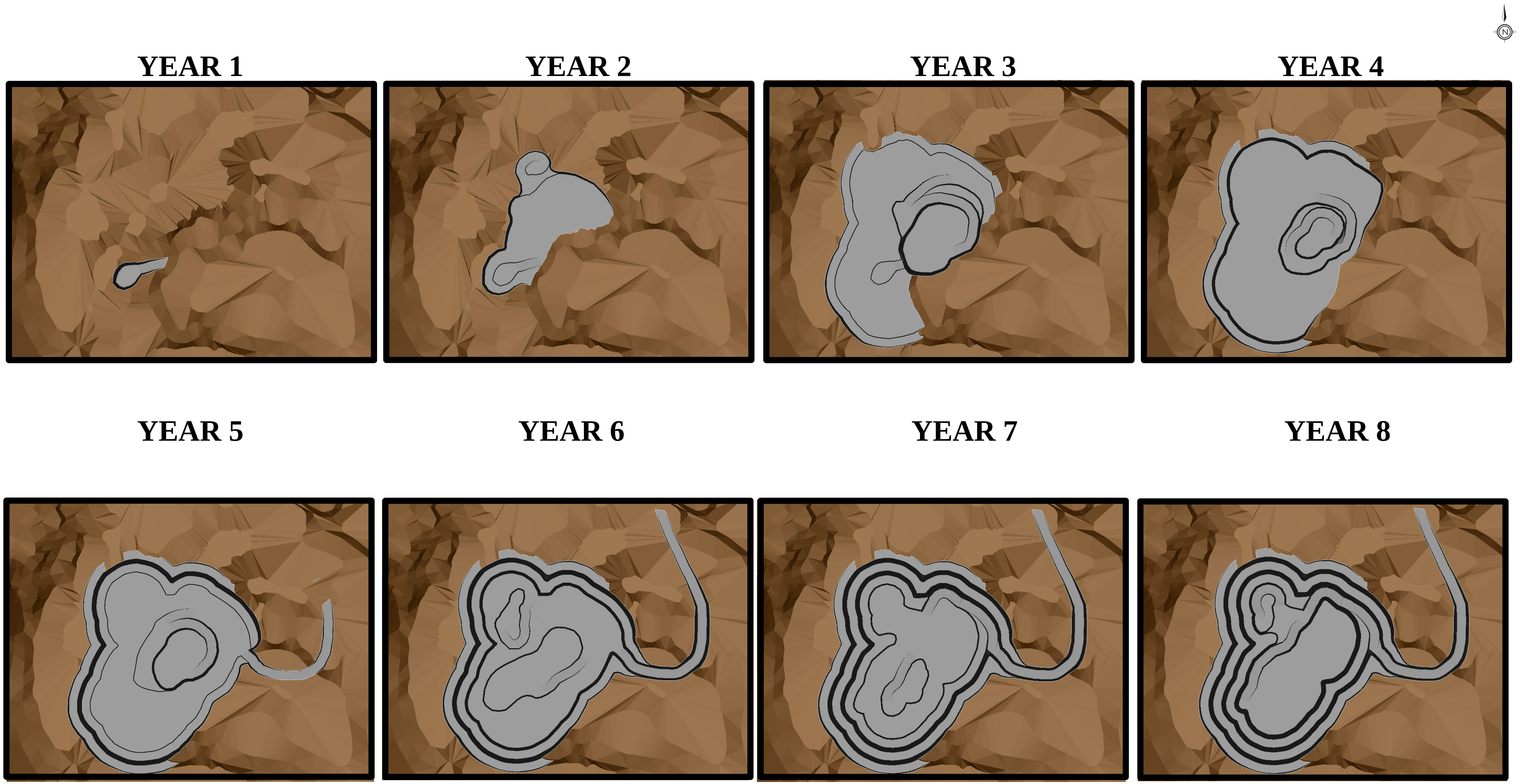
Figure 19



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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Aappaluttoq Project Pit Phases through Years 1 - 8

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16.7 Open Pit Equipment Selection

Tetra Tech has been provided with a recommended equipment list by LNSG. As shown in Table 29, LNSG will provide and operate all mining equipment as part of their joint venture agreement with TNG. It is understood that LNSG will recuperate capital and operating cost by charging a hire cost for the machinery and staff. The scope of this machinery includes mining operations and services, mobile machinery for process plant, port operations and management.

Table 29: LNSG Mining equipment list

Equipment name	Type	Number on site	Proposed use
Sandvik QJ341 Jaw Crusher	Diesel powered mobile jaw crusher	1	Crushing of ore for processing and crushing waste rock for road construction
Sandvik DX 780 Tracked Drilling Rig	Diesel powered blast hole drill rig	1	Drilling blast holes for waste rock and a line of blast buffer/damper holes between waste rock and ore
35 Tonne Articulated Dump Trucks (Bell or Volvo)	35 Tonne Articulated Mining Trucks	2	Waste rock haul to waste dumps and ore haul to processing facility
Moxy MT26HL Articulated dump truck (spare)	26 Tonne Articulated Mining Truck	1	Spare truck also assist in road construction through transport of waste rock to locations on haul road
Hitachi ZW75 frontend loader	Front end loader	1	Support loader, snow removal
Hitachi ZW310-5B frontend loader	Front end loader	1	Loading waste rock in pit, snow removal Loading ore blocks prior to crushing
Hitachi ZW220-5B frontend loader	Front end loader	1	Loading ore into crusher / feeding plant Support in pit
Hitachi ZX520LC-3 Excavator,	Hydraulic excavator / backhoe	1	Excavation of ore via handling
Hitachi ZX290LC-5B Excavator	Hydraulic excavator / backhoe with impact hammer on boom	1	Excavator with impact hammer for breaking ore blocks
Hitachi ZX65USB-5A Excavator	Hydraulic excavator / backhoe	1	Support work and trenching
Tamrock commando 300 drill rig	Diesel powered drill rig for small diameter blast holes	1	Drilling of holes for blasting ore into blocks
Scania fuel truck 18,000 liter tank	Rigid fuel truck	1	Fuel transport to mine site, process facility and camp from main storage facility
Volvo service truck	Rigid flatbed truck	1	Inpit servicing of mining equipment, transport of materials from port to process facility and workshops
Mercedes flatbed truck with crane	Rigid flatbed truck with crane	1	Inpit servicing of mining equipment and equipment lifting inpit elsewhere where required during operations

Table 29: LNSG Mining equipment list

Equipment name	Type	Number on site	Proposed use
Manitou MT 1335	Forklift	1	Handling of materials off barges at port, handling materials in the process facility and any heavy lifting required in the pits
Mercedes Vacuum truck	Vacuum truck	1	Water transport for mine site dust allaying or general use as well as spill cleanup
Mitsubishi L200 Light vehicles	Light delivery vehicle	1	Transport of supervising and support staff from camp to mine site as required for operations
Small services truck	Rigid truck	1	Small duty transporting including waste removal and handling material from port facility to mine site
Mercedes Benz Bus for 12-16 persons	Bus	1	Bussing staff from port or camp to process and mine site
3 axle low trailers	Low boy trailer	1	Use during transport of crawler mounted equipment during maintenance or to winter storage locations
Ambulance	Ambulance	1	Emergency use
Fire truck	Fire truck	1	Emergency use
Hagglund 206 (snow tracked)	Tracked snow vehicle	1	Winter/ early spring transport of personnel to and from camp and process facility Also for use by security during winter

To the above list in Table 29, Tetra Tech has added a mobile diesel pump with a 45 kW engine for dewatering of the pit, and recommended the additional incorporation of a single D7 caterpillar dozer.

16.8 Estimated machinery hours

An equipment list for mining operations has been sized and selected based on the production requirements. Table 30 highlights all equipment as well as the proposed use of each and the estimated hours of operation per year for each equipment type.

Table 30: List of equipment and estimated hours of use over life of mine

Equipment Type	Proposed use of equipment	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
Sandvik QJ3+14:3041 Jaw Crusher	Crushing of run-of-mine	hrs	57	255	331	456	456	471	523	622	624	3,795
Sandvik DX 780 Drill rig HF hammer	Drilling of waste rock for blasting and long holes to reduce blast damage to ore	hrs	47	400	1,086	1,032	1,290	1,109	954	637	396	6,950
Bell B35D Articulated dump truck Or 2 pc. Volvo trucks	Hauling ore and waste rock	hrs	115	967	3,171	2,732	3,500	3,224	3,004	2,139	1,485	20,335
Moxy MT26HL Articulated dump truck (spare)	Spare truck for ore and waste loading	hrs	0	150	250	250	250	250	250	250	250	1,900
Hitachi ZW75 frontend loader whit, quick coupler, bucket. Forks, snow blade	Pit services, snow clearing, general assistance	hrs	25	139	181	249	249	257	285	339	340	2,064
Hitachi ZW310-5B frontend loader whit, quick coupler, bucket, Forks fore dimensions stone	Loading waste, with ability to load ore	hrs	49	472	1,362	1,263	1,605	1,362	1,146	705	386	8,350
Hitachi ZW220-5B frontend loader whit, quick coupler, bucket, Forks, snow blade	Feeding crusher	hrs	8	35	46	63	63	65	72	86	86	522
Hitachi ZX520LC-3 Excavator,	Primarily loading of ore	hrs	28	119	185	237	244	246	289	355	379	2,082
Hitachi ZX290LC-5B Excavator, whit quick coupler, Sandvik rammer BR3288 hydraulic hammer	Primarily for impact hammer	hrs	224	1,001	1,301	1,790	1,792	1,851	2,053	2,444	2,449	14,903
Hitachi ZX65USB-5A Excavator whit quick coupler,	Trenching	hrs	25	111	145	199	199	206	228	272	272	1,656
Tamrock commando 300 drill rig for drilling dimensions stone	Drilling of small holes for ore blasting	hrs	172	771	1,002	1,379	1,381	1,426	1,582	1,883	1,886	11,481

Table 30: List of equipment and estimated hours of use over life of mine

Equipment Type	Proposed use of equipment	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
Scania fuel truck with 18.000 liter fuel tank	Fuel	hrs	102	228	343	408	408	422	468	557	558	3,495
Volvo FL 7 service truck	Large service truck	hrs	11	97	317	273	350	322	300	214	148	2,034
Mercedes 4146K 8x4 Fassi 530 flatbed truck whit 53 ton meter fassi crane whit fly jip	Crane truck for services	hrs	13	29	43	51	51	53	58	70	70	437
Manitou MT 1335	Offloading barges, handling heavy equipment and spares	hrs	51	114	172	204	204	211	234	279	279	1,747
Mercedes Vacuum truck, have also high pressure for cleaning 6 m^3 dirty water and $3m^3$ clean water	Cleaning oil spills other spill, sanitation	hrs	25	57	86	102	102	105	117	139	140	874
Mitsubishi L200 Light vehicles	Supervisor transport/maintenance/ management	hrs	408	913	1,373	1,632	1,634	1,687	1,872	2,228	2,232	13,978
Small services truck,	Small services truck, can run between port and workshop	hrs	22	100	130	179	179	185	205	244	245	1,490
Mercedes Benz Bus for 12-16 persons	Personnel transport, camp to w/shop and process	hrs	51	114	172	204	204	211	234	279	279	1,747
3 axle low trailers	Moving heavy equipment from port to mine/ process facility	hrs	8	8	8	8	8	8	8	8	8	72
Ambulance	Emergency Vehicle	hrs	6	6	6	6	6	6	6	6	6	54
Fire truck	Emergency Vehicle	hrs	6	6	6	6	6	6	6	6	6	54
Hagglund 206 on tracks	Accessing site during winter	hrs	40	40	40	40	40	40	40	40	40	360
Pit Dewatering Pump	Pit dewatering	hrs	2	33	132	187	236	257	316	345	420	1,927

16.9 Open Pit Mining Operations

The mining operation at Aappaluttoq is planned as a conventional truck and shovel operation. Mining will use blast, load, and haul equipment to move the required material over an eight month operating season from beginning of March to the end of October each year. The mining operation will be run by LNSG, with TNG providing geology, surveying and overall project oversight. LNSG will provide all mining equipment, operators and undertake equipment maintenance, logistics and fuelling.

Blasting of waste rock and ore will occur daily during the operating season, with a target production of 20,000 tonnes per year of undiluted ore for feed to the processing plant. For the PFS the total mining tonnage has been limited to 650,000 tonnes per year. In year 7 of the mine life, the production is ramped up to 23,000 tonnes per year. In years 8 through 9 of the mine life, the target ore production is increased to 27,000 tonnes per year. This increase in production rate is due to the fact that the mine is currently permitted for 9 years, however options exist to maintain the ore feed at a constant feed-rate and extend the life of mine once permits have been amended.

Years 1 through 6 are to be mined utilizing 12 hour day shifts only. The increased production starting in year 7 will be achieved either by increasing shifts lengths or by scheduling in a night shift for a portion of the year. The nightshift would ideally be implemented in the summer months when days are longer. This will help minimise costs associated with power consumption for lighting plants required to carry out mining activities during darker hours of operation.

Ore will be mined in flinches of 3 m, while the waste will be blasted and removed using a minimum of 6 m flinches and up to 12 m where possible. Ore will then be loaded and hauled to the process facility which will be located on the north end of the West Basin of Lake Ukkaata Qaava. During Year 1 and portion of Year 2, the waste rock will be used for the construction of safety dykes in the lakes as discussed below. The remaining waste rock is to be hauled to the dyke on the east side of the pit and tipped into the East Basin of Lake Ukkaata Qaava.

16.10 Rock Breakage

Primary rock breakage is planned to be undertaken by drill and blast. For the PFS waste is considered to be blasted in a minimum of 6 m benches or flinches, with ore blasted in 3 m flinches. In addition, between the ore and waste, Orica Denmark, a blasting specialist, has proposed drilling a line (or two staggered lines) of closely spaced holes which will reduce blast vibration from waste blasting into ore zone (J. Schneider, personal communication, April 20, 2014).

16.10.1 Waste blasting

Waste will be blasted using holes roughly 6.5 m long, with a burden and spacing of 2.45 m by 3.05 m, respectively. Ideally ANFO will be used as the primary blasting agent, however if the holes contain water, emulsified, heavy ANFO or cartridged explosives will be considered. Non-electric detonating systems will be used, with detonators sensitive boosters or cartridges. For the PFS blasting is considered to be done at the end of each shift to ensure that blasting does not interfere with mining during the shift.

16.10.2 Ore blasting

Ore blasting will be done by blasting off blocks of gem hosting rock. Around the perimeter of each block and along the base, closely spaced holes (PFS considers 0.2 m), will be drilled and charged with cartridged explosives. The intention of the blasting is to crack the rock between blast holes, and to free the block from the bedrock. The freed block will be further sized through cracking with an excavator mounted impact hammer.

16.10.3 Load and Haul

Loading will be done by wheeled loader and by tracked excavator. For the PFS waste is considered to be loaded via wheeled loader with ore loaded by excavator, however during operations this may interchange as needed. All material mined will be loaded in 35 tonne articulated dump trucks for haul to either waste storage locations or to the mill for processing.

16.10.4 Ancillary Operations

Ancillary operations expected to take place at the mine site include handling of waste material at waste dumping sites, transport of waste material for haul road maintenance, dust allaying as well as maintenance activities using a combination of three dedicated trucks as well as pick-up trucks. Fuel delivery will be done using a tanker truck. Other smaller personnel vehicles include pick-up trucks and a Hagglund tracked vehicle for accessing the mine site and process facilities for supervision, inspections, and maintenance and support activities.

16.10.5 Operational controls

TNG through LNSG will retain skilled mining management personnel who would be tasked with ensuring that mining activities are carried out safely and in accordance with all applicable regulations and permit conditions. In addition TNG will update mining plans as mining enhances geological knowledge. Mining survey will be carried out by LNS survey teams on a quarterly basis, with mine site personnel doing interim periodic bench based updates to mine plans, using site based equipment which may include a combination of theodolite, site level and staff, handheld GPS and tapeline measurements.

16.10.6 Dewatering

Accurate estimation of mining dewatering requirements is not possible due to the fact that the host rock around the proposed mine is not expected to have high permeability, and as such water infiltration will be predominantly from snow melt and seepage through discontinuities in the rock mass.

Tetra Tech has evaluated the likelihood of high volumes of water seepage through the pit wall caused by the hydraulic head from the adjacent Lake Ukkaata Qaava. Figure 21 below presents the final pit and shows the lake basins in relation to the pit. Darcy's law was applied on the final pit design to better understand the potential pumping requirements throughout the life of mine. A hydraulic gradient was determined using an approximate lateral pit distance from the drained lake basins as well as the change in head from the Lake Surface to the bottom of the pit. A hydraulic conductivity factor for gabbro was assumed based on the inspection of host rock during the site visit which predominantly showed competent igneous rock. The results of this exercise show that there would be a negligible amount of water infiltration through the rock mass. This assessment is preliminary and does not consider any rock discontinuity related groundwater infiltration. Pumping requirements are based on the annual precipitation expected as well as water from machinery.

Dewatering is planned to be undertaken using a 45 kW diesel trailer mobile pump unit, which will pump from an inpit sump created for that purpose during mining. The pump will use lay flat hose to connect into a more permanent highwall dewatering line, likely to be +100 mm in diameter.

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Figure 21

16.10.7 Pit Ramps and Mine Roads

Pit ramps have been designed to have a maximum centerline gradient of 12%. At 9 meters wide, they are designed to be single lane with sufficient room left for a water diversion ditch to be dredged at the toe of the bench on the inner side of the pit ramp. A safety berm will be constructed on the outer edge of the pit ramp.

Single lane traffic is feasible as there is only 2 haul trucks accounted for in the mine plan, with a possible third truck to provide assistance during downtime or when higher rates of production are required. To support the flow of traffic in the pit, Tetra Tech has included switchbacks and wider areas, where trucks can layby to allow the other/s to pass.

The mine access roads will link the open pit to the process facility, but also to the main camp area and port. The alignment of the access road in relation to mine infrastructure can be seen on the overall site layout in Figure 29.

16.11 Production Schedule

Tetra Tech have generated a mining schedule based on Whittle outputs and on subsequently designing annual pit shape based on mine design parameters Table 27. It must be noted that this is based on the modelled grade and that the mining strategy for each year may vary as planned by a short term mine planner prior to and during production, based on conditions encountered. The operating schedule is presented in Table 31.

Table 31: Aappaluttoq Prefeasibility Mining schedule

Scheduled aspect	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total / Average
Ore mined	t	1,668	10,040	12,905	15,730	15,757	16,027	17,784	22,164	18,788	130,863
		2,428	566	358	457	288	276	362	321	651	430
Ore mined tonnage	t	2,507	11,215	14,572	20,055	20,080	20,734	23,003	27,382	27,434	166,983
Grade of mined reserves	g/t	1,618	508	318	360	227	216	283	262	604	365
Process feed tonnage	t	2,849	12,745	16,560	22,792	22,820	23,564	26,142	31,118	31,178	189,768
Process head grade g/t	g/t	1,396	438	274	310	196	186	244	226	386	292
Waste tonnes mined	t	17,485	167,729	485,012	449,311	571,179	484,642	407,319	249,920	136,266	2,968,862
Strip ratio	N/A	6	13	29	20	25	21	16	8	4	16
Waste Volume	m^3	8,118	77,874	225,184	208,609	265,190	225,012	189,113	116,034	63,266	1,378,400
Used for Diversion Dykes	m^3	8,118	36,673								44,791
Deposited in East Basin	m^3		41,201	225,184	208,609	265,190	225,012	189,113	116,034	63,266	1,333,609
Tailings produced (Solid)	t	2,847	12,743	16,558	22,789	22,818	23,562	26,139	31,115	31,173	166,773
Tailings produced (Water)	Kl	10,819	48,424	62,921	86,597	86,710	89,535	99,329	118,238	118,457	633,737
Tailings produced (Solid)	m^3	1,157	5,177	6,727	9,258	9,270	9,572	10,619	12,641	12,664	67,751
Total Tailings Volume	m^3	11,976	53,600	69,647	95,855	95,980	99,107	109,949	130,879	131,121	701,488
Corundum in mill feed	g	3,975,653	5,580,754	4,535,175	7,073,970	4,473,282	4,384,178	6,376,768	7,023,422	12,047,013	55,470,216
Corundum recovered	g	3,776,870	5,301,717	4,308,416	6,720,272	4,249,618	4,164,969	6,057,930	6,672,251	11,444,662	52,696,705
Total dirty primary concentrate	g	906,449	1,272,412	1,034,020	1,612,865	1,019,908	999,593	1,453,903	1,601,340	2,746,719	12,647,209
Total dirty secondary concentrate (middlings)	g	2,870,421	4,029,305	3,274,396	5,107,407	3,229,709	3,165,377	4,604,027	5,070,911	8,697,943	40,049,496

Table 31: Aappaluttoq Prefeasibility Mining schedule

Scheduled aspect	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total / Average
Total primary concentrate mass	g	1,648,089	2,313,476	1,880,036	2,932,482	1,854,379	1,817,441	2,643,460	2,911,528	4,994,035	22,994,926
Primary concentrate shipped	g	1,648,089	2,313,476	1,880,036	2,932,482	1,854,379	1,817,441	2,643,460	2,911,528	4,994,035	22,994,926
Secondary concentrate mass	g	10,939,548	15,356,203	12,479,149	19,464,989	12,308,842	12,063,662	17,546,543	19,325,899	33,148,992	152,633,828
Secondary concentrate stockpiled	g	9,626,803	6,142,481	2,495,830							18,265,114
Secondary concentrate shipped	g	1,312,746	9,213,722	9,983,319	29,091,792	18,451,324	14,559,492	17,546,543	19,325,899	33,148,992	152,633,828
Total concentrate shipped	g	2,960,835	11,527,198	11,863,355	32,024,274	20,305,702	16,376,933	20,190,003	22,237,427	38,143,026	175,628,754
Total corundum in concentrate shipped	g	906,449	1,272,412	1,034,020	9,590,693	8,278,922	7,439,366	6,057,930	6,672,251	11,444,662	52,696,705
Matrix in concentrate	g	2,054,386	10,254,786	10,829,335	22,433,581	12,026,780	8,937,567	14,132,074	15,565,176	26,698,364	122,932,049
HF recovery of corundum from primary	g	906,449	1,272,412	1,034,020	1,612,865	1,019,908	999,593	1,453,903	1,601,340	2,746,719	12,647,209
HF recovery of corundum from secondary	g	344,451	2,417,583	2,619,517	7,633,377	4,841,431	3,820,256	4,604,027	5,070,911	8,697,943	40,049,496
Total dissolved solids	g	1,709,935	7,837,204	8,209,819	22,778,032	14,444,363	11,557,084	14,132,074	15,565,176	26,698,364	122,932,049
Final clean corundum (to sort house)	g	1,250,899	3,689,995	3,653,537	9,246,243	5,861,340	4,819,849	6,057,930	6,672,251	11,444,662	52,696,705

16.12 Tailings and Waste Rock Strategy

For the PFS, full environmental permitting has been concluded and the mine tailings and waste rock will be disposed of in Lake Ukkaata Qaava. Potential acid rock generation is noted for one rock type (ref ARD-ML section) which is a small fraction of the rock exposed in the future mining pit.

The mine plan aims to minimise any ARD-ML impacts by using a sub-aqueous disposal technique. In addition, the processing methodology is purely mechanical and does not rely on any potentially hazardous chemicals.

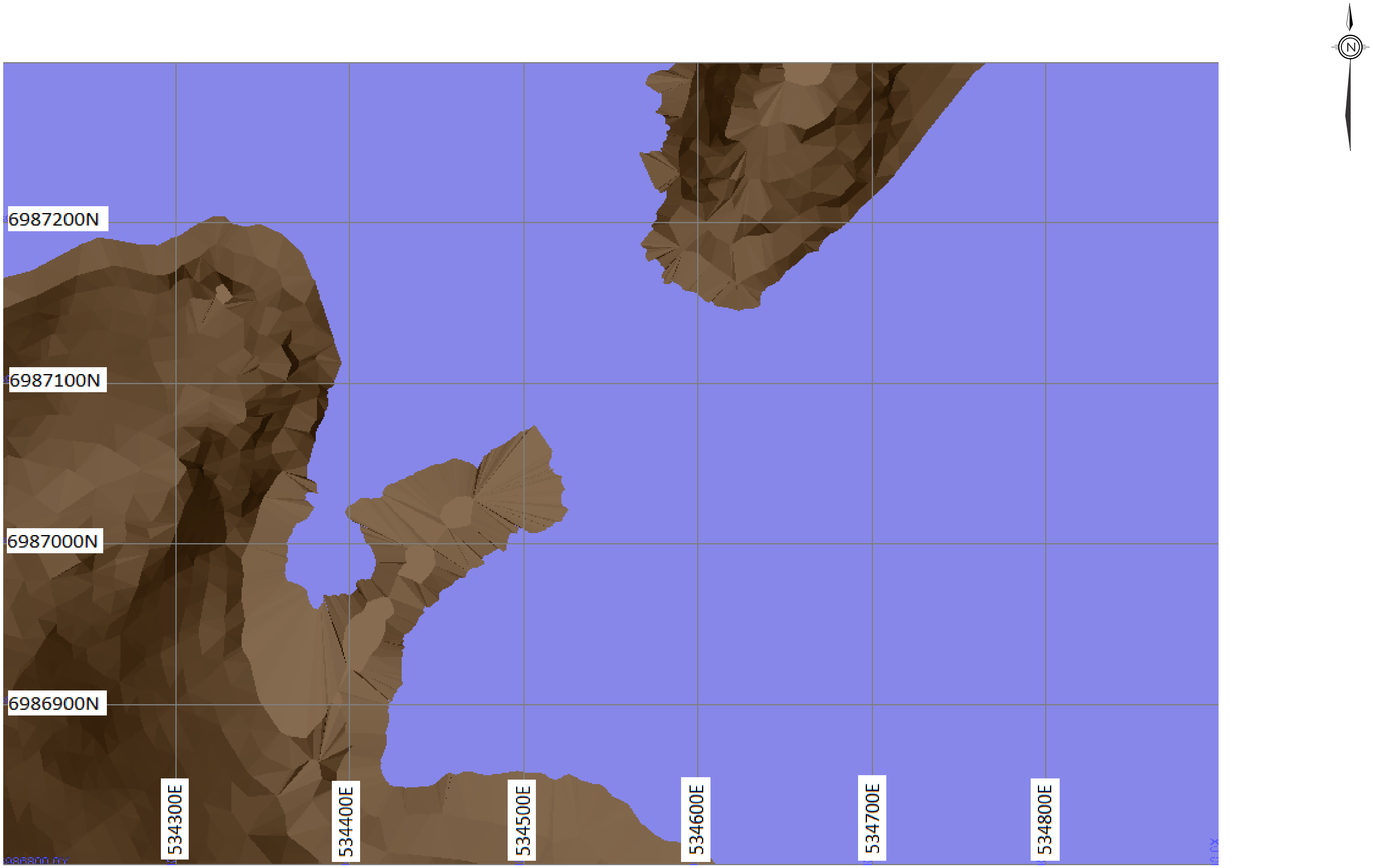
The EIA baseline confirms the lake is not fish bearing; as such subaqueous disposal would suppresses any potential acid and metal leaching as well as minimises visual impacts upon mine closure.

Prior to mining, the lake level is to be drained down by 10 m by the use of a drainage channel off the northern end of the west basin of Lake Ukkaata Qaava. This will provide a safe working zone around the open pit mining area. The draining of the lake will ultimately result in two separate basins, one on the west side of the pit and another on the east side. A second diversion channel, or large diameter pipes, will be constructed between these two basins, linking them and enabling the levels to be equalized. Though the lake levels will be lowered to elevations lower than the planned mining crests, dykes will be constructed to prevent any wave or surge caused by natural rock falls into the lake from reaching the open pit.

Following all mining activities, the mining area will be reclaimed by backfilling the drainage channel and filling the lake back up 10 m to pre-mining levels. The estimated total capacity of Lake Ukkaata Qaava prior to commencing mining is 20 Mm^3, while the capacity is slightly decreased post mining due to slight swell of waste rock and tailings placed in the lake during operations and movement of a small quantity of rock currently protruding from the lake surface to below the water level.

An estimated total of 1.4 Mm^3 of mine waste rock and an estimated total of 77,067 m^3 tailings solid will be deposited into Lake Ukkaata Qaava for a total of 1.5 Mm^3 of solid waste. This is roughly 7% of the total Lake volume.

The pit area is shown prior to mining activities commencing as well as after when the lake levels are increased again in Figure 22 and Figure 23 respectively.



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Open Pit Mining Area before Mining Activities

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Figure 22

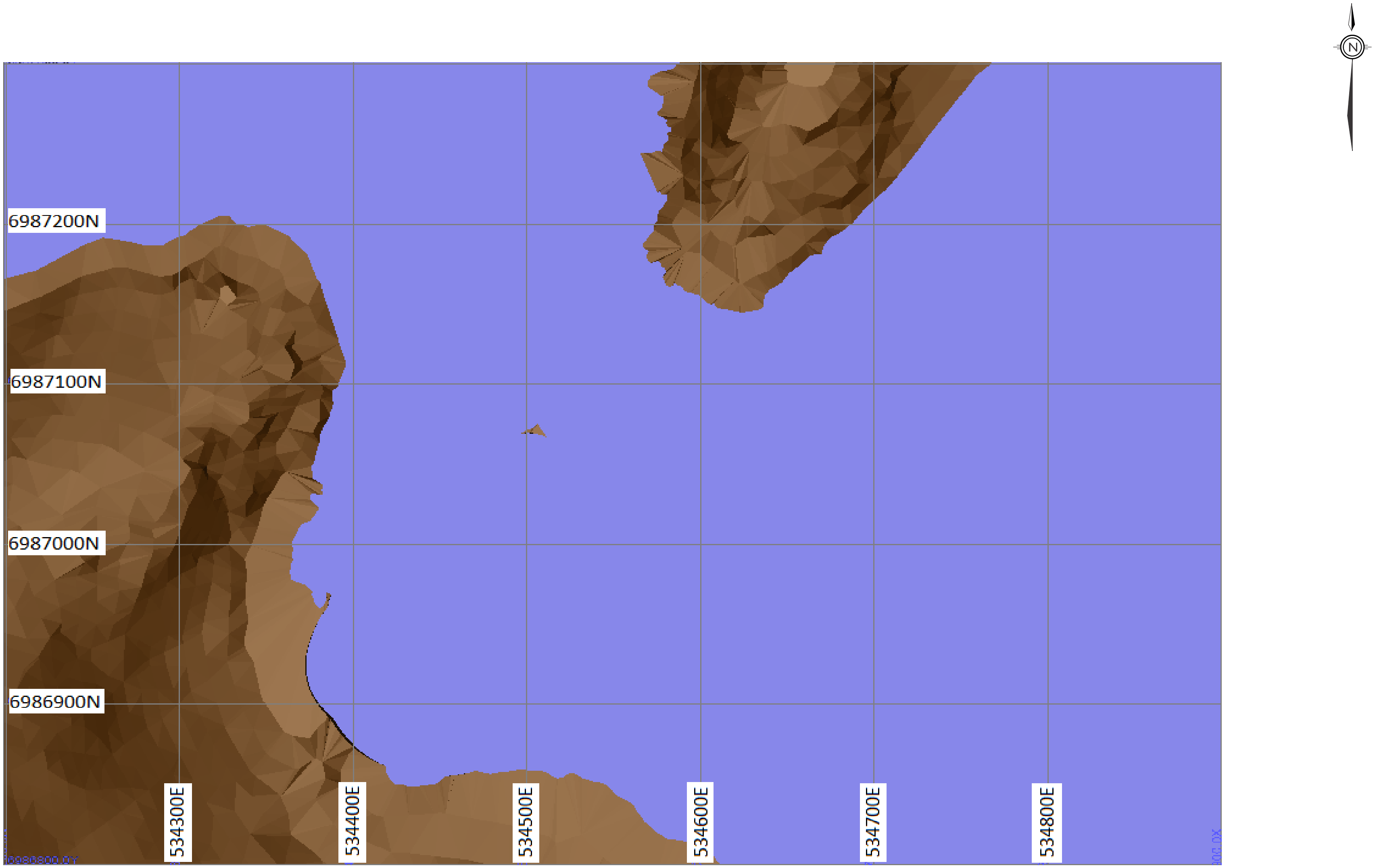

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Figure 23

16.12.1 Tailings

The tailings effluent is proposed to be discharged into the Eastern Basin of Lake Ukkaata Qaava. Processing operations will generate tailings solids as well as 3.8 kl/t of water for every tonne of tailings solids. The east basin has a total in operation capacity of 7.1 Mm^3. A total tailings volume of 529,057 m^3 has been determined for the life of mine. The tailings solids generated from the processing operation deposited into the East Basin will be 77,067 m^3.

The current proposed plan is to discharge the tailings effluent underwater with the ~1km pipe leading from the process plant to the East basin, with the outlet sited deeper than the pynocline. Discharging the tailings effluent at 30 m or deeper would be acceptable, assuming the pynocline would form and be maintained at depths no deeper than 30 m. In addition, tailings are to generate from screening at 1.7 mm and as such the tailings are expected to be relatively coarse.

Any dissolved contaminants or leachate metals, if any, would be contained below the pynocline.

16.12.2 Waste Rock

After appropriate screening, non-ARD/ML waste rock from the initial stages of mining operations will be used for the construction of two flood protection dykes. The dykes will allow pit expansion and protect the pit from the risk of flooding. 44,791 m^3 of waste rock will be required for construction of the diversion dykes. A swell factor was applied and Tetra Tech has estimated that 100,331 tonnes of mined waste rock will be moved to construct the dykes. Any potentially acid generating material that is mined during the construction of the two diversion dykes will be disposed of in the east basin. Note that the schedule above has not considered the amount of potentially acid generating material that will be mined during this construction period and is assumed all material is adequate for the purpose of construction.

Waste rock in excess of that required for construction will be backfilled into Lake Ukkaata Qaava. The risk of material slumping may require a bulldozer to push each load off, rather than direct dumping into the lake (short dump and push). This will be further evaluated during mining operations and may vary depending on how blasting is carried out.

Backfill will progress from the eastern basin side of the lake which should eliminate any risk of sediments polluting the downstream watershed.

Depending on the construction quality of the rock some non-ARD/ML material may be stockpiled on the surface for use in future earthworks such as roads and port maintenance.

16.12.3 Final Waste Dump

The total amount of waste material which will be deposited into Lake Ukkaata Qaava is 1,378,400m^3. This represents 19% of the in operation total volume of the east basin (7,110,309 m^3).

16.12.4 Stability

There are no reasons to expect that there will be stability issues with the mine waste after remediation. During operations, there may be occasional slumping caused when mine waste is dumped into water. These issues will be managed on site by careful monitoring to avoid safety issues.

17.0 RECOVERY METHODS

Information provided in this section has been provided to Tetra Tech by Novus Engineering, who are currently conducting engineering, procurement and construction management for Aappaluttoq processing plant and Nuuk HF facilities. Mark Horan of Tetra Tech has reviewed the information provided by Novus, including engineering drawings, process recoveries and laboratory results and finds this work adequate for inclusion in the PFS.

The True North Gems Aappaluttoq Ruby Project's Process Plant consists of the following primary sub-processes:

- Crushing (Primary & Secondary);
- Scrubbing;
- Dense Media Separation (DMS);
- Drying, Magnetic Separation and Optical Sorting; and
- Services.

A simplified flow chart for these processes is shown in Figure 24**.**

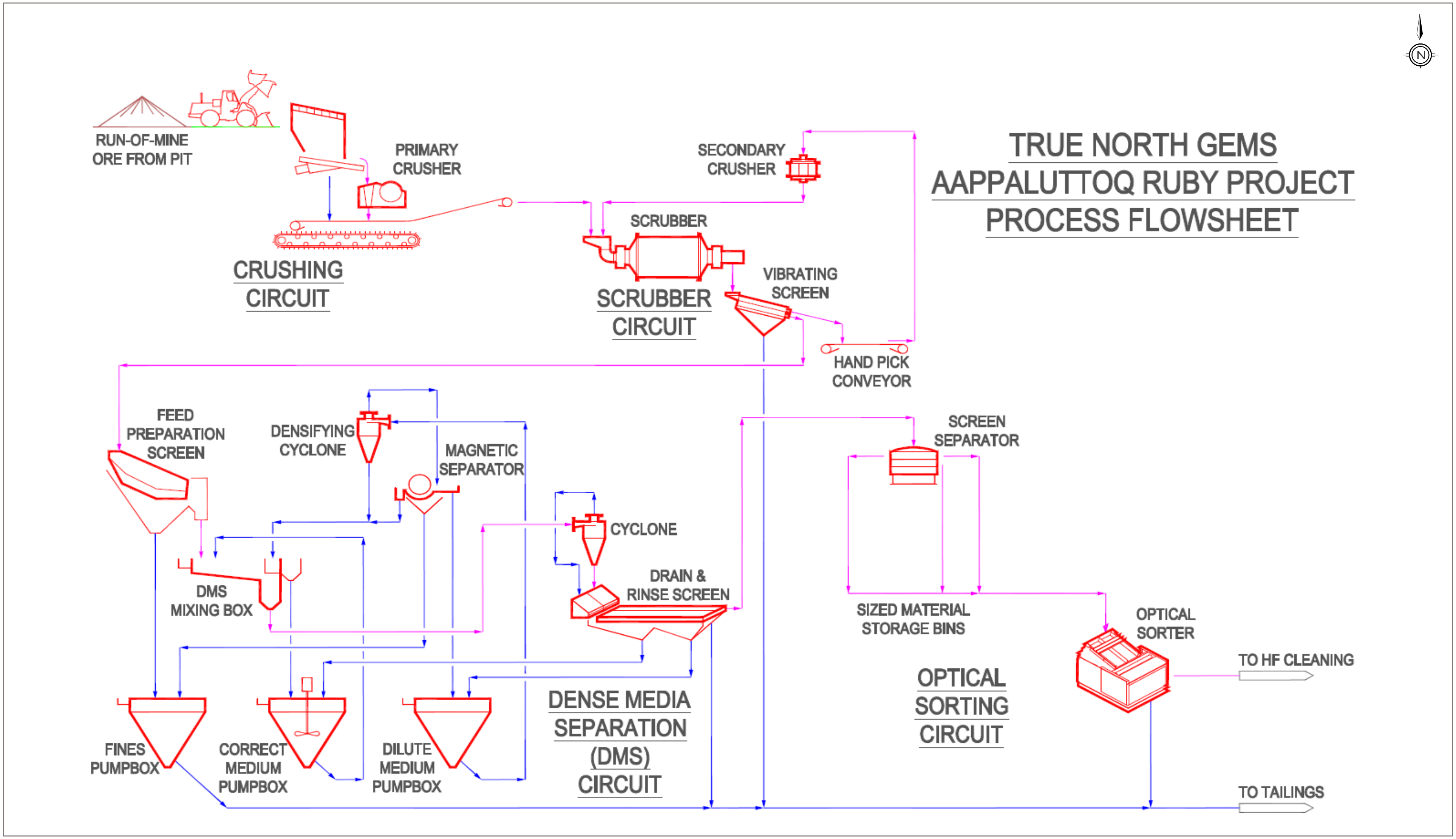

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Figure from "Novus Technical Services"

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Simplified Process Flow sheet

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The process is designed to produce a secured rough corundum concentrate that is predominantly corundum particles with minor host rock attachments. The concentrate will be exported from site for further processing.

All sub-processes described will be housed in a single "Process Building" which is a purpose built steel structure housing not only the sub-process facilities but also the Office / Security structure and all required electrical and control facilities. The Process Building will be located adjacent to the project maintenance facility and in close proximity to the open pit. The Process Building will be heated and ventilated as required to allow for personnel comfort and process operations.

17.1 Crushing (Primary and Secondary)

The crushing facility consists of a Primary Jaw Crusher and Secondary Cone Crusher. Associated belt conveyors provide materials handling and allow for the movement of ore between the crushing units. The Primary Jaw Crusher accepts the Run-of-Mine (ROM) ore delivered from the project pit. Ore is transferred into the Jaw Crusher using a Front-end Loader. ROM ore is delivered at a nominal size of 550mm and below. After processing through the Jaw Crusher nominal ore particle size is reduced to 60mm and below. Jaw Crusher product is delivered to the Scrubbing facilities Feed Bin via belt conveyor.

The Secondary Cone Crusher accepts screened material from the Scrubbing facilities Scrubber Discharge Screen. Incoming ore is delivered to the Cone Crusher via Belt Conveyor the Cone Crusher reduces the incoming material from a size of +20mm to a discharge material size of between 20mm and below. Product from the Cone Crusher reports to the Scrubber Feed Bin.

17.2 Scrubbing

Crushed ore is delivered to the process Scrubber which washes and cleans the incoming ore and delivers the product to a Scrubber Discharge Screen. The Discharge Screen is a horizontal vibrating 3 deck screen which separates the ore into 3 size fractions. +20mm, -20mm to +1.7mm and -1.7mm. The +20mm material is delivered to the Secondary Cone Crusher via the "Hand Pick" area. The "Hand Pick" area is part of the Scrubbing process and allows for a visual inspection of the +20mm material by project personnel. This visual inspection allows for large lumps of Corundum to be manually removed from the process stream which, if delivered to the Secondary Crushing, would possibly result in destruction of larger product quality fragments. The -20mm to +1.7mm is delivered from the scrubber discharge screen to the DMS Facility via a mechanical conveying system and the -1.7mm is discharged into a collection Pump Box and treated as tailings material. This tailings material is pumped to the project's Tailings Storage Facility via a centrifugal pump.

17.3 Dense Media Separation (DMS)

The DMS facility is a "wet" process, the purpose of which is to separate the corundum bearing material from gangue using density. The Milled or atomized Ferro-Silicon (FeSi) powder will be mixed with process water to produce slurry with a bulk density of approximately 2.7 – 3.3 SG. This FeSi slurry will then be mixed with the crushed and scrubbed ore and pumped to a cyclone separator. The Cyclone will provide material separation, producing a "Heavy" or "Sinks" stream and a "Light" or "Floats" stream. Sinks material (including corundum) will report to the cyclone underflow and the floats material will report to the cyclone overflow. The FeSi slurry will be recovered for re-use from both the sinks and floats streams on a combined vibrating screen. The FeSi slurry will be cleaned and densified through the wet magnetic separation and densifying circuits included in the DMS plant.

Float material will then be discarded to tailings and pumped to the project's Tailings Storage Facility via a centrifugal pump.

17.4 Drying, Magnetic Separation and Optical Sorting

The sink material is received from the DMS facility and dried utilizing an infrared dryer. It is then sorted into 3 size fractions using a Vibrating Mechanical Screen (+10mm, -10mm to 4mm and -4mm to +1.7mm). Each size fraction will be stored in an individual surge bin upstream of the dry Magnetic Separator and Optical Sorter and each fraction is processed independently.

The magnetic separator passes the material over a magnetic head pulley on a flat conveyor. The magnetic material is separated from the non-magnetic corundum bearing material and discharged to the tailings system via a mechanical conveyor.

The nonmagnetic material passes to the Optical Sorting process which utilizes a series of cameras to identify the 'red' potential corundum material from the product stream. Once identified, a burst of compressed air separates the identified stone from the product stream. In this manner the incoming product stream is then separated into "Concentrate" (corundum bearing material) and "Rejects" material the latter which is expected to contain minimal or no corundum material content. The Concentrate and Rejects stream will be collected into storage containers and stored within the Process Building. Concentrate material will then be transported to True North Gem's HF cleaning facility in Nuuk, Greenland while the Rejects are stored onsite for potential future re-processing.

Through an external recycle mechanism, the Optical Sorter can produce three different products; a Rejects stream, a Secondary Concentrate Stream (particles that show 10% to 50% of corundum to the sorter cameras) and a Primary Concentrate Stream (particles that show more than 50% corundum to the sorter cameras). The Primary and Secondary concentrate streams will be shipped separately to the HF facility in Nuuk to allow for optimised cleaning processes there.

17.4.1 Optical sorter results

Optical sorting testing was undertaken at Tomra in Germany. The results for a single pass show 24% of corundum going to primary concentrate with 76% of corundum going to secondary concentrate. The primary concentrate contained 55% corundum by weight whereas the secondary corundum contained 26% corundum by weight. The hydrofluoric acid required to digest the primary corundum has been estimated by the SRC in Saskatoon as 700g HF per kilogram concentrate and for the secondary corundum it has been estimated as 1,200g per kg corundum.

17.5 Services

To support the primary processes services are required. Electrical feed and distribution, compressed air and process water are all required for the operation of the primary sub-processes previously described. Incoming electrical feed will be obtained from the overall plant site power grid and report to the required control and distribution equipment. Compressed air will be provided by the site services to compressed air stations within the process plant building. An air drier within the process plant will provide the required instrument air for the process. Process water will be pumped directly from the western lake basin as needed for the processing plant. Process water distribution will be through the use of electrically powered water pumps.

17.6 Operating Schedule, Capacity and Availability

The process plant is scheduled to operate 1 x 12 hour shift per day for 224 days each year between the months of April through November. Design parameters allow for a plant utilization of 90%. The primary crusher is decoupled from the rest of the process by a 100 tonne feed bin and operates on a shorter shift of 2 hours per day.

The nominal plant throughput is 111 tonnes of fresh feed per day. The design plant capacity is 11 tonnes of fresh feed per hour resulting in the required plant utilisation of 83%.

Section 16 details the planned production schedule for the Aappaluttoq operations.

17.7 Tailings Disposal

See section 19.9.1 Tailings for details on tailings disposal.

17.8 Power

The total equipment rated power is 959 kW. The actual draw during operations is expected to be 575 kW which is 60% of the total equipment rated power. Table 32 shows the major equipment and power requirements. Power will be provided by onsite diesel generators.

Table 32: Process equipment list (as used for capital cost estimation)

Description	POWER (kW)
In Pit Lock Box	
Scrubber Feed Bin Feed Conveyor	8.00
Primary Crushing Jaw Crusher (Existing Package)	261.00
Primary Crusher Discharge Belt Magnet	1.00
Scrubber Feed Bin Feed Conveyor Weightometer	1.00
Process Plant Dust Scrubber Fan	
Mill Building Sump Pump	5.00
Process Plant Dust Scrubber	
Secondary Crusher Feed Bin	
Hand Picked Flask	
Hand Pick Conveyor	5.00
Secondary Crusher Feed Bin Feed Conveyor	2.00
Secondary Crusher Discharge Tube Conveyor	6.00
Secondary Crusher	75.00
Secondary Crusher Feeder (VFD)	10.00
Secondary Crusher Feeder Metal Detector	1.00
Hand Picked Lock Box	
Scrubber Feed Bin	
Scrubber Feeder (VFD)	10.00
Scrubber Feed Bin Vent Filter	
Scrubber Discharge Pumpbox	
Scrubber Discharge Pump	10.00
Scrubber Feeder Weightometer	1.00
Scrubber Discharge Screen	10.00
Scrubber	15.00
Dry Mag Separator Product Bin No.1, No. 2 & No. 3	
DMS Floats Oversize Bin No.1 & No. 2 (Future)	
DMS Sinks Optical Sorting Module Discharge Flask No.1	
DMS Sinks Optical Sorting Module Discharge Flask No.2	
DMS Sinks Optical Sorting Module Discharge Flask No.3	

Table 32: Process equipment list (as used for capital cost estimation)

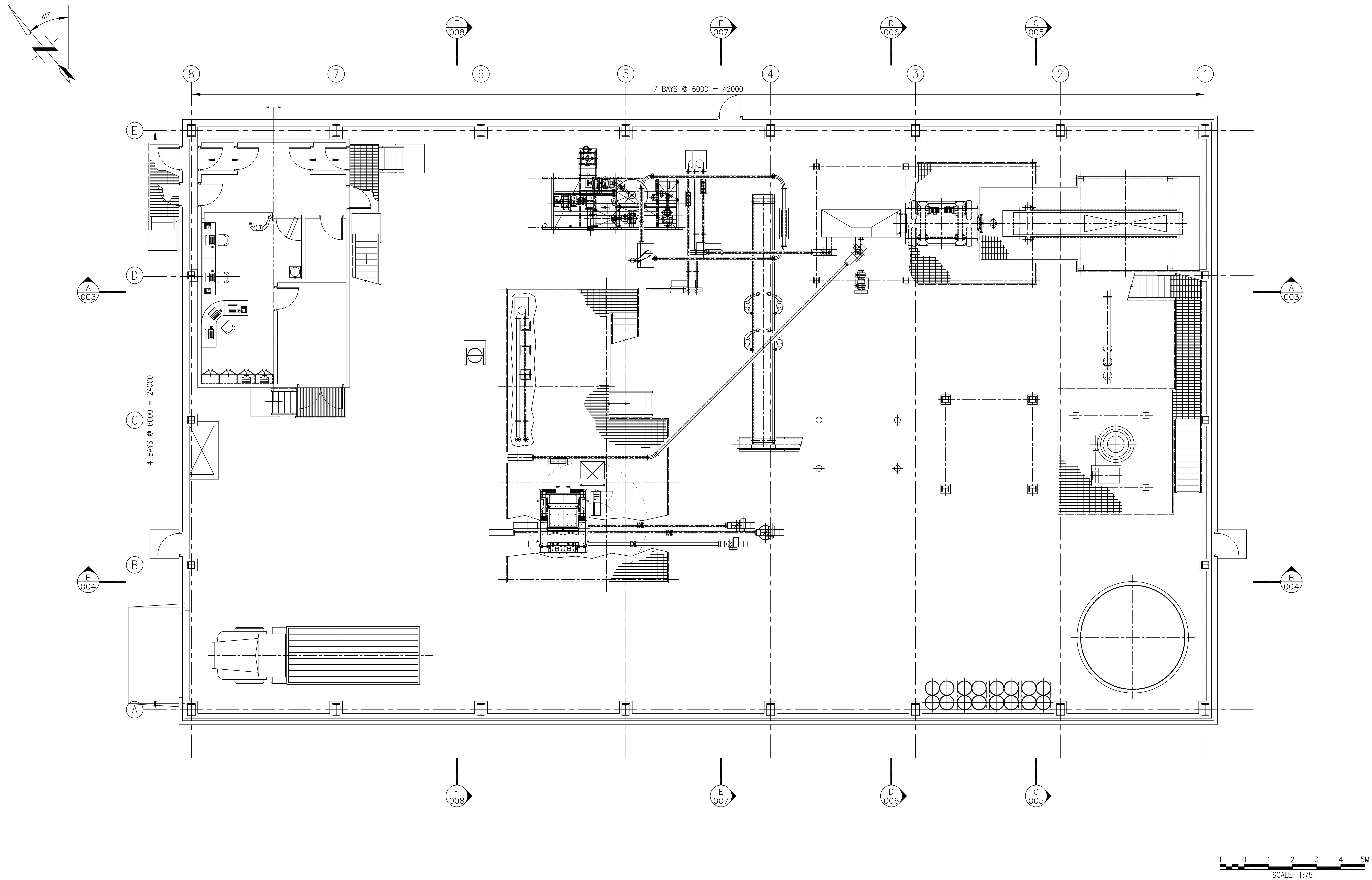
Description	POWER (kW)
DMS Feed Tube Conveyor No 1	6.00
DMS Sink Separation Screen Feed Tube Conveyor	6.00
DMS Floats Tube Conveyor	6.00
Dry Mag Separation Rejects Tube Conveyor	6.00
DMS Sinks Optical Sorting Pass 1 Product Tube Conveyor	6.00
DMS Sinks Optical Sorting Pass 2 Rejects Tube Conveyor	6.00
DMS Recrush Feed Tube Conveyor (Future)	
Optical Sorting Recycle Conveyor	
DMS Sinks Optical Sorting Pass 1 Rejects Tube Conveyor	
DMS Floats Recrush Crusher (Future)	
DMS Cyclone	
Densifying Cyclone	
DMS Sinks Optical Sorting Module Rejects	
DMS Sinks Dryer	75.00
DMS Mixing Box	
Circulating Medium Splitter Box	
DMS Sinks Product Transfer Feeder (VFD)	10.00
DMS Floats Product Transfer Feeder	
DMS Fines Pumpbox	
Correct Medium Pumpbox	
Dilute Medium Pumpbox	
Dense Media Separation Plant	
DMS Fines Pump	10.00
Correct Medium Pump	20.00
Dilute Medium Pump	5.00
Cyclone Feed Pump	10.00
DMS Sump Pump	5.00
DMS Feed Preparation Screen	5.00
DMS Floats/Sinks Split Screen Drain & Rinse Screen	10.00
DMS Sinks Separation Screen	30.00
DMS Floats Separation Screen (Future)	
Magnetic Separator	5.00
DMS Sinks Dry Magnetic Separator	15.00
DMS Sinks Optical Sorting Module	50.00
DMS Floats Sampler	
FESI Drum Lift	
Process Water Pump No.1	
Process Water Pump No.2	
Process Water Vertical Turbine Pump No.1	

Table 32: Process equipment list (as used for capital cost estimation)

Description	POWER (kW)
Process Water Vertical Turbine Pump No.2	
Process Water Tank	
Gland Water Filter	
Gland Water Pump	5.00

17.9 Process plant layout

The process equipment layout is shown in Figure 25, Figure 26, Figure 27 and Figure 28.



DWG. NO.	REFERENCE DRAWINGS
–	–

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C		ISSUED FOR INFORMATION	12JAN15	MdR
B		ISSUED FOR PERMITTING	280314	BRR
A	1	ISSUED FOR CLIENT APPROVAL	11OCT13	AJB

CLIENT | PROJ.MAN. | PROJ.ENG. | PROCESS | ELECTR. | INSTR. | PIPING | MECH. | STRUCT. | SERVICES | ARCH. | LAYOUT

DISCIPLINE: LAYOUT	
SCALE: 1:75	DATE
DESIGNED BY: AJB	01OCT13
DRAWN BY: AJB	01OCT13
CHECKED BY:	
APPROVED BY:	

True North Gems

NOVUS

AAPPALUTTOQ RUBY PROJECT

PROCESS BUILDING
GENERAL ARRANGEMENT
LOWER FLOOR PLAN

CLIENT PROJECT No. –		CLIENT DWG No. –	
FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
2000–10–001.DWG	13–004	2000–10–001	C

13/10/07 13:07

A1

C:\13–004\TRUE NORTH GEMS\10–LAYOUT\DWG\2000–10–001.DWG

SCALE: 1:75

DWG. NO.	REFERENCE DRAWINGS
–	–

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C		ISSUED FOR INFORMATION	12JAN15	MdR
B		ISSUED FOR PERMITTING	280314	BRR
A	1	ISSUED FOR CLIENT APPROVAL	110CT13	AJB

CLIENT, PROJ.MAN., PROJ.ENG., PROCESS, ELECTR., INSTR., PIPING, MECH., STRUCT., SERVICES, ARCH., LAYOUT

DISCIPLINE: LAYOUT		
SCALE:	1:75	DATE
DESIGNED BY:	AJB	01OCT13
DRAWN BY:	AJB	01OCT13
CHECKED BY:		
APPROVED BY:		

TRUE NORTH GEMS

NOVUS

AAPPALUTTOQ RUBY PROJECT

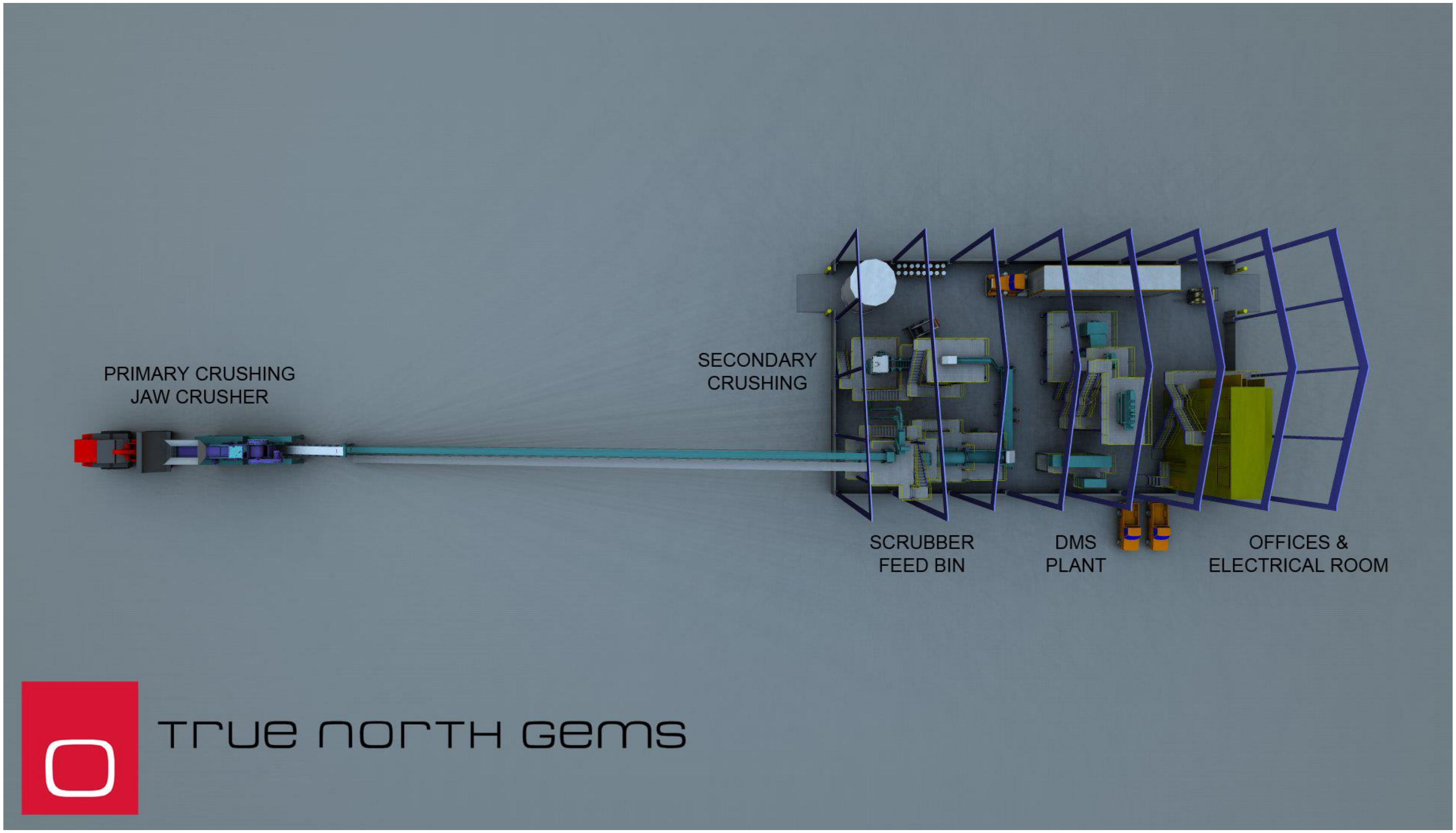
PROCESS BUILDING GENERAL ARRANGEMENT UPPER FLOOR PLAN

CLIENT PROJECT No.	–	CLIENT DWG No.	–
FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
2000-10-002.DWG	13-004	2000-10-002	C

A1

13/10/07

C:\13-004\TRUE NORTH GEMS\10-LAYOUT\DWG\2000-10-002.DWG



LEGEND

NOTES

STATUS

CLIENT

true north gems greenland

TETRA TECH

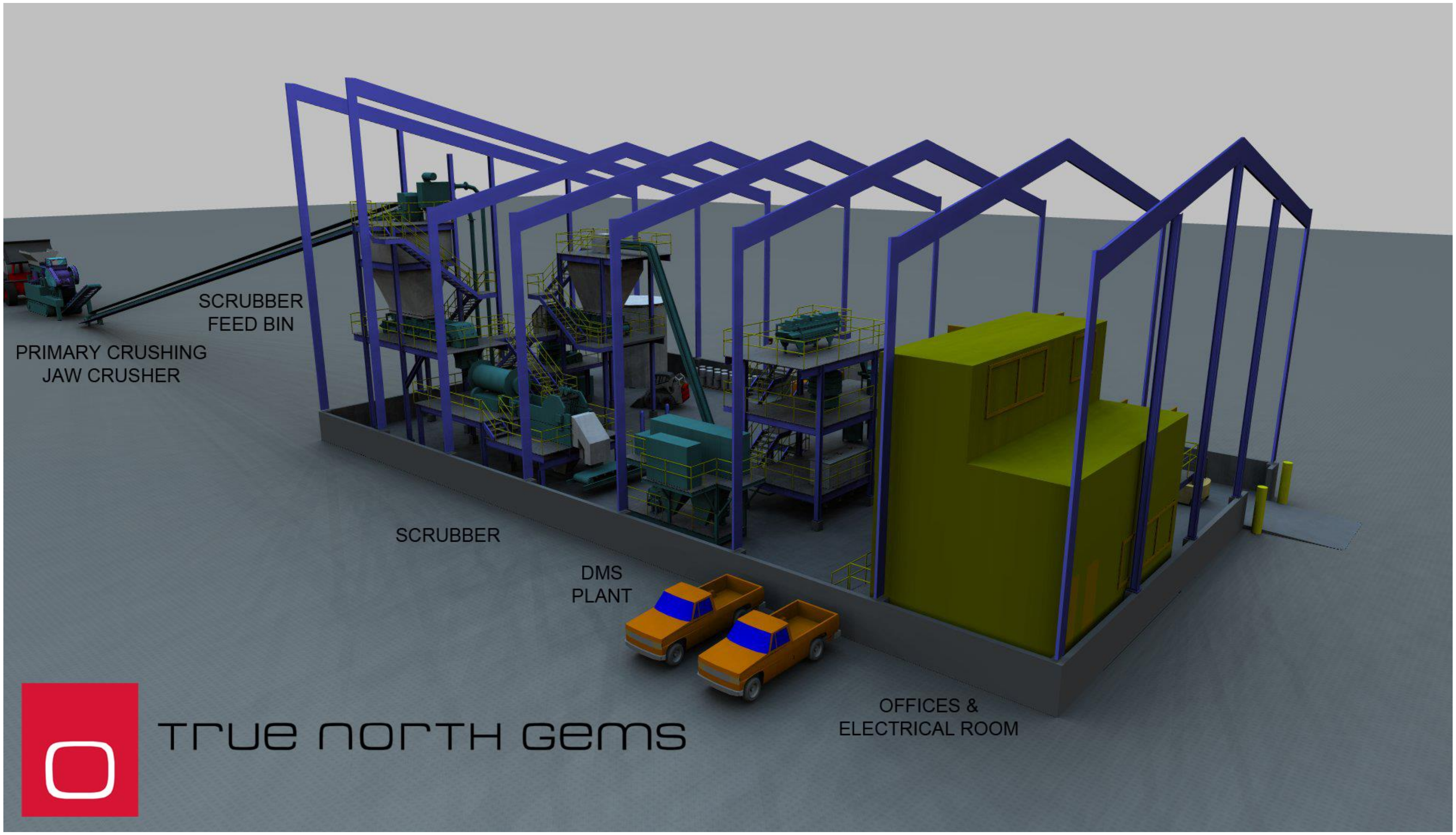
Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Processing Facility (Plan View)

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	0

OFFICE	DATE
EBA-VANC	February 17, 2015

Figure 27



LEGEND

NOTES

STATUS

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TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Processing Facility (Isometric View)

PROJECT NO.	DWN	CKD	APVD	REV
704-v15103083-01	CS		MH	0

OFFICE	DATE
EBA-VANC	February 13, 2015

Figure 28

17.10 Water

- The sources of water for the processing of the ore will be the nearby lake;
- The crushing stage is dry with minimal water used for dust suppression;
- Fresh water will be required for the scrubber, DMS plant and screens; and
- The main plant will also require potable water facilities which are considered to be a small in quantity and have not been included in the estimate of water usage.

Total process water consumption is estimated to be 3.8 Kltr per ore tonne.

17.11 Temporary HF Cleaning Facility

A temporary facility will be constructed in an existing building in Nuuk for the purpose of cleaning the corundum prior to sorting and grading. This facility will have the capacity to treat the optical sorter concentrate with HF acid in a safe and environmentally acceptable manner.

The temporary hydrofluoric acid facility will operate throughout the year. The primary sorter concentrate (approximately 55% corundum by weight) will be treated in sized batches of 20 kg. The incoming concentrate will be check weighed to ensure that there has been no tampering between the mine site and the facility. Concentrate will be loaded into acid resistant carboys and an equal weight of 49% hydrofluoric acid will be added in a fume hood. The carboys will then be put on rollers for a period of 24 to 48 hours where the reaction between the fluoride and the silica, and the mild autogenous grinding process removes all of the non-corundum material. The rollers are located in a negatively pressurised room to ensure that all fumes are captured. The captured fumes and ventilation from the fume hoods is treated in an acid mist scrubber.

After the rolling period, the spent acid is decanted and the remaining corundum is rinsed clean with water. The corundum is then dried in a low temperature oven, weighed and packaged for shipping to the sorting and grading facility.

Spent acid sludge, rinse water and any spillage is directed to the agitated neutralisation tank where the acid is automatically neutralised with slaked lime added by a screw feeder. Once the batch neutralisation process is complete, the contents of the tank are pumped to a plate and frame filter press. Upon completion of the batch filtration, the filter cake is manually removed from the filter and placed in drums ready for export. The liquid from the filtering process will be checked for acidity and any harmful elements and disposed.

For safety, when acid is being moved or transferred, the plant will always be staffed by a minimum of two operators. The operators will be clothed in full chemical protection suits and showers will be available for rinsing suits prior to removal. Safety showers and calcium gluconate neutralizing gel are also provided for incidental acid exposure. The laboratory is within 10 minutes' drive of the Nuuk central hospital.

18.0 PROJECT INFRASTRUCTURE

Tetra Tech has reviewed TNG's plans for construction of the mine site, by means of reviewing the plans developed by TNG, Novus Engineering and LNSG, and the associated drawings. It should be noted that at the time of writing this PFS, construction of the mine site infrastructure was being undertaken. Temporary construction facilities including diesel storage, camp and explosive storage are already in place, whilst Tetra Tech observed evidence of construction activity including roads, camp and permanent port facilities. Currently TNG and LNSG have planned the following facilities for construction:

1. Mine camp including gym, catering and recreation facilities.
2. Mine offices.
3. Process facility.
4. Mine workshop.
5. Outer port facilities.
6. Explosive storage and magazines.
7. Fuel storage at outer port and at camp.
8. Process power generation.
9. Camp power generation.
10. Site roads including culverts and bridges.
11. Helipad.

Detailed engineering drawings of site works and infrastructure required for the mining operation have been undertaken by Inuplan, a Greenlandic engineering company as well as by Novus Engineering.

These drawings were provided to Tetra Tech for review, and are highlighted in Table 33 to Table 42.

An overview of the mine site layout is provided in Figure 29.

LEGEND

- Site Road
- Pit
- Dyke
- Building
- Exploitation Licence Area (ss16)

NOTES
Base data source:
Data and imagery provided by
True North Gems (Feb 2015)

STATUS
ISSUED FOR REVIEW

UPDATED PRE-FEASIBILITY STUDY ON THE AAPPALUTTOQ RUBY PROJECT GREENLAND

Site Plan

PROJECTION	DATUM	CLIENT
UTM Zone 22	NAD83	true north gems greenland

Scale: 1:15,000
200 100 0 200
Metres

TETRA TECH EBA

FILE NO.
V15103083-01_100_Figure28_SiteLayout.mxd

PROJECT NO.	DWN	CKD	APVD	REV
V15103083-01.100	MEZ	SL	MH	0

OFFICE	DATE
Tt EBA-VANC	February 18, 2015

Figure 28

Q:\Vancouver\GIS\ENGINEERING\V151\V15103083-01\Maps\100\V15103083-01_100_Figure28_SiteLayout.mxd modified 2/18/2015 by morgan.zondervan

It is further noted that TNG has in house expertise relating to Greenlandic and Danish construction codes as applicable. TNG is currently engaged in reviewing plans for their mine site and the Nuuk facilities and interacting with the Greenland government regarding the designs and construction of the infrastructure.

Tetra Tech has established that the engineering done is at a level adequate for the PFS, and serves as a basis for the capital and operating cost estimates for the economics analysis. Details of the infrastructure are included below.

18.1 Permafrost Considerations

Tetra Tech considered the impact of permafrost soil/rock conditions on the proposed mine development infrastructure given the northern latitude of the project site.

The following summarizes the data reviewed:

1. Two very high quality aerial photographs covering the area of interest for the development provided by TNG.
2. Publically available maps showing the distribution of permafrost in Greenland.
3. A publication titled, “Permafrost degradation risk zone using simulation models (Daanen, et al., 2011).
4. Meteorological data for Nuuk located 145 km to the northwest and for Paamiut 120 km to the southwest of the project area.
5. A large number of photos taken by TNG and Tetra Tech personnel while on site at various times.

18.1.1 Findings and Recommendations

The review of the above noted information has led to the following findings and recommendations:

1. Examination of the aerial photographs did not identify any landforms indicative of hazardous permafrost conditions. As was known, bedrock outcrops cover perhaps 80% of the area of interest. There is an abundance of cobble and boulder sized material scattered on the ground surface. Where surficial soils do exist it appears to be a relatively thin veneer.
2. Available permafrost distribution maps indicate that the site is located in an area where permafrost conditions are noted to be “isolated or at most, sporadic” indicating that permafrost conditions would only be expected in 10% to perhaps 25% of the area.
3. Figure 30 from the noted paper is presented below. This figure would indicate that the area is likely to be permafrost free.

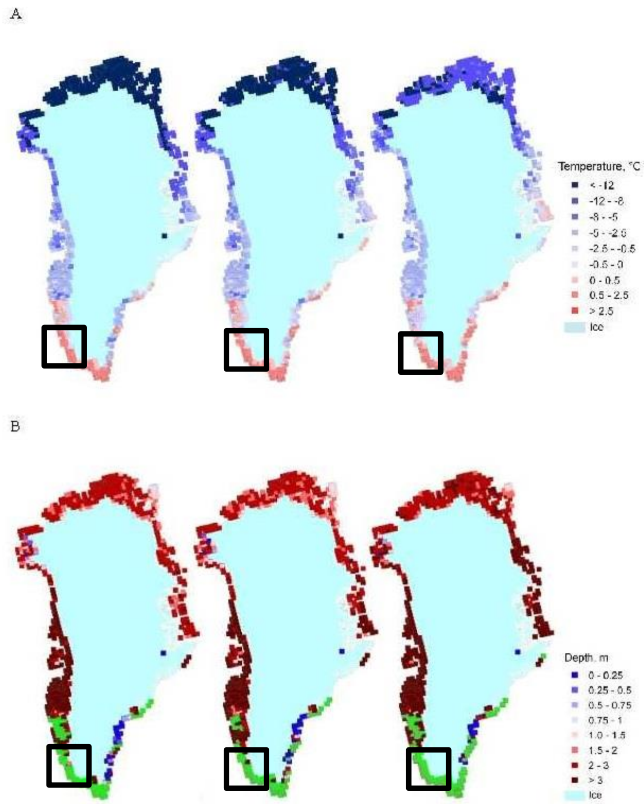

Fig. 3. **(A)** Bedrock temperature distribution at 2 m depth for an average over the periods 1955–1965, 1995–2005, and 2065–2075. **(B)** Active layer depth distribution in bedrock for an average over the periods 1955–1965, 1995–2005, and 2065–2075. The green color represents a permafrost free zone.

LEGEND

NOTES

STATUS

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Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Bedrock Temperature & Active Layer Distribution

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	

OFFICE	DATE
EBA-VANC	February 13, 2015

Figure 30

Mean annual air temperatures for Nuuk and Paamiut were determined to be -1.4 and -0.8°C, respectively. Annual air temperature obviously determines the presence or lack of permafrost and the ground temperatures, although other meteorological conditions such as precipitation, snow cover, solar radiation, etc. also impact ground temperatures. Regardless, ground temperatures at depth in permafrost areas are on average typically 3° to perhaps as much as 4°C warmer than the mean annual air temperature. Using this “rule of thumb”, permafrost would not likely be expected to exist at the site.

The examined photos do not appear to show the presence of any landforms indicative of hazardous permafrost conditions.

Based on this assessment, it is concluded that permafrost conditions are unlikely to be found in the soil/rock at the project site and therefore special geotechnical designs that would consider permafrost are not expected to be required. The locations for the various infrastructure components: camp, process plant, truck shop etc. have been selected so that they would be founded on outcropping bedrock. It is also understood that the access roads would simply be constructed by “padding” over the ground surface. Both are appropriate design approaches for this site.

18.2 Mine site infrastructure

18.2.1 Camp

The camp is located north east of the process facility see Figure 29. The camp consists of 4 detached buildings consisting of 12 rooms each, a laundry room and living quarters. The camp will also include a common area that will house a gym and open area for hosting other events, another building that will have office space, a separate building for a clinic, and lastly the Main Hall. The hall consists of 2 change rooms, a reception area, canteen, kitchen and stock room. Towards the north side of the camp will be the power plant, switch house, waste water treatment plant and waterworks area. This will all be housed behind a gabion wall barrier for noise mitigation. The power supply to the camp will be diesel supplied. See Figure 31 for a plan view of the general camp arrangement.

Table 33: Mine Camp Engineering Drawings

Camp		
Title	**Drawing #**	**Design Firm**
Hydraulic Section, ECO-line	1011	AEC
Explosive Storage Site Map	I 100-0	Inuplan
Operations Camp Plan	I 101-3	Inuplan
Operations Camp Water and Sewage Pipe Plan	I 102-0	Inuplan
Operations Camp Principal Trench Cross Sections	I 103-0	Inuplan
Camp Power Plant Tank Plan/Section	I 104-2	Inuplan
Operations Camp Water Treatment Plan	I 105-1	Inuplan
Operations Camp Foundations, Plan	I 106-0	Inuplan
Operations Camp Typical Sections Camp, Details	I 107-2	Inuplan
Kitchen Plan	PR13178	KEN Storkokken

LEGEND

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TETRA TECH

Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland

Camp and HeliPad

PROJECT NO.	DWN	CKD	APVD	REV
704-V15103083-01	CS		MH	0

OFFICE	DATE
EBA-VANC	February 13, 2015

Figure 31

18.2.2 Workshop

The workshop will be located to the north east side of the process building near to the proposed pit location. The workshop building will be a 1 bay structure with some office space adjacent to the workshop bay area. The workshop will also include a washroom as well as a utilities room on the main floor with Kitchen upstairs. Outside the Workshop will be a 10,000 L fuel tank as well as a 2,500 L sewage tank and pump. Power, water, and heating will all be shared with the process building.

Table 34: Workshop Engineering Drawings

Workshop		
Title	**Drawing #**	**Design Firm**
Site Plan	I 200-1	Inuplan
Views	I 201-0	Inuplan
Concrete Constructions Plans, Details	I 202-2	Inuplan
Steel Constructions Views, Sections	I 203-0	Inuplan
Sections	I 204-0	Inuplan
Concrete Constructions Details	I 205-1	Inuplan
Constructions Plan and views	I 206-0	Inuplan
Concrete Constructions Plans, Installations	I 207-0	Inuplan

18.2.3 Access Roads

Access roads will be constructed on site linking all infrastructure. This includes the open pit, process plant, explosives storage area, camp site, and the outer port. Plan overview of this can be seen in Figure 29. The main stretch of the access road will include bridges where required.

Table 35: Engineering Drawings of Mine Site Access Roads

Access Roads		
Title	**Drawing #**	**Design Firm**
Access Roads Overview Site plan	I 300-1	Inuplan
Access Roads Port Road, Plan	I 301-1	Inuplan
Access Roads Port Road, Length Profile	I 302-0	Inuplan
Access Roads Camp Road, Plan	I 303-0	Inuplan
Access Roads Camp Road, Length Profile	I 304-0	Inuplan
Access Roads Process Road, Plan	I 305-2	Inuplan
Access Roads Process Road, Length Profile	I 306-2	Inuplan
Access Roads Process Roads, Length Profile 2	I 307-2	Inuplan
Access Roads Explosive Road, Plan	I 308-1	Inuplan
Access Roads Explosive Road, Length Profile	I 309-1	Inuplan
Access Roads Drainage Channels and Dam, Plan	I 310-0	Inuplan
Access Roads Drain Channels and Dam, Length Profile	I 311-0	Inuplan
Access Roads Principal Road, Dam and channel Cross Sections	I 312-0	Inuplan

Table 36: Bridge General Arrangement Drawing

Bridge		
Title	Drawing #	Design Firm
Bridge General Arrangement	I 900-0	Inuplan

18.2.4 Outer Port

The outer port will be constructed with 4 piles driven into ground 7.5 m below water level with a stick up of 4.1 m above water level in 4 corners with 9.618 m between them. Tie rods will be used to connect all piles. A stone berm will protect the front of the pier head below water level. 30 tonne bollards will be placed in all 4 corners of the offshore portion of the port with 2 bollards on land. The entire length of the port is to be 26 m.

Table 37: Engineering Drawings for Outer Port

Outer Port		
Title	Drawing #	Design Firm
Outer Port Site Plan	I 400-0	Inuplan
Outer Port Views, Sections	I 401-0	Inuplan
Outer Port Rammeplan	I 402-0	Inuplan
Outer Port Bollard on Port, Details of Anchors	I 410-0	Inuplan
Outer Port Handle Bar Details	I 411-0	Inuplan
Outer Port Attachment Hammer	I 412-0	Inuplan
Outer Port Section Coating	I 413-0	Inuplan
Outer Port Bollard on Land	I 414-0	Inuplan
Outer Port Fender and Bollard Bases	I 415-1	Inuplan
Outer Port Steel Sheet Details Upper Walling	I 416-0	Inuplan

18.2.5 Helipad

The Helipad will be located to the east side of the camp, with the access road passing between the camp and helipad. The helipad will be circular in shape and be an elevated pad constructed from 0.2 m of blasted rock backfill and another 0.1 m of screed stone aggregate. The outer edges will have a 1:1.5 slope. See Figure 31.

Table 38: Helipad Engineering Drawings

Helipad		
Title	Drawing #	Design Firm
Helipad Location Plan	I 500-0	Inuplan
Helipad Site Plan	I 501-1	Inuplan
Helipad Section	I 502-0	Inuplan

18.2.6 Fuel Storage

The main fuel tank and station will be positioned directly east of the pier site. The fuel storage area will consist of two 100 cubic metre double skinned fuel tanks encompassed with gravel minimum 300 mm around the tanks liners. The remaining will be land filling, with stabile and draining materials sloping at edges at 1:1.5. This storage area will be surrounded with a 2.0 m fence. A supply line will then run out to the 10’ supply container. The fueling surface will be gravelled with an underlying impermeable membrane.

Table 39: Fuel Storage Bay Engineering Drawings

Fuel Storage		
Title	**Drawing #**	**Design Firm**
Fuel Storage General Arrangement	I 601-2	Inuplan
Fuel Storage Principal Diagram	I 602-1	Inuplan

18.2.7 Explosive Storage

The explosive storage will be located between the process building and the main camp site, approximately half way between the two. A barb wire fence will surround the explosive storage area, which will be recontoured to make the surface area flat. A Berm will be constructed within the fenced area to separate the containers containing the Detonator, Ammonium Nitrate, and Mixer.

Table 40: Explosive Storage Area Engineering Drawings

Explosive Storage		
Title	**Drawing #**	**Design Firm**
Explosive Storage Site Map	I 700-1	Inuplan
Explosive Storage General Arrangement	I 701-1	Inuplan

18.2.8 Process Building

The process building is located north of the pit and is situated on the northern side of the Ukkaata Qaava next to the workshop. The process facility will consist of a crusher on the east side of the road. A pad for stockpiling will be constructed such that a wheeled loader can feed the crusher. A conveyor will then transport the crushed ore over to the west side of the access road and will feed the mill plant. The process building itself is planned as a single detached building with all processing equipment installed as well as some office spaces and washrooms.

Table 41: Process Facility Engineering Drawings

Process Building		
Title	**Drawing #**	**Design Firm**
Plant Site General Arrangement Plan	1000-10-001	Novus
Process Building Arrangement Plan	2000-11-001	Novus
Process Building Arrangement Section A	2000-11-002	Novus
Process Building Arrangement Section B	2000-11-003	Novus
Process Building Arrangement Section C	2000-11-004	Novus
Construction Plans	I 1001-0	Inuplan
Concrete Construction Plans	I 1002-0	Inuplan
Concrete Construction Section Views	I 1003-0	Inuplan
Concrete Construction Details	I 1004-0	Inuplan
Concrete Construction Details	I 1005-1	Inuplan
Construction Plan and Views	I 1006-0	Inuplan
Steel Construction Steel frames and Facades, Views	I 1007-0	Inuplan
Steel Construction Steel frames, Views	I 1008-0	Inuplan
Steel Construction Facades, Views	I 1009-0	Inuplan

18.2.9 Security/Office Complex

Within the process building will be housed a security and office complex to store recovered concentrate prior to shipping to Nuuk for processing.

Table 42: Security/Office Complex Engineering Drawings

Security		
Title	**Drawing #**	**Design Firm**
Ancillary Facilities Process Building arrangement Security/Office Complex Ground Floor Plan	5400-11-001	Novus
Ancillary Facilities Process Building arrangement Security/Office Complex Upper Floor Plan	5400-11-002	Novus

18.2.10 Water supply

Water will be sourced from Lake Ukkaata Qaava, using an electrical power vertical turbine pump. The pump will be mounted on a floating barge or floating jetty arrangement. The water will then be stored at the process facility, no treatment is required. Water for the camp will be sourced from a water source unassociated with mining and processing.

18.2.11 Water treatment

The camp construction will include facilities for potable water treatment and sewage treatment, prior to disposal. These will be engineered prepackaged containerised units.

18.2.12 Power supply

Tetra Tech has considered the use of 7 power generating facilities for the PFS. These include the port, camp, process facility, workshops, explosive storage facility, mining facility and a boiler at the workshop. All facilities will be diesel powered. Heating for the process facility and workshop will be provided by the boiler as heat exchange from diesel powered generators is not expected to be practical due to the small size of the generators. The camp will use a diesel powered generator for all utilities other than for the gas cookers in the kitchen. Smaller generators will be used for powering lights at the explosives storage facility and for power at the port.

Note that TNG has been had consultation with various parties regarding the construction of renewable power generation facilities. At the time of writing the agreements were not in place to enable consideration of the renewables as a basis for the PFS.

18.2.13 Temporary Nuuk HF facility

During the first three years of operations, TNG plan to rent an industrial property in Nuuk for undertaking HF processing of the corundum. This will consist of a working area including fume hoods, for working with the HF, storage areas and work benches for working with the corundum. This facility will be setup with facilities for safe handling and disposal of HF and security services will be provided.

Grading of the corundum will be done at the current TNG offices which include vault facilities for storage of gemstones.

18.2.14 Nuuk offices and permanent HF facility

TNG are currently planning to construct an office facility and an upgraded HF processing building in Nuuk during year 3 of operations. This will include permanent HF working areas with fume hoods and sorting tables. Details of this building have not yet been determined, though this PFS includes a cost for construction of this facility based on TNG knowledge of Greenlandic construction costs and provisional plans.

19.0 MARKET STUDIES AND CONTRACTS

For the purpose of completing the PFS, GemWorld International provided a report on the current global market conditions for gem corundum and associated jewelry. Extracts from this report have been reproduced here.

This section examines issues related to the gem corundum (ruby and sapphire) market. The primary focus of this is to provide specific details regarding the colored stone industry and its market structure as they relate to the price forecasts and trends.

19.1 Considerations in Colored Stone Market and Price Research

The global gemstone trade does not lend well to transparency. The rough stone trade is generally unregulated with a significant amount of informal trade. It is the author's researched opinion that the size of the global informal trade by volume is 3X that of the formal trade. To place this figure into context, the reported precious gems production for 2012 was 105M carats. This figure excludes diamond, jadeite, and pearls.

Considerable illegitimate trade exists and even members of the "legal trade" will understate product value in a number of circumstances including import/export related ones. As a result certain official statistics and figures obtained from governmental and related agency sources that purport to state production and market size should be regarded as establishing the minimum amounts as measured by both quantity and value of product. The actual is likely larger. These points are essential to a considered understanding of the colored stone market and its growth potential.

Demand for most colored gem varieties is growing. The colored gemstone jewelry market is forecast to grow at rate of 7% per year globally through 2020. The trade is currently estimated at $14B representing slightly more than 6% of the total retail jewelry market. However, the increasing consumer appetite for colored stones in both emerging and traditional markets is expected to result in colored stones capturing a significantly larger share of the retail jewelry market and is motivated by strong economic growth trends in emerging markets. China, India and the USA are leading consumers of gemstone jewelry.

19.2 Rough Market and Price

The arrival of a small number of large scale producers (i.e., Gemfields, True North Gems,) operating in the colored stone mining sector is offering some improved transparency regarding production and value.

The evaluation of gem rough is not precise. The nature of mineral rough invites considerable subjectivity into the process of quality grading. For purposes of this report the rough is broadly categorized as non-gem rough, near-gem rough or gem rough. Gem rough is further rated by its crystal form, transparency, color, clarity and size.

The classic source of gem quality ruby is Burma (Myanmar). Mining at this source has occurred for centuries and as result there is very little production currently. This has led to a severe shortage of gem quality ruby in the market. More recent sources have been developed. The most notable of these include Montepuez in Mozambique, mined by UK based Gemfields. Significant corundum deposits have also been discovered in Greenland. This resource is particularly promising as a reliable source of natural (non-heated) pink sapphire and ruby.

19.3 Greenland

The corundum deposits reported in Greenland are consistent with other hard rock formations in that they can contain a higher percentage of non-gem grade material. This is not unusual. Gemstones by their very nature are rare. The Aappaluttoq deposit, exhibits some surface glacial erosion, though it is theorized that larger, higher clarity crystals exist below this zone and reside protected from weathering in the permafrost zone.

Unlike polished gemstones which are typically priced per carat, rough is generally priced by kilogram, or gram for near-gem and gem material. The rough prices reported in this document are stated by gram and based on research conducted between February 1st and 8th 2015 by GemWorld. By conducting interviews with industry members and examining corundum rough projected to yield polished stones to those represented by the client as typical for the production, it is the author's opinion that a per kilogram value of $250 can be anticipated for that rough suitable for carving and bead fabrication to much as $1,000 per kilo for the better end of these grades; while a per gram value of $10 can be anticipated with as much as $60 per gram achieved for the range of facet-grade gem qualities. This conclusion is based on the critical assumption that the samples examined are typical of the deposit as has been represented. Branding offers the potential for additional value capture.

The market for smalls is active and projected to grow on demand for melee to be consumed in the jewelry manufacturing. Major markets include China and India for export and internal consumption, as well as consumption in the North American market. These major markets are expected to drive demand.

Natural ruby and pink sapphire melee in both near gem and gem qualities are highly saleable. It is understood that production of natural gem quality ruby and pink sapphire is insufficient to meet demand. As a result the industry has grown increasingly reliant on corundum treated by one or more methods to meet this demand. One of the chief attractions to the Aappaluttoq corundum material is TNG's commitment to marketing the rough in its natural state. Any gem quality ruby or sapphire not subjected to heat treatment is rare and expected to achieve a premium value as a result. Preliminary research of the melee market indicates that a premium of approximately 15% - 20% for no-heat gem material exists in pink sapphire. The premium is slightly higher for ruby.

19.4 Conclusion and Price Analysis

The size of the colored stone market is not well understood. In contrast to the diamond industry where a small number of producers account for most of the production, in the colored stone trade small-scale miners currently account for an estimated 80% of the production.

The colored stone trade currently accounts for about 10% of the total market by value. It is projected to increase by approximately 7% per year through 2020.

Prices for most colored stone varieties above the commercial qualities have increased during the past decade. This general trend is also observed if one examines the market over a sufficiently long period to be able to reconcile both pricing peaks and valleys.

Prices for natural, fine quality ruby and sapphire have increased since 2009, with the increases recorded in the ruby category being particularly dramatic. Prices are projected to continue to rise on tight supply and growing demand.

Several key conditions have proven influential to the natural ruby and sapphire market. These include: The strong interest in owning natural ruby and sapphire as a vehicle of wealth preservation; red is culturally an important color in China; ruby and sapphire production is waning at the classic sources. Ruby and sapphire prices are expected to continue to experience upward momentum as supply lags behind demand.

Current market conditions support strong growth for both ruby and pink and result from increasing demand among manufacturers and reduced production from classic sources. Prices are trending up in response. There is currently no indication that demand will decline. Worldwide, the population of consumers is growing. This growth compared to the limited production of natural ruby and sapphire supports a positive long-term outlook.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Environment Impact Assessment

Under Section 16 of the Mineral Resources Act (Greenland) a full Environmental Impact Assessment (EIA) was required as part of exploitation licence application. This was completed and filed by True North GEMS (TNG) in June 2011 and approved with amendments by the Government of Greenland upon signing of the Exploitation Licence in March of 2014. A summary of the major points within the EIA has been enclosed below; please see the publically available EIA for further details and background (http://naalakkersuisut.gl/en/Hearings/Hearing-Archive/2013/TNG-QEQ).

20.2 Expected Impacts

20.2.1 Landscape

Lowering the lake will leave a portion of the lake dry and barren for the duration of the mining operation. Thus, the mine pit and the process plant will have large aesthetic impact on landscape around the lake and pit for the medium-term; but this is only visible from close-up (or from the air) due to the topography surrounding the area. Most of this impact is neutralized when the lake level is restored and the mine pit is covered with water as part of the closure plan. The most visible and long lasting effect on the landscape will be from the quarry used for construction materials before opening the mine pit and from the roads and staging areas which will be visible for an extended period after closure.

20.2.2 Ukkaata Qaava Lake

The lake is deep, very clear, with little vegetation, and contains no fish or birdlife. The lowering of the surface level, building safety bunds/dikes, depositing waste rock and tailings will reduce clarity and change the lake dynamic. However, the water residence time is more than one year in each lake basin and no significant amount of suspended matter is expected to reach the outlet.

Ramboll (2010) concluded that the potential for acid generation and for metal leaching from the deposited tailings material is zero to low potential. Please see ARD/ML section that follows.

Along with the tailings a small amount (up to 10 tonnes per year) of a fine grained ferrosilicon alloy is deposited as run-off from the dense media circuit in the processing plant. This dense media is used to separate the ruby from the host rock. The heavy ferrosilicon particles are essentially inert and are mainly deposited deep in the sediment and so do not pose a threat to either sediment or water quality. The lake is expected to slowly restore its dynamic and clarity when the mine closes. The surface level will be restored within 2-3 years of closing the drainage trench upon closure of the mine.

20.2.3 The Fjord

The Tasiusaa fjord has somewhat brackish surface water due to the high input of freshwater and the shallow sill at the outlet to Tasiusarsuaq sea fjord. The impact due to the change of the fresh-water outlet during the lake water level adjustment is small and only insignificant impacts from pier construction and run-off from road and other constructions are expected. The impact from the outlet of treated wastewater from the camp is expected to be insignificant.

20.2.4 The Terrestrial Nature and Wildlife

The project area is situated in the low arctic oceanic plant region and the dominating plant communities are:

- Crowberry/bog bilberry heath community with club mosses and lichens.
- Birch heath community dominated by dwarf birch.
- Willow scrub community with northern willow reaching more than 1 m in sheltered spots.
- Fen and mire wetland communities - small areas usually adjacent to lakes and streams.

These plant communities are abundant in south western Greenland and no rare or protected plants have been found in the area. The mine pit, camp, staging areas, roads and other infra- structure may occupy an area of up to 120,000 m^2 (12 ha), now mostly covered by vegetation. Compared to the vast extent of these vegetation types, this area is insignificant and the impact is regarded as small and localized, although the rehabilitation of the vegetation in areas use for roads and other barren areas is very slow.

The three terrestrial mammals: caribou, fox, and hare are found abundant in the area throughout the year and are hunted in-season. The nearest caribou calving area is about 60 km away, and will not be disturbed. The loss of grazing area due to the project is regarded as insignificant.

Few birds are found in the project area, but ptarmigan are common and hunted by local hunters. White tailed eagle is nesting north of the inner gate and by the shore 9 km south- west of the mine. Common eider and razorbill are abundant during the summer season in Tasiusarsuaq; 20 km south of the area is the shallow fjord area called Ikkattoq which is designated as a protected bird (Ramsar) area, i.e. an area of international importance due to the many nesting and moulting water birds and to nesting white tailed eagle. White tailed eagle is sensitive to helicopter traffic to site during its breeding season. Helicopter traffic to the outer port should be minimized and flying north and east of the Inner gate should be avoided completely; designated no fly zones have been suggested in connection with the projects helipad. The Ikkatoq area should also be avoided, but this is not within the usual transport corridors for the project. If these rules are observed only minor local impacts on the wildlife are expected during the construction and operation of the mine.

20.2.5 Emissions

Blasting, heavy machinery, vehicles, power plants etc. generate noise, dust and emission of gasses. An average fuel consumption of up to 1,000,000 liters per year is expected. Gaseous emissions and noise are kept to a minimum by using modern machinery complying with Greenlandic standards. Helicopter traffic should be regulated as mentioned above. Dust is kept to a minimum mainly by watering roads and pit area when necessary.

20.2.6 The Nuuk facility

The cleaning and sorting of the ruby rough will take place in Nuuk. The rough will be cleaned of its attached silicate material by a process using hydrofluoric acid. The work will take place on a laboratory approved by the authorities for handling and storage of the necessary chemicals. The acid waste from the process will be neutralized with lime, the remainder of the waste will consist of a liquid phase (including some trace metals from the dissolved rocks), and a precipitate consisting primarily of inert calcium fluoride (CaF_2) and silicate compounds. Until further studies prove this waste is environmentally safe to dispose in local landfills or sewer systems, the waste will be shipped for further processing and disposal outside of Greenland. When these precautions are taken the impact on the environment will be insignificant.

20.2.7 Environment Management Plan

An Environmental Management Plan will be prepared prior to the opening of the mine. It outlines among other things how the risks of identified in the EIA will be mitigated during the construction, operation and decommissioning phases of the mine project and it outlines how the environmental performance will be monitored.

20.2.8 Environmental Monitoring

Environmental monitoring is to be carried out during construction, operation and decommissioning of the mine. True North has submitted its mine monitoring program to the Greenland Government and is await approval of this prior to mine start-up. Monitoring is underway for the construction period. The monitoring is focused on heavy metal pollution and acidification and will cover emissions to water recipients, the surface water quality, and the content of heavy metals in marine biota, sediments and lichens.

An environmental study baseline study has been carried out since 2007 and the monitoring program will to a certain extent build on this program.

20.2.9 ARD & ML

Two screening programs for acid rock generation and metal leaching potential have been run by True North since 2007. The first was completed in 2010 and formed part of the original EIA (See Appendix 3 of the EIA), the second was recently conducted on rock where infrastructure development was planned or where significant blasting was due to occur. Both test programs were completed by B. Soregaroli and R. Lawrence Consulting of Vancouver with petrography provided by Vancouver Petrographics and Hummingbird Geological Consulting.

20.2.9.1 Primary Screening Program

First screening program comprised a 109 core samples from Aappaluttoq, representing sulphide-bearing and non-sulphide intervals of each major lithology at the property, were selected and put through an analytical program that included:

- Acid-Base Accounting (ABA) using the Modified ABA NP method (MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991).
- Total sulphur and sulphate-sulphur speciation analysis to determine sulphide-sulphur content, by the difference between the two Elemental (trace metals) and analysis by aqua-regia digestion followed by ICP-MS scan.
- Whole Rock analysis by Li-metaborate fusion followed by x-ray fluorescence (XRF) spectroscopy.
- Mineralogical assessment of 6 samples, conducted by Vancouver Petrographics.
- Short-term leaching tests on 20 select samples, using shake-flash extraction in distilled water followed by ICP-MS scan.

The principal conclusions resulting from this initial assessment were:

- Lithological units that are not generally of concern with respect to potential acid generation, include pegmatite (PEG) and phlogopite (PHLOG), which represent the ore and tailings, sapphirine/gedrite (SAPGED), overburden (OVB) and non-sulphide ultramafics (UM). Sulphides do not appear to be generally associated with these rock types.

- A few lithological units, such as mafic gabbro (GABM), gneiss (GNS) and sulphide-bearing ultramafics (UMS) may be of concern with respect to potential acid generation. These concerns are directly related to sulphide concentrations in the relative absence of adequate neutralizing potential. The planned subaqueous deposition of most waste rock and tailings material in the lake will minimize sulphide weathering and reduce potential acid generation to negligible rates by limiting exposure to free oxygen. Short-term leaching tests indicated that these elements are not likely to be mobilized to any significant extent under the neutral pH drainage conditions that prevail at the project site.

This report recommended the development of a screening program for rock designated for infrastructure use, open pit water quality measurements during operations, and flooding of the pit post-closure. Table 43 Summarizes Elements of Potential Concern by rocktype.

Table 43: Elements of concern by rocktype

Lithology	Elements of Potential Concern
Gabbro	As, Cu (Pb, V)
Gneiss	(As, Cu)
Overburden	–
Pegmatite	(As, Cu, Ni, Pb, V)
Phlogopite	Ni, V (As, Cr, Cu)
Sapphirine/Gedrite	(As, Ni)
Ultramafic	As, Cu (Ni, V)

Short-term leaching test work suggests that only very minor metal leaching should be expected from these materials at the property. Monitoring of runoff and lake water quality where subaqueous deposition occurs is recommended, but mitigation measures are not expected to be necessary.

20.2.9.2 Secondary Screening Program

The second ARD/ML test program targeted the infrastructure areas and was designed to alleviate the need for an on-site screening program prior to bedrock being utilized for building work.

The mineralogical characterization and whole rock analysis performed by Hummingbird Geological Services of Vancouver, BC confirmed that the samples are all of the gneiss lithotype. The samples were all described as altered granite in the mineralogy report, and further described as either orthogneiss (4 samples) or quartz-rich granitoid (2 samples).

Acid Base Accounting - as the gneiss samples contained no carbonates and no sulphides, there was minimal neutralizing potential and no acid producing potential. In reference to the conclusions and recommendations of the 'Initial Assessment' report (May 2011), the gneiss lithotype was identified as a material of potential ARD concern when greater that 0.1% sulphides are present, due to the lack of any effective neutralizing potential. As these screening samples do not contain any sulphides (below the 0.01% detection limit for all samples), they are classified as non-acid generating material and there is no concern regarding their ARD potential.

Metal Leaching - No metals of potential concern were identified in the 6 gneiss samples submitted. In the 'Initial Assessment' report (May 2011), arsenic and copper were identified as potential elements of concern in gneiss samples containing sulphides. However, as sulphides were not present in the screening samples, copper concentrations were not significant (2.1 – 6.8 µg/g compared to a global crustal average of 68 µg/g), and arsenic was below the 1 µg/g method detection limit in all samples.

Based on these results, metal leaching is not expected to be a concern for infrastructure development, and short-term leach testing was not deemed to be necessary for these screening samples. Further assessment of the newly exposed bedrock along roads, drainage channels etc. will be conducted as part of the mine monitoring program.

20.2.10 Water Management and Treatment

Drinking water supply will be from local freshwater lakes in a different basin/catchment area to the mine operations area. Wastewater is discharged to the fjord through a mobile sewage plant.

Process water is required in the process facilities for the concentration plant, screen and jigs. The process water consumption is estimated to be 3.8 m^3 per tonne of ore or up to about 500 m^3/day. No foreign chemicals or treatment is needed for the process water. The sources of water for the processing of the ore will be the lake or the stream entering the lake in the southernmost corner. Water is furthermore used for dust suppression in the quarry, in the mine pit and on the roads. This water will be taken from the lake or the stream below the lake.

Rain water and water seeping into the mine pit from the lake will accumulate in the sump in the bottom of the pit and on each bench. From here it will be pumped to a settling dam at the pit crest before it is discharge into lake or used for dust suppression. The water in the pond will be regularly monitored for contaminants and if necessary will be circuited through an oil-water separator for cleaning.

Sewage will be treated in modular biological-chemical sewage plant and wastewater discharged to the fjord.

20.2.11 Environmental Conclusion

It is made probable that the Aappaluttoq ruby and pink sapphire mining project can be realized without major environmental impact during construction and operation. The mine pit, waste rock and tailings will for the main part be hidden under water, and although the remains of the infrastructure and the quarry will be visible for an extended period of time, the long term impact will be small.

20.3 Heritage Resources

20.3.1 Summary

The Greenland National Museum and Archives (NKA) completed an archaeological survey at the Aappaluttoq ruby project on request from True North Gems. According to the Greenland Conservation Act of May 19th 2010 NKA must be involved in the planning phase for exploitation of resources in Greenland (§11 subsection 2). As the area of interest was unknown regarding to cultural heritage sites NKA recommended an archaeological survey be completed.

Seventeen (17) cultural heritage sites were located and mapped during the survey, all relating to the Inuit and their descendants that were not known to the Greenlandic authorities prior to this survey. It is the assessment of NKA that natural heritage conflicts with the mining activities in the area can be avoided.

20.3.2 Results

Table 44 shows the heritage sites found during the archeological survey.

Table 44: Summary of heritage sites found

Type	Number
Tent Ring	10
Shelter	1
Hunters Beds	1
Graves	1
Cairn Systems	5
Shooting Blinds	1

20.3.3 Conclusion and recommendations

The best solution for True North Gems, if plans for mining in the area are to be realized, is to avoid the identified sites of cultural remains. The Greenland Conservation Act places a limit of 20 meters around the archaeological structures for preservation.

If a conflict with heritage sites cannot be avoided negotiations between TNG and NKA probably can provide a solution that is acceptable for both parts, as none of the heritage sites found in the project area are unique. For further information please consult the full Archaeological Report filed as part of the publically available Environmental Impact Assessment Appendices.

20.3.4 Social Impact Assessment

True North completed the draft Social Impact Assessment (SIA) for the Aappaluttoq ruby and pink sapphire mining project in June 2011. This went through all stages of Government review, public hearings and was finalized in January 2014. The SIA was formally approved by the Bureau of Minerals and Petroleum on behalf of the Greenland Government in early March 2014 upon granting of the 30-year exploitation licence.

The SIA was designed and prepared by Grontmij A/S on behalf of TNG, according to the *Guidelines for Social Impact Assessment for mining projects in Greenland*, Bureau of Minerals and Petroleum (BMP), now Ministry of Mineral Resources (MMR), November 2009 (the Guidelines). The full SIA and its executive summary are available on the True North website for public download; however, important extracts have been summarized below.

20.3.5 The SIA process

The SIA process started in July 2009 with the elaboration of a preliminary Scoping document. Scoping consultations with stakeholders and field work in Nuuk and Qeqertarsuatsiaat were performed in February 2011. As a result of the scoping phase, Terms of Reference (ToR) were agreed and submitted to the authorities for review and comment; revised versions of these documents were made publicly available in Greenlandic, English and Danish on True North's website on March 21st 2011.

The SIA covers the construction stage, the operational stage and closure of the proposed mine and describes the socioeconomic baseline in Greenland and in the areas affected by the project. The SIA evaluates likely socioeconomic impacts related to the project and identifies measures to mitigate negative impacts. The social impacts have been assessed at two different levels: potential local impacts on the village of Qeqertarsuatsiaat (the closest to the mine) and impacts at regional and national level (Nuuk, Kommuneqarfik Sermersooq and at Greenland level).

Once prepared the draft SIA was sent to the BMP for review and was posted for the public on both the BMP and TNGs websites for comments. Based on the feedback received during the review and public hearing process, a revised final SIA will be prepared and submitted. The conclusions of the revised final SIA forms the basis for negotiations between the Greenland Government, the municipality and the company resulting in a signed Impact Benefit Agreement (IBA).

20.3.6 Social and Economic Baseline

The Draft SIA describes the social and economic baseline, addressing the relevant context in Greenland in general and for the Qeqertarsuatsiaat area in particular. The baseline study provides information on demographic, economic conditions and trends, political structures, local organisations, cultural traits, and other factors that can influence the way in which affected communities will respond to anticipated changes brought about by the proposed project. The baseline study also helps to predict in which way the Project will be affected by these factors. For full information on the current baseline, please refer to the full SIA report. Table 45 summarises the social impact study results.

Table 45: Summary of positive and negative social impacts and social risks expected from the project

Impact Analysis: Expected positive impacts and opportunities	Impact Analysis: Expected negative impacts and social risks
Generation of local employment	Conflict with other economic sectors
Local business opportunities	Social conflicts
Synergy with other sectors at national level	Vulnerable groups in Qeqertarsuatsiaat
Taxes and revenues	Access to natural areas of importance
Education and training	Sites of cultural importance
	Occupational health and safety
	Health and quality of life
	Public services and infrastructure

20.3.7 Impact and Mitigation Results

Anticipated social impacts are summarised in the above tables with colours indicating their magnitude and significance both before and after applying mitigation measures. The public concerns identified during the consultations with stakeholders in Nuuk and Qeqertarsuatsiaat have also been considered when assessing the significance of the impacts. Mitigation measures have been identified for all impacts likely to occur that are adverse in nature and significant enough to require mitigation (i.e. medium and high-level negative impacts). Table 46 and Table 47, show the social impacts of the Aappaluttoq Project before and after the implementation of mitigation measures.

Table 46: Potential Impact of Aappaluttoq Project before the implementation of mitigation measures

Impact categories	General Impacts (Municipal/National)	Local Specific (Qeqertarsuatsiaat)
Economic environment		
Employment	+M	+L
Local business life	+M	+L
Conflict/synergies with other sectors	+L	-M

Table 46: Potential Impact of Aappaluttoq Project before the implementation of mitigation measures

Impact categories	General Impacts (Municipal/National)	Local Specific (Qeqertarsuatsiaat)
Changes on traditional production systems		-L
Salary boost	Non relevant	
Taxes and revenues	+M	Not significant
Education and training	+M	+M
Public service and development plans		
Existing infrastructure and services	-L	Not significant
Pressure on development plans	Not significant	+L
Social and health services	Not significant	
Social aspects		
Demography and population	Not significant	
Social conflicts	Not significant	-H
Vulnerable groups	Not significant	-L
Health		
Occupational health and risk of accidents	-M	
Public health and quality of life	Not significant	Not significant
Environmental impact	Not significant	-L
Cultural and natural values		
Sites of monumental or cultural importance	Not significant	-L
Access to natural areas	Not significant	-M

Table 47: Potential Impact of Aappaluttoq Project *after* the implementation of mitigation measures

Impact categories	General Impacts (Municipal/National)	Local Specific (Qeqertarsuatsiaat)
Economic environment		
Employment	+M	+M
Local business life	+M	+M
Conflict/synergies with other sectors	+M	-M
Changes on traditional production systems		-L
Salary boost	Not significant	+L
Taxes and revenues	+M	Not significant
Education and training	+H	+M
Public service and development plans		
Existing infrastructure and services	-L	+L
Pressure on development plans	Not significant	+L
Social and health services	Not significant	
Social aspects		

Table 47: Potential Impact of Aappaluttoq Project *after* the implementation of mitigation measures

Impact categories	General Impacts (Municipal/National)	Local Specific (Qeqertarsuatsiaat)
Demography and population	Not significant	
Social conflicts	-L	-M
Vulnerable groups	Not significant	-L
Health		
Occupational health and risk of accidents	-L	
Public health and quality of life	+L	+L
Environmental impact	Not significant	-L
Cultural an natural values		
Sites of monumental or cultural importance	Not significant	Not significant
Access to natural areas	Not significant	-L

20.3.8 White Book and Approved Impact Benefit Agreement

After public hearings in fall 2013 the draft SIA was revised into its final form with all of the comments generated from the public consultation process being compiled into the 'White Book'. This is a matrix showing the identified impact and the Company's response and/or mitigation. Upon completion and acceptance of the White Book by the Greenland Government, formal negotiations for the Impact Benefit Agreement (IBA) began in spring of 2014. These negotiations spelled out the company's social commitments and focussed on employment and training. The IBA was formally agreed by all parties on June 4th 2014; effectively ending the formal permitting process and allowing mine development to move forward.

The successful completion of mine permitting through Sections 16, 19 & 43 of the new Mineral Resource Act (as described above) is the first time in Greenland's history that this new process has been completed since the country acquired home rule from Denmark.

Section 86 of the Mineral Resource Act is now in effect; this governs the development and construction of the mine.

20.4 Permits

The Company's interest in the Property is governed by "Exclusive Licence No. 2014/21 for Exploitation of Certain Minerals in Areas at Aappaluttoq in West Greenland" from the Government of Greenland – Ministry of Industry and Mineral Resources (the "Exploitation License"), which Exploitation License became effective on March 10th 2014. A full copy of the Exploitation License is available under the Company's SEDAR filings at www.sedar.com.

The Exploitation License is an exclusive 30-year exploitation (mining) licence respecting the exploitation of ruby, pink sapphire and other red, reddish, pink, pinkish, lilac, white or whitish corundum ("Minerals") from the Property. The Government of Greenland may, but is not obligated to, extend the Exploitation License in accordance with the Mineral Resources Act (Greenland), provided that the total license period cannot exceed 50 years. The Government of Greenland has the right to revoke the Exploitation License if, among other things, the Company fails to comply with the Mineral Resources Act (Greenland), the Company fails to comply with the terms of the Exploitation License, the Company does not fulfill or comply with an order issued by the Government of Greenland under the Exploitation License, or if a condition for granting and/or upholding the Exploitation Licence is no longer met and/or complied with, including the conditions under the Exploitation or under the Mineral Resources Act (Greenland).

Under the Exploitation Licence, the Company has agreed to pay a gross revenue royalty (the “Gross Royalty”) to the Government of Greenland of 5.5% on all sales of Minerals exploited from the Aappaluttoq Ruby Deposit. The gross royalty will be payable in each calendar year when the total aggregate paid by the Company in corporate taxes, withholding taxes and “surplus royalty” are less than the calculated gross royalty in that calendar year. The surplus royalty is calculated at a rate of 15% on earnings before financial items and tax on any profit in any calendar year to the extent the annual profit exceeds the profit margin percentage of 40%.

The Company paid an initial fee of DKK 100,000 for the grant of the Exploitation License and shall pay a fee of DKK 200,000 upon each extension of the Exploitation License. The Company is also obligated to reimburse the Government of Greenland for annual expenses of up to 250,000 DKK for the further training of employees doing work related to mineral resource activities. The fees payable are subject to adjustment on the basis of the Greenland consumer price index.

The Exploitation License includes requirements and provisions respecting the storage, handling, transportation, processing and sale of Minerals. In addition, the Exploitation License includes provisions respecting: the deemed timing of sales of Minerals; how Minerals may be sold; the determination of the volume of Minerals sold; the determination of the value of Minerals sold; reporting obligations of the Company with respect to the Company’s activities under the Exploitation License and the sale of Minerals and royalties payable; sales or transfers to parties related to the Company; the use and employment of Greenlandic workers on the Property; the use of Minerals as security for financing transactions; the Company’s information technology systems respecting the Minerals; and the Company’s obligations on termination of activities under the Exploitation License.

The Company is required to respect all existing rights pertaining to the Property, including rights under licences for prospecting, exploration and exploitation of mineral resources. However, the Company is permitted to close off limited onshore areas, to the extent necessary, for the purpose of performing specific mineral resource activities, provided that the Government of Greenland has given prior permission thereto.

20.5 Mine Closure

True North Gem’s environmental policy includes a commitment to progressively rehabilitate disturbed areas, to develop and adhere to the mine closure plan that will be continuously improved and updated as the project progresses.

Acknowledging that the Company is only a temporary user of land that will be returned to nature at the end of the mine life, the Project design has been optimized to reduce the footprint and to facilitate closure and rehabilitation. The following activities are part of the planned mine closure and were used to estimate the costs of Rehabilitation of the Project:

- No building will be left in place. Where possible equipment and goods will be recycled and all equipment and machinery will be sent out of the mine site for sale.
- On-site roads and tracks will be scarified and re-vegetated where required.
- The pit area will no longer be dewatered and will gradually become part the Lake, as it was prior to the mining activity.
- The drainage channel will be backfilled and sealed, allowing the lake to rise 10m to its pre-mining level. This will fill the pit and cover the majority of roads and other infrastructure in the basin.
- Whenever possible, surface water drainage will be re-established to conditions similar to the original hydrological system.

- The explosives storage facilities, inner & outer ports, mining and exploration camp will be dismantled and removed from site.
- Re-vegetation, hydrology and geochemistry will be monitored after mine closure is completed.

As part of the Section 19 & 43 (of the Greenlandic mineral code) approval True North were required to place into escrow the total estimated rehabilitation costs of the project. As each section of the infrastructure is started then a corresponding deposit into the environmental escrow is made, thus by the start of mining the environmental account will enable full reclamation of the project to occur and no further deductions for mine closure will be required at the end of the LOM. The amounts of escrow provided are discussed in section 22 of this document.

21.0 CAPITAL AND OPERATING COSTS

For the purpose of the PFS Tetra Tech and TNG have considered two scenarios for evaluation. The first assumes that the project is 100% owned by TNG and shareholders and TNG is required to expense all project costs at 100%. For this scenario upfront capital costs provided by LNSG are considered cash costs to TNG and no leasing or shareholder agreements are included.

The second scenario evaluates the project as it is being advanced which includes a joint venture (JV) agreement with LNSG, which results in reduction upfront cash requirements. This scenario will be referred to as the LNSG JV for the purpose of the PFS.

Note that the capital and operating costs are planned around the LNSG JV, with the effect of the LNSG JV evaluated in the structuring of the economics and not the cost estimates.

This scenario considers that for the construction and operation of the Aappaluttoq mine, TNG have made an agreement with LNSG whereby LNSG will fund and construct all aspects of the mine site with the exception of supplying processing equipment and indirect capital costs, and in doing so earn a 27% share in the project. TNGG will thereafter lease the completed infrastructure from LNSG from mine earnings. Furthermore LNSG will operate the mine once constructed on the basis of a cost plus fee (10%) approach. True North will re-bill TNGG for the cost of marketing and sales of the gemstones at a cost plus fee (10%).

Tetra Tech has estimated the LNSG JV cash costs of constructing and operating the mine based on this agreement.

Other general assumptions that have been made for estimation of operating and capital costs for the project are:

1. An exchange rate of CAD$0.191:DKK1.
2. An exchange rate of CAD$1.24: US$1.
3. A fuel cost of $1.34 delivered to site.
4. Mine site operations of 230 days per year.
5. Nuuk operations year round.
6. Year 1 to have three months total mining and only one month of processing.
7. The temporary processing facility will be run for three years after which the permanent facility will be operated.
8. The temporary processing facility has capacity limited to 50 kg of concentrate per day.

21.1 Capital costs

Tetra Tech has reviewed costs provided by LNSG, TNG and Novus Engineering for the construction of the infrastructure required for the Aappaluttoq project. As described above the construction aspects covered under the LNSG JV are not realised as a cash cost for scenario 2. However the breakdown of the total capital expenses are presented, such that the LNSG contribution is disclosed and scenario 1 economics can be evaluated.

These costs are summarised in Table 48.

Table 48: Summary of Aappaluttoq capital cost estimates for the PFS

Item	Life of Mine	2015	2016	2017
Mine site construction	$21,118,948	$21,118,948		
Process equipment	$3,327,618	$3,327,618		
Temp Nuuk HF facility	$252,720	$252,720		
Permanent Nuuk	$5,732,865	$0	$1,719,860	$4,013,006
Total direct costs in CAD$	**$30,432,150**	**$24,699,285**	**$1,719,860**	**$4,013,006**
Indirect	$340,213	$340,213		
Owners costs	$575,047	$516,168	$29,439	$29,439
Total Indirect in CAD$	$915,259	$856,381	$29,439	$29,439
Total Capital in CAD$	**$31,347,410**	**$25,555,666**	**$1,749,299**	**$4,042,445**
Total Capital in US$	**$25,077,928**	**$20,444,533**	**$1,399,439**	**$3,233,956**

21.1.1 Mining equipment capital costs

Tetra Tech has reviewed a list of mining equipment to be used at the Aappaluttoq site. This list is presented in Table 29. Tetra Tech understands that LNSG will recover equipment capital costs through equipment hire charges made to TNG during the operating phase of the project. Thus no direct cash capital cost is applicable to mining costs. It is understood that LNSG will cover mobilisation costs of equipment to site and any onsite assembly.

21.1.2 Mine site infrastructure - LNSG

Under the LNSG JV, the following infrastructure will be purchased and constructed by LNSG with no cash cost to TNGG. LNSG is currently constructing these facilities and has provided cost estimates totalling the amounts as shown in CAD$ in Table 49. Due to the fact that much of this infrastructure is currently being constructed, and due to the nature of the arrangements with LNSG, no contingency has been applied to this capital cost estimate as cost over-runs on the construction are entirely covered by LNS.

Table 49: Capital cost for infrastructure being constructed (converted from DKK to CAD$ at a rate of CAD$ 0.191 to DKK 1)

Summary of quotes in CAD$								
Items	**Labour costs**	**Materials cost**	**Construction equipment**	**Subcontracts**	**Purchases**	**Freight**	**Consumables**	**Total cost**
Construction camp	$570,624	$595,722	$3,414				$180,222	$1,349,982
Operations camp	$454,674	$759,715	$58,504	$276,630	$3,463,566	$107,415	$48,263	$5,168,767
Workshop	$204,125	$61,040	$37,080	$45,909	$347,435	$80,136	$44,791	$820,516
Communications	$39,238	$19,619	$9,810	$333,526	$19,619	$19,619	$9,810	$451,241
Access road	$974,266	$396,546	$471,449	$24,720	$826,966	$79,340	$498,994	$3,272,281
Logistics work	$1,005,238		$409,884	$1,370,330			$171,393	$2,956,845
Outer port	$130,262	$113,844	$69,852		$207,805	$64,512	$49,393	$635,668
Helipad	$8,829	$28,452	$3,178		$18,729		$3,178	$62,366
Power consumption		$293,112			$481,088			$774,200
Port fuel storage	$38,569	$117,984	$6,496		$32,511	$3,539	$6,496	$205,595
Heliport fuel storage	$1,471		$235		$4,167	$1,177	$294	$7,344
Process building 1								$5,053,772
Process fuel storage 1								$35,268
Explosive storage	$88,572	$91,623	$29,622		$51,280	$34,090	$29,916	$325,103
Total capital cost	**$3,515,868**	**$2,477,657**	**$1,099,524**	**$2,051,115**	**$5,453,166**	**$389,828**	**$1,042,750**	**$21,118,948**

1 At the time of writing the breakdown of these costs into categories had not been supplied although quotes for full amounts were provided.

21.1.3 Process equipment capital costs

NOVUS Engineering has provided Tetra Tech with estimated costs relating to purchase and freight of the process equipment. These are included in Table 50. Contingency has been added to some areas where firm budget numbers have not yet been obtained from suppliers. In terms of the agreement with LNSG, LNSG will provide labour and equipment for the assembly of the processing plant under the supervision of TNG processing staff.

Table 50: Mine site processing equipment costs including in capital cost estimate (CAD$)

Process equipment	Equipment cost	Freight	Contingency	Total budget
Mill Building Dust collector	$30,310	$2,425	$0	$32,735
Feed Bin Scrubber	$25,000	$2,000	$7,500	$34,500
Feed bin dry mag separator	$7,500	$600	$2,250	$10,350
Office security complex	$230,000	$18,400	$69,000	$317,400
Hand picked	$1,000	$80	$0	$1,080
DMS sinks	$1,000	$80	$0	$1,080
DMS sinks	$1,000	$80	$0	$1,080
DMS sinks	$1,000	$80	$0	$1,080
Scrubber Feed Bin Conveyor	$150,000	$12,000	$22,500	$184,500
Scrubber Conveyor	$50,000	$4,000	$7,500	$61,500
Hand Pick conveyor	$25,000	$2,000	$7,500	$34,500
Secondary crusher feed bin conveyor	$35,000	$2,800	$5,250	$43,050
Secondary crusher discharge conveyor	$75,000	$6,000	$11,250	$92,250
DMS feed conveyor	$50,000	$4,000	$7,500	$61,500
Separation Screen conveyor	$50,000	$4,000	$7,500	$61,500
DMS floats tube conveyor	$50,000	$4,000	$7,500	$61,500
Dry mag separation rejects	$50,000	$4,000	$7,500	$61,500
Optical sorter - recycle conveyor	$50,000	$4,000	$7,500	$61,500
DMS sinks optical sorting pass 1	$50,000	$4,000	$7,500	$61,500
DMS sinks optical sorting pass 1	$50,000	$4,000	$7,500	$61,500
Secondary crusher	$75,000	$6,000	$11,250	$92,250
DMS sinks dryer	$170,455	$13,636	$0	$184,091
Secondary crusher feeder	$50,000	$4,000	$15,000	$69,000
Scrubber discharge pump box	$5,000	$400	$1,500	$6,900
DMS plant	$304,250	$24,340	$0	$328,590
Freshwater distribution pump 1	$5,000	$400	$1,500	$6,900
Freshwater distribution pump 2	$5,000	$400	$1,500	$6,900
Scrubber discharge pump	$20,000	$1,600	$6,000	$27,600
Mill building pump	$5,000	$400	$1,500	$6,900
Freshwater vertical turbine pump 1	$15,000	$1,200	$4,500	$20,700
Freshwater vertical turbine pump 2	$15,000	$1,200	$4,500	$20,700
Scrubber feed conveyor weightometer	$5,000	$400	$1,500	$6,900
Scrubber Discharge Screen	$50,000	$4,000	$15,000	$69,000
Sizing screen	$50,000	$4,000	$15,000	$69,000

Table 50: Mine site processing equipment costs including in capital cost estimate (CAD$)

Process equipment	Equipment cost	Freight	Contingency	Total budget
Scrubber	$144,508	$11,561	$0	$156,069
Optical sorting	$502,800	$40,224	$0	$543,024
DMS sinks DRY magnetic separator	$39,860	$3,189	$0	$43,049
In pit lock box	$1,000	$80	$0	$1,080
Handpicked lock box	$1,000	$80	$0	$1,080
Steel	$90,000	$7,200	$0	$97,200
Piping	$90,000	$7,200	$0	$97,200
Electrical	$136,000	$10,880	$0	$146,880
Instrumentation	$75,000	$6,000	$0	$81,000
Total	**$2,836,683**	**$226,935**	**$264,000**	**$3,327,618**

21.1.4 Temporary HF facility in Nuuk

Prior to the construction of a permanent facility in Nuuk for processing gem containing concentrates from the mine site, TNG intend to rent a facility in Nuuk for siting of HF processing equipment. Arrangements for this facility are currently being made. Table 51 summarises the temporary HF facility costs.

Table 51: Estimated cost of equipment for temporary HF facility in Nuuk

Temporary HF facility in Nuuk in CAD$				
Item	**Cost**	**Freight**	**Contingency**	**Total budget**
Mechanical and Process Equipment	$50,000	$4,000	$16,200	$70,200
Instrumentation	$10,000	$800	$3,240	$14,040
Piping	$10,000	$800	$3,240	$14,040
Services (Ventilation, Safety Showers)	$10,000	$800	$3,240	$14,040
Electrical	$10,000	$800	$3,240	$14,040
Architectural	$20,000	$1,600	$6,480	$28,080
Owners Cost (Design etc.)	$70,000	$5,600	$22,680	$98,280
Total	**$180,000**	**$14,400**	**$58,320**	**$252,720**

21.1.5 Permanent HF facility and office complex in Nuuk (sustaining)

Though engineering of the permanent facility has not yet been completed. TNG have estimated the cost of construction of such a facility based on Greenland construction rates. Table 52 shows the estimated costs in CAD$ for construction of a HF facility and an office complex. If further mechanical concentration engineering is successful (integration of SelFrag technology, or similar) then the size and cost of the permanent HF facility would be reviewed and the facility sized to fit the new level of concentrate production.

Table 52: Estimated cost of permanent HF facility and Nuuk offices

Permanent Nuuk offices and HF facility in $CAD			
Item	**Cost**	**Contingency**	**Total budget**
HF facility	$2,406,600	$360,990	$2,767,590
Offices	$2,578,500	$386,775	$2,965,275
Total	**$4,985,100**	**$747,765**	**$ 5,732,865**

21.1.6 Indirect capital costs

Indirect capital costs have been estimated based on costs expected for management of engineering procurement process and construction management as well as owners costs. Indirect capital costs total $915 thousand are summarised in Table 53.

Table 53: Indirect costs included in capital cost estimate

Indirect capital costs in CAD$			
Item	**Cost**	**Contingency**	**Total cost**
Spares and fills			
Process spares	$50,000	$7,500	$57,500
First fills Fesi	$87,750	$4,388	$92,138
Plant commissioning			
Fees by Novus EPCM	$144,000	$7,200	$151,200
Disbursements Novus	$20,000	$1,000	$21,000
Vendor visits	$17,500	$875	$18,375
Owners costs			
TNT Architects (new office/ HF build)	$56,075	$2,804	$58,879
Deres Auto, Electrical Cars	$108,411	$5,421	$113,832
Vault for gemstones	$28,037	$1,402	$29,439
Security Hardware/Design	$355,140	$17,757	$372,897
Total indirect capital in CAD$	**$866,914**	**$48,346**	**$915,259**

21.1.7 Operating costs

Tetra Tech assisted TNG, Novus and LNSG with an operating cost estimate through breakdown of the operating cost into areas and variable and fixed cost components. Variable components are relatable to tonnage mined or processed, whereas fixed cost components include overhead expenses which are not related to production.

Average cost per tonne mill feed over life of mine is shown in Table 54.

Table 54: Life of mine estimated average cost per tonne for Aappallutoq

Summary	Cost per tonne mill feed
Mining	$201
Processing	$46
G and A	$67
Mine site Power	$57
Transport	$10
Nuuk Office	$146
HF processing	$29
Marketing	$40
Corporate	$18
Capital leasing	$96
Total cost per tonne in CAD$	**$711**
Total cost per tonne in US$	**$573**

A breakdown of operating costs by year are shown in Table 55.

Table 55: Summary of operating cost estimate by area

Operating cost summary table										
Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
Ore	2,849	12,745	16,560	22,792	22,820	23,564	26,142	31,118	31,178	189,768
Waste	17,485	167,729	485,012	449,311	571,179	484,642	407,319	249,920	136,266	2,968,862
Mining										
Mining variable costs	$347,651	$1,651,119	$3,394,928	$3,593,789	$4,106,528	$3,875,724	$3,827,196	$3,582,268	$3,146,006	$27,525,208
Mining contractor fixed costs	$46,061	$337,638	$624,514	$597,646	$734,431	$627,498	$630,972	$633,655	$578,625	$4,811,041
Mining fixed costs	$138,900	$359,200	$409,200	$409,200	$409,200	$384,200	$334,200	$284,200	$284,200	$3,012,500
Mining diesel	$32,569	$159,801	$347,051	$357,819	$414,524	$390,362	$383,711	$349,976	$303,252	$2,739,065
Total mining	$565,181	$2,507,758	$4,775,692	$4,958,453	$5,664,683	$5,277,785	$5,176,079	$4,850,100	$4,312,083	$38,087,814
Mining cost per tonne ore	$198	$197	$288	$218	$248	$224	$198	$156	$138	$201
Mining cost per tonne mined	$28	$14	$10	$11	$10	$10	$12	$17	$26	$12
Process										
Process variable costs	$5,269	$90,066	$117,022	$161,058	$161,261	$166,514	$184,734	$219,899	$220,320	$1,326,142
Process fixed costs	$116,089	$691,826	$691,826	$691,826	$691,826	$691,826	$691,826	$691,826	$691,826	$5,650,697
Process management costs	$51,000	$204,000	$204,000	$204,000	$204,000	$204,000	$204,000	$204,000	$204,000	$1,683,000
Total processing costs	$172,358	$985,892	$1,012,848	$1,056,884	$1,057,087	$1,062,340	$1,080,560	$1,115,725	$1,116,146	$8,659,839
Total processing per tonne ore	$61	$77	$61	$46	$46	$45	$41	$36	$36	$46
General and administration Mine Site										
General and administrative Costs	$429,234	$1,486,683	$1,535,150	$1,538,184	$1,545,014	$1,544,888	$1,545,267	$1,569,082	$1,560,956	$12,754,458
Total G and A	$429,234	$1,486,683	$1,535,150	$1,538,184	$1,545,014	$1,544,888	$1,545,267	$1,569,082	$1,560,956	$12,754,458
G and A cost per tonne	$151	$117	$93	$67	$68	$66	$59	$50	$50	$67
Other										
Mine site power	$390,602	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$10,869,903
Mine site power per tonne	$137	$103	$79	$57	$57	$56	$50	$42	$42	$57
Transport to mine site	$157,200	$207,360	$207,360	$207,360	$238,160	$207,360	$207,360	$207,360	$349,840	$1,989,360
Cost per tonne	$55	$16	$13	$9	$10	$9	$8	$7	$11	$10
Nuuk office	$2,375,965	$2,940,485	$4,161,045	$3,034,784	$3,034,784	$3,034,784	$3,034,784	$3,034,784	$3,034,784	$27,686,197
Nuuk office per tonne	$834	$231	$251	$133	$133	$129	$116	$98	$97	$146
Nuuk process and sorting	$152,246	$514,877	$517,165	$862,126	$622,099	$545,334	$629,082	$672,626	$1,005,296	$5,520,851
Nuuk processing per tonne	$53	$40	$31	$38	$27	$23	$24	$22	$32	$29
Marketing	$1,001,600	$1,001,600	$1,001,600	$750,800	$750,800	$750,800	$750,800	$750,800	$750,800	$7,509,600
Marketing per tonne	$352	$79	$60	$33	$33	$32	$29	$24	$24	$40
Corporate costs	$467,600	$467,600	$467,600	$350,600	$350,600	$350,600	$350,600	$350,600	$350,600	$3,506,400
Corporate costs per tonne	$164	$37	$28	$15	$15	$15	$13	$11	$11	$18
Capital leasing from LNS	$496,407	$2,035,267	$2,086,149	$2,138,303	$2,191,760	$2,246,554	$2,302,718	$2,360,286	$2,419,293	$18,276,736
Leasing costs per tonne	$174	$160	$126	$94	$96	$95	$88	$76	$78	$96
Total operating costs	$6,208,393	$13,457,433	$17,074,523	$16,207,407	$16,764,899	$16,330,357	$16,387,162	$16,221,274	$16,209,711	$134,861,159
Operating costs per tonne mill feed	**$2,179**	**$1,056**	**$1,031**	**$711**	**$735**	**$693**	**$627**	**$521**	**$520**	**$711**

Operating cost distribution is shown in Figure 32.

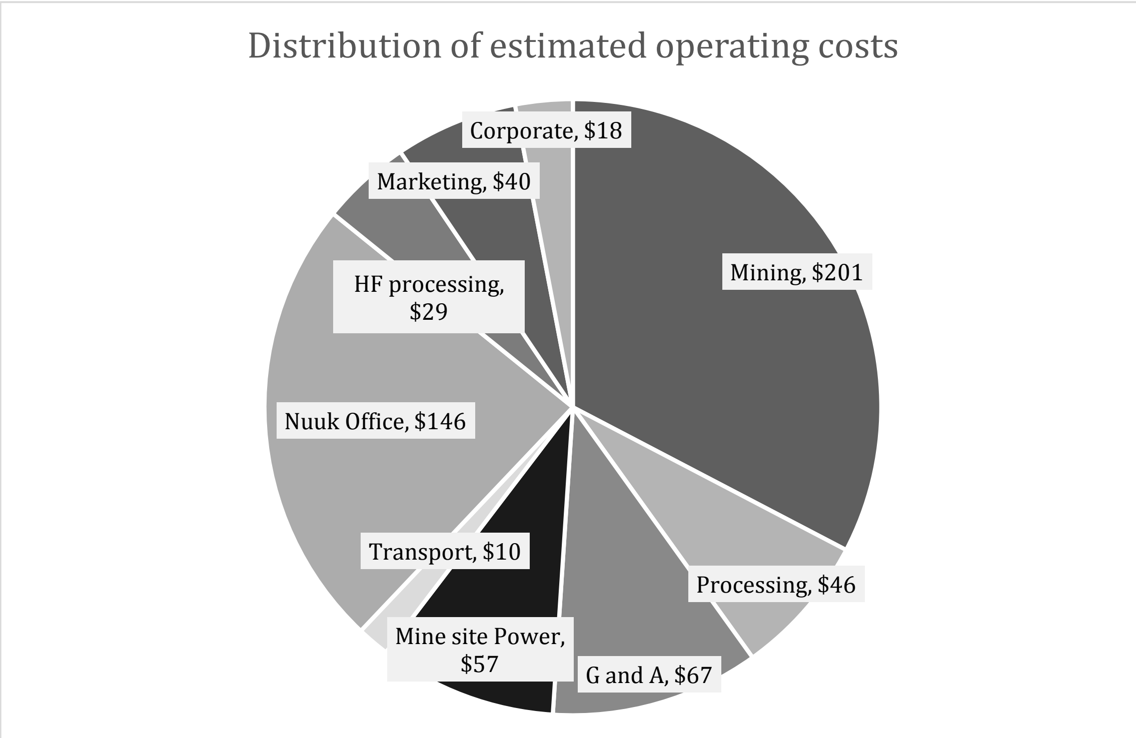

Figure 32: Distribution of operating cost by aspect of operations provided as cost per tonne mill feed

21.1.8 Mining costs

For the PFS and as currently planned for Aappallutoq, it is proposed that LNSG undertake mining on a cost plus 10% basis to TNGG. TNGG will provide management oversight including geology and mine planning, whereas LNSG will provide and operate mining equipment and consumables including undertaking drill and blast activities. The breakdown in mining costs is shown in Table 56.

Table 56: Mining cost breakdown (in CAD$)

Mining costs	Life of mine costs	Cost per tonne mill feed	Cost per tonne mined
Fuel	$2,739,065	$14.43	$0.87
Equipment	$15,374,684	$81.02	$4.87
Operator labour	$7,412,596	$39.06	$2.35
Explosives	$4,737,928	$24.97	$1.50
Supervision labour	$3,238,087	$17.06	$1.03
Freight	$1,572,953	$8.29	$0.50
TNG mining oversight	$3,012,500	$15.87	$0.95
Total mining	**$ 38,087,814**	**$ 201**	**$ 12.06**

21.1.9 Mine Site Processing

Estimated costs for the processing facility are included in Table 57. Note that these costs exclude the cost of power generation, which is included in 21.1.11.

Table 57: Breakdown of mine site processing costs (in CAD$)

Processing costs	Life of mine costs	Cost per tonne mill feed
FESI	$237,447	$1.25
Labour	$5,630,688	$29.67
Equipment maintenance	$975,138	$5.14
Screen replacement	$113,557	$0.60
Management	$1,683,000	$8.87
Freight	$22,010	$0.12
Total processing excluding power	**$ 8,659,839**	**$ 45.63**

21.1.10 Mine site general and administrative costs

Tetra Tech have included costs for general running of the mine site operations including the camp and general administration. These costs total CAD$12.7 million over life of mine, averaging CAD$67 per tonne milled.

21.1.11 Mine site power

Mine site power is planned to be provided through use of multiple diesel powered generators. Tetra Tech has estimated the running costs of these generators based on fuel consumption and maintenance requirements. Table 58 shows the breakdown of power generation costs, totalling CAD$0.50 per kWhr of power produced.

Table 58: Mine site power generation

Power generation	
Average KWhrs per year	2,434,963
Total life of mine KWhrs	21,914,670
Average diesel consumption per year	811,654
Life of mine diesel usage	7,304,890
Average fuel cost per KWhr	$0.45
Life of mine maintenance costs	$93,177
Total life of mine power costs	**CAD$10,869,903**
Average power cost over life of mine	**CAD$0.50**

21.1.12 Transport relating to operation of mine site

Tetra Tech has estimated transport costs for personnel movements to and from site and for shipments from Nuuk. These include boats to Nuuk, helicopter charter as well as provision for periodic barges over life of mine. The total over life of mine has been estimated at CAD$1.99 million, which averages CAD$10 per tonne of mill feed.

21.1.13 HF processing in Nuuk

Tetra Tech assisted TNG and Novus in compiling the estimated costs for processing in Nuuk. HF costs included CAD$15.37 per kg HF, with shipping estimates based on shipping of 400 kg pallets from Europe at CAD$3,500 per pallet. HF consumption rates were included as 700g/kg of primary dirty concentrate and 1,200 g/kg of secondary dirty concentrate. These costs are presented below in Table 59.

Table 59: Estimated costs associated with the HF facility in Nuuk (in CAD$)

Processing costs	Life of mine costs	Cost per kg concentrate processed	Cost per tonne mill feed
Labour	$1,034,550	$5.89	$5.45
HF including shipping	$3,249,020	$18.50	$17.12
Slaked lime	$27,554	$0.16	$0.15
Power	$304,620	$1.73	$1.61
Site administration, safety and management	$270,900	$1.54	$1.43
Equipment maintenance and replacement	$60,000	$0.34	$0.32
Disposal of sludge[1]	$230,498	$1.31	$1.21
Temp facility rent (years 1 to 3)	$150,000	$0.85	$0.79
Total HF processing	**$5,327,142**	**$30.33**	**$28.07**

1 Cost estimated based on shipping to Denmark

21.1.14 TNGG management costs

TNG have provided estimated costs for the TNG office in Nuuk including Greenland security (Nuuk and mine site), office rent, management salaries, loan interest repayment, environmental monitoring expenses, and permit fees, salaries for sorters and associated utilities, vehicle, travel and communication expenses. The costs average CAD$ 3.1 million per year of operations, equivalent to CAD$ 146 per tonne mill feed.

21.1.15 Capital leasing costs

In terms of the agreement with LNSG regarding construction of the mine infrastructure, TNG will lease the capital equipment over the life of mine with a cost totalling CAD$ 18 million, averaging CAD$ 2.2 million for full production years. The leasing cost is estimated to be equivalent to CAD$ 96 per tonne milled.

21.1.16 Marketing costs

TNG have estimated marketing costs of gem stones produced over the life of mine. These costs have been included as over CAD$ 1 million for first three years of operation, and CAD$ 750,000 for each year thereafter. The assumption is that the initial years will require additional costs relating to product promotion, which once relationships are built with customers will reduce. The marketing has been estimated to cost CAD$ 40 per tonne milled over life of mine.

21.1.16.1 Corporate expenses

TNG have estimated corporate expenses relating to project operations, at CAD$ 3.5 million over life of mine. These costs include corporate contractors of employees working for the project, engineering expenses, corporate travel and insurance. Corporate fees are estimated to be equivalent of CAD$ 18 per tonne processed.

22.0 ECONOMIC ANALYSIS

22.1 Introduction

Tetra Tech and TNG have evaluated the project economics in two ways. The first excludes the LNSG JV and as such considers that the infrastructure and capital equipment provided by LNSG is a cash cost to the project in year 1 (2015). This scenario is called "without LNSG JV" in this document and reflects project economics.

The second scenario evaluates the economics of the project as it is being advanced, which is through the LNSG JV. The key difference between the two options is that the second scenario has reduced upfront capital but increased operating costs due to inclusion of capital leasing.

Both scenarios have the same production results, which include 9 year mine life with revenue of US$ 573 million. Without the LNSG JV, the project post-tax NPV has been estimated at US$ 171 million with an IRR of 122% and a payback period of 1.8 years.

The evaluation of the LNSG JV economics resulted in an estimate for post-tax NPV of US$ 179 million, an IRR of 485% and a payback period of 1.1 years. The increase in IRR relates to reduction of capital cost from US$ 25 million to US$ 8 million for the owner (TNG).

Note that taxation estimates have been reviewed by Claus Bech, of Deloitte Denmark.

A summary of economic results is shown in Table 60 and Table 61.

Table 60: Key financial and project highlights of the Aappaluttoq PFS

Aappaluttoq Ruby Project	Production results	Units
Tonne processed	190	Tonnes (Thousands)
Waste rock mined	2,969	Tonnes (Thousands)
Stripping ratio Mine operational years (starting 2015)	16 9	N/A Years
Total corundum recovered from mine site	52.7	Grams Millions
Rough gemstones recovered from operations	17.5	Grams Millions
Average Ruby and Pink Sapphire Price: US$ pct.[1]	$7	US$ per ct.
Estimated revenue	$573	US$ Million
Economic scenario results	**Project Economics[5]**	
All in cash cost per equivalent rough ct. recovered[2]	$3	US$ per ct.
Total Operating costs	$94	US$ Million
Total Project Capital cost (Initial and sustaining)[3,4]	$25	US$ Million
Total Sustaining Capital cost	$5	US$ Million
Total Pre-tax cash flow from operations	$452	US$ Million
Total Post tax cash flow	$282	US$ Million

Table 60: Key financial and project highlights of the Aappaluttoq PFS

Aappaluttoq Ruby Project	Production results	Units
Pre-tax NPV at 8% real discount rate	**$275**	**US$ Million**
Post-tax NPV at 8% real discount rate	**$171**	**US$ Million**
Post-tax IRR %	**122%**	
Post tax payback period	**1.8**	**Years**

Notes:
1. The average price utilizes gem and near-gem material only; sale of commercial grade corundum has not been included in this PFS. Price forecasts are inclusive of 2.5% annual escalation from the average 2015 price over the life of the mine, this escalation is based on a conservative estimate of the long term supply-demand balance in the coloured gemstone market.
2. All- in-cash costs include the capital, operating, taxes and royalties projected on a per rough carat produced basis. The calculation is performed by dividing life of mine total cash costs of $291 million by life of 88 million rough carats produced over life of mine.
3. This figure includes the investment that LNSG have made of US$14 million in True North Gems Greenland (TNGG) through an agreement whereby LNSG earns 27% shareholding of TNGG through investment and construction of project infrastructure at Aappaluttoq. Tetra Tech has estimated that the contribution by LNSG reduces upfront capital by an equivalent of US$ 17 million, with the remaining US$8 million covered by TNG.
4. Estimated capital cost includes 4% contingency, varying between 0% for quoted items currently in construction and 30% for equipment for which bids have not yet been received.
5. US$ to CAD$ used through the PFS is US$ 1 to CAD$ 1.24.

Table 61 shows the economic results which result from the joint venture with the LNS group. The high IRR of 485% relates to a leasing arrangement for capital costs, reducing upfront cash capital costs to US$8 million from US$25 million.

Table 61: Key financial and project highlights of the Aappaluttoq PFS for True North Gems

Economic scenario results	TNG	Units
All in cash cost per equivalent rough ct. recovered[1]	$3	US$ per ct.
Total Operating costs[2]	$109	US$ Million
Total Capital cost	$8	US$ Million
Total Sustaining Capital cost	$5	US$ Million
Total Pre-tax cash flow from operations	$454	US$ Million
Post tax cash flow	$287	US$ Million
Pre-tax NPV at 8% real discount rate	**$281**	**US$ Million**
Post-tax NPV at 8% real discount rate	**$179**	**US$ Million**
TNG Post-tax NPV at 8% real discount rate[3]	**$125**	**US$ Million**
Post-tax TNG IRR %	**485%**	
Post tax payback period	**1.1**	**Years**

Notes:
1. All- in-cash costs include the capital, operating, taxes and royalties projected on a per rough carat produced basis. The calculation is performed by dividing life of mine total cash costs of $291 million by life of 88 million rough carats produced over life of mine
2. Inclusive of lease payments.
3. NPV solely for TNG interest in the project

The results are based on discounted cash flow analysis, which has been undertaken based on the following assumptions:

- Weighted average rough ruby price of $53 per gram;
- Weighted average rough sapphire ruby price of $32 per gram;
- Sales of 75% of gemstones as rough and 25% as polished over life of mine;

- Polishing retention of 9.3%;
- Polishing cost of $1.18 per ct. for Ruby and $1.03 for Sapphires and all polishing will be completed by contracted polishing factories outside of Greenland;
- Discount rate of 8%;
- Canadian dollar to Danish Kroner of 1 : 0.191;
- CAD$1.24 : US$ 1;
- Initial tax deductible losses of US$ 20 million carried forward from expenses prior to project construction; and
- To estimate working capital:
  - 1 Sale of gemstone in year 1
  - 3 sales of gemstone in year 2 (remainder of year 1, and 2 from year 2 production)
  - 4 sales of gemstones each year thereafter

22.2 Revenue estimation

To estimate revenue, Tetra Tech have reviewed numerous independent estimates completed between 2006 and 2015 of the gem stones taken from bulk samples at Aappaluttoq.

Rough prices used averaged $53 per gram for Ruby and $32 per gram for sapphires. Independent valuations ranged from $5 to $300 per gram for rough gem and near gem material. Individual prices used in the model can be seen in Table 62. The economic evaluation of Aappaluttoq considers 75% rough sales and 25% polished over the life of mine. Polished prices provided by GemWorld varied from US$65 to US$700 per ct. for Rubies and from US$50 to $700 per ct. for Sapphires. The average price of the polished used equated to $64 per ct. for Ruby and $31 per ct. for sapphire. These prices equate to the moderate prices for the smallest size fraction (0.1 ct.) polished valuations from GemWorld.

To simplify the estimation of revenue, the estimated recovery of gemstones has been factored based on the ratios of recovery of gemstones from the bulk samples to the total corundum as is shown in Table 17 through to Table 21. Table 62 shows the prices used and the percentages of total corundum estimated to be gem into three grading categories as top, good and moderate. These have been assigned prices based on independent rough or polished valuations, public auction results and published prices within the GemGuide. Note that the percentages of gemstones from total corundum assumes that mining controls are in place such that ore horizons are limited to zones carrying gemstones, as the corundum is known to grade into the gabbro beyond ore horizons.

Tetra Tech have relied on several valuations of the rough material and consider that the prices used in this PFS may be conservative; the average (US$11/ct. ruby, US$5.80/ct. pink sapphire) can be supported by both independent valuations and by recent public auction data from other corundum deposits in the world. Unlike diamonds, the valuation of rough material is complex due to the non-transparent nature of the rough wholesale market. Through back estimation of polished prices to the price of the original rough has been undertaken and showing that numbers are below the valuations provided to Tetra Tech by TNG.

Tetra Tech compared the polished prices utilized in this PFS to the independent valuations including the most recent prices from Gemworld completed in January 2015. Specifically Tetra Tech have selected the small melee sized (-4mm) polished material from the GemWorld report as this is what TNG believe the size fraction of their main contractual obligations will be as the mine enters production. GemWorld polished prices for 0.1-0.5ct classifications are higher on average than the price used in the economic model, despite the fact the TNG have demonstrated the presence of larger polished material derived from Aappaluttoq. The use of the small goods prices demonstrates that the model is robust and Tetra Tech/TNG have used the most appropriate conservative prices in this economic analysis.

Table 62: Basis of estimation of revenue for Aappallutoq

Rough Ruby Prices	Proportion	Prices used	Weighted average of prices used	GEMWorld Report January 2015 0.1 ct.	GEMWorld Report January 2015 0.25 ct.	GEMWorld Report January 2015 0.5 ct.	Valuations 2007 to 2015	Gemfields auction June 2014	Units
Top Ruby Rough Price	1%	$211.95	$53	N/A	N/A	N/A	$15 to $300	$92	$/g
Good Ruby Rough Price	10%	$92.15							
Moderate Ruby Rough Price	22%	$27.65							
Commercial Ruby Rough Price - not considered for PFS	67%	$0.00							
Rough Sapphire Prices									
Top Sapphire Rough Price	1%	$127.17	$32	N/A	N/A	N/A	$5 to $100	N/A	$/g
Good Sapphire Rough Price	10%	$55.29							
Moderate Sapphire Rough Price	22%	$16.59							
Commercial Sapphire Rough Price -not considered for PFS	67%	$0.00							
Polished Ruby Prices									
Top Ruby Polished Price	1%	$250.00	$64	$300	$450	$1,350	S73 to $120	N/A	$/Ct.
Good Ruby Polished Price	10%	$100.00		$100	$200	$515			
Moderate Ruby Polished Price	22%	$40.00		$65	$100	$175			
Commercial Ruby Polished Price	67%	$0.00							
Polished Sapphires									
Top Sapphire Polished Price	1%	$100.00	$31	$200	$300	$700	$30 to $90	N/A	$/Ct.
Good Sapphire Polished Price	10%	$50.00		$80	$100	$325			
Moderate Sapphire Polished Price	22%	$20.00		$50	$65	$125			
Commercial Sapphire Polished Price	67%	$0.00							

22.3 Taxes and Royalties

In Greenland corporate tax is 30%, from which royalties are deductible. Greenland has a two tiered royalty system the first being a payable sales royalty of 5.5% and a payable surplus royalty, which comes into effect if profitability is greater than 40%. Greenland taxes also include a 37% withholding tax on dividends. This PFS has not evaluated payment of dividends to shareholders and as such has not evaluated the impact on the economics of this tax.

Tax estimates have been reviewed by Claus Bech of Deloitte, in Nuuk, Greenland as tax advisor to TNGG.

Table 63 summarises the life of mine taxes for the project.

Table 63: Summary of life of mine taxes

Taxation category	Without LNS JV	With LNSG JV
Payable Gross Royalty	$31,637,105	$31,637,105
Corporate Taxes Payable	$102,803,983	$100,597,518
Surplus Royalty Payable	$35,515,597	$34,412,365

22.4 Working capital

Tetra Tech has estimated working capital for the project based on each year's cumulative operating costs and revenues. The working capital required relates to the accumulation of operating expenses between income receipts from sales. Working capital required to fund the operating expenses of the mine prior to the first receipt of income is estimated to be $5.45 million for 2015, after which revenue from sales reduces or removes the need for funded working capital and the working capital is thus recovered. At the end of the operation a remaining estimate of $2.9 million in working capital is recoverable.

22.5 Reclamation escrow

In terms of conditions of the mining permit, TNG has been required to place a fund or escrow against potential mine reclamation liabilities as each phase of the construction has been initiated. The full amount currently required is $4.2 million, of which $2.6 is outstanding and will be paid during 2015. The reclamation escrow forms part of the mine closure and monitoring plan, this is subject to change as conditions alter on-site.

22.6 Economic sensitivities

To evaluate the economic analysis, Tetra Tech has conducted sensitivity analysis on the economic inputs of the project. This included changing costs and revenue inputs from -40% to +40%, however some sensitivities have been done to a greater extent to test the projects robustness.

The findings show that the project is most sensitive to the percentage of gemstones of the total corundum mined and processed. This shows the project is only feasible as currently assessed if gemstones (gem and near-gem quality material) exceeds 7.5% of corundum content of mined and processed ore over the life of mine (see Figure 33).

Table 64 shows key sensitivity analyses, for "Percentage corundum as gem", sensitivities have been done down to -90% change in the ratio of gems to total corundum. This to enable evaluation of breakeven number based on the gem percentage of corundum.

Table 64: Summary of key sensitivity analyses

Sensitivity results					
Aspect evaluated	**Input low *(change in input)***	**Input high *(change in input)***	**Output low**	**Output high**	**Comments**
Capital cost[1]	$15,168,101	$35,392,237	$138,058,352	$175,748,248	Low sensitivity
Operating cost (per tonne)[1]	$369	$860	$145,126,625	$191,989,683	Low sensitivity
Diesel fuel cost (per litre)[1]	$0.80	$1.9	$168,875,701	$168,240,607	Low sensitivity
Percentage corundum as gem[1]	3%	42%	-$60,056,870	$253,860,514	High sensitivity
Rough prices[2]	*-40%*	*+40%*	$91,957,648	$242,092,640	Moderate sensitivity
Polished prices[2]	*-40%*	*+40%*	$158,274,719	$178,782,810	Moderate sensitivity

1 Actual low and high input of aspects included in table
2 % change input attribute provided in table

The key sensitivity charts are shown in Figure 33, Figure 34 and Figure 35 show the sensitivities. The most sensitive aspect of the project being the percentage of corundum as gem quality is shown in Figure 33. This showing how the project would be affected if results differ from bulk sample results.

From a revenue point of view Figure 34, shows that the price of rough goods has the greatest impact on the project. Noting that conservative numbers for prices have been used this is expected to have a positive impact on the project, see Table 62 for prices used for the project.

Figure 35 shows the sensitivities of the project to cost variations. The project is most sensitive to operating cost variation. It is noted that the project is expected to be a high cost per tonne operation, and that once operations begin, there will be opportunity to increase throughput which will mitigate against cost increases.

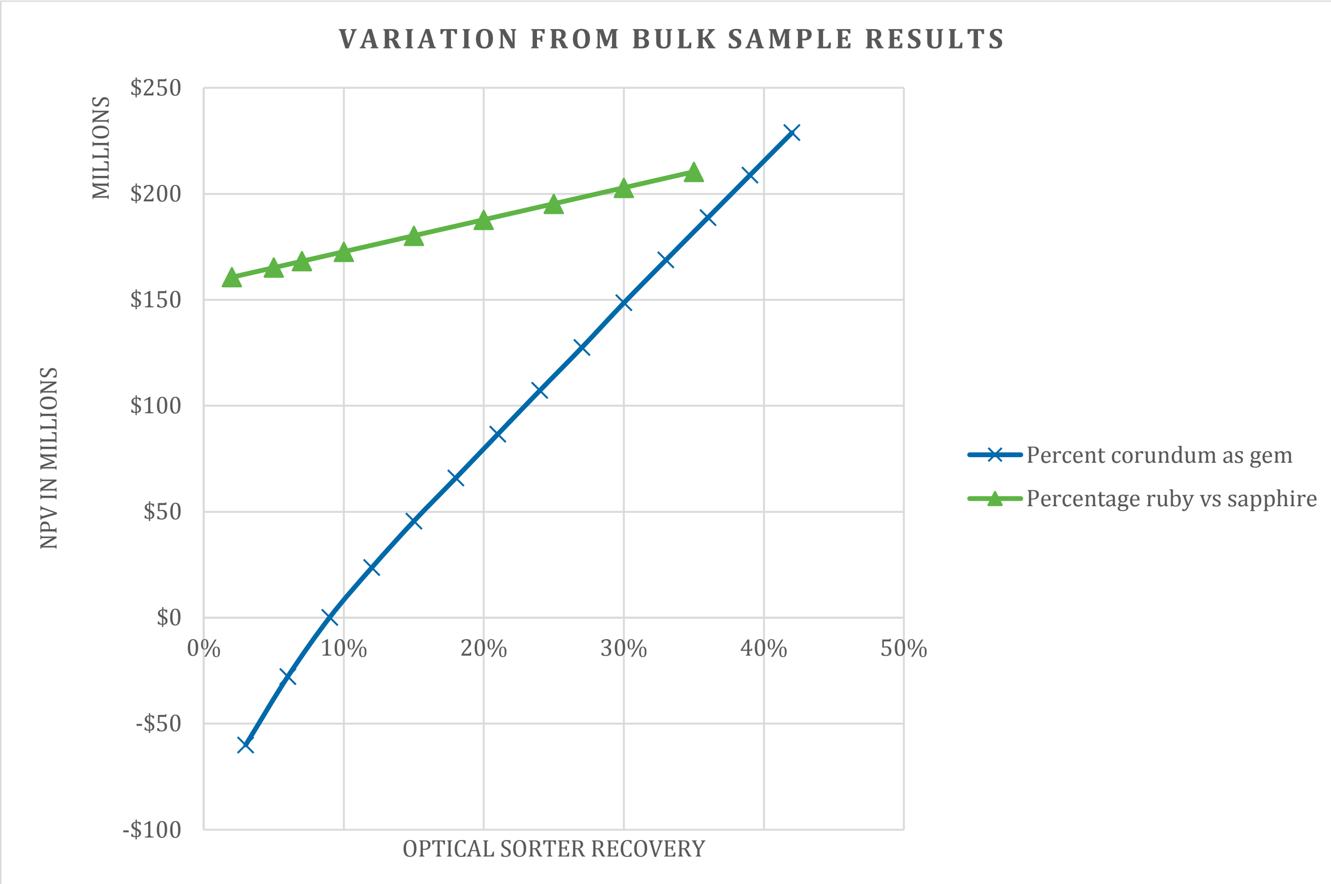

Figure 33: Sensitivity to deviation from bulk sample results, showing percentage of ruby vs sapphire of corundum recovered and percentage of total corundum as gem or near gem quality

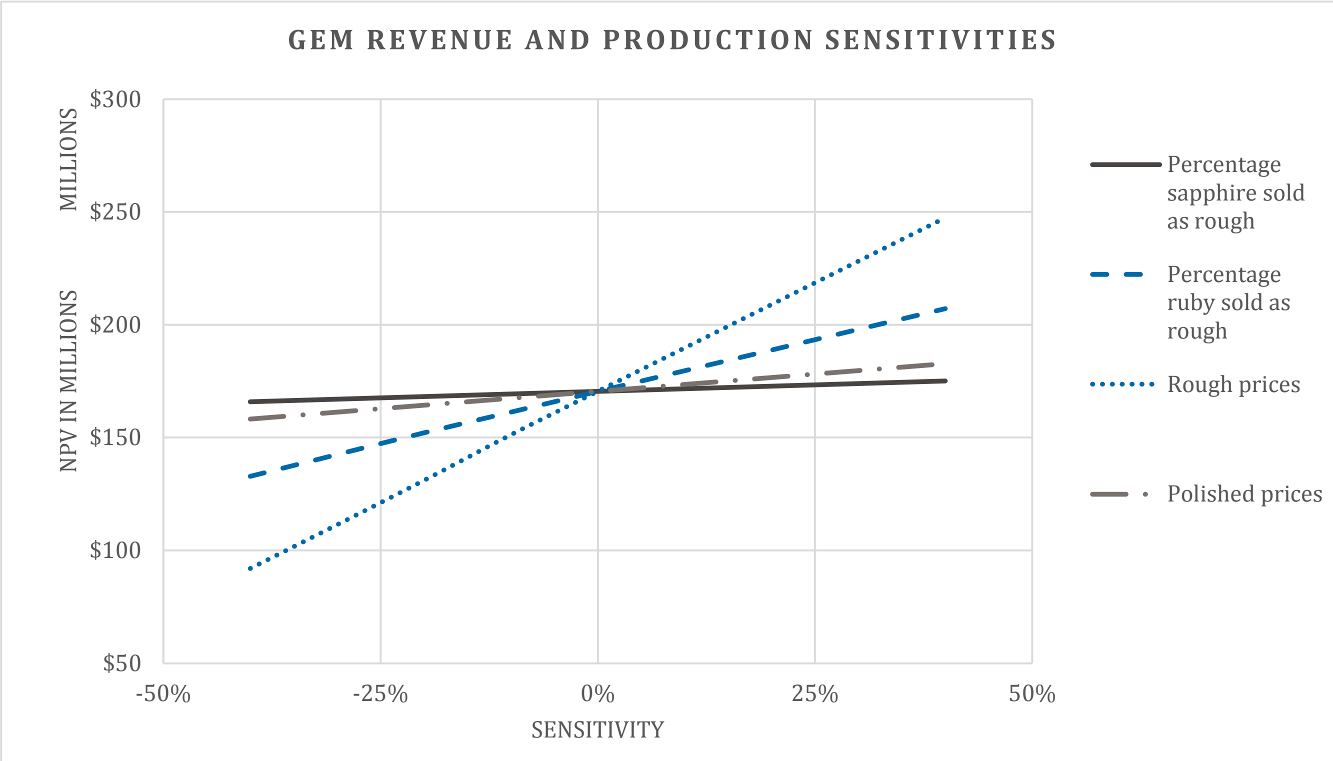

Figure 34: Sensitivities to prices and percentage sold as rough vs polished

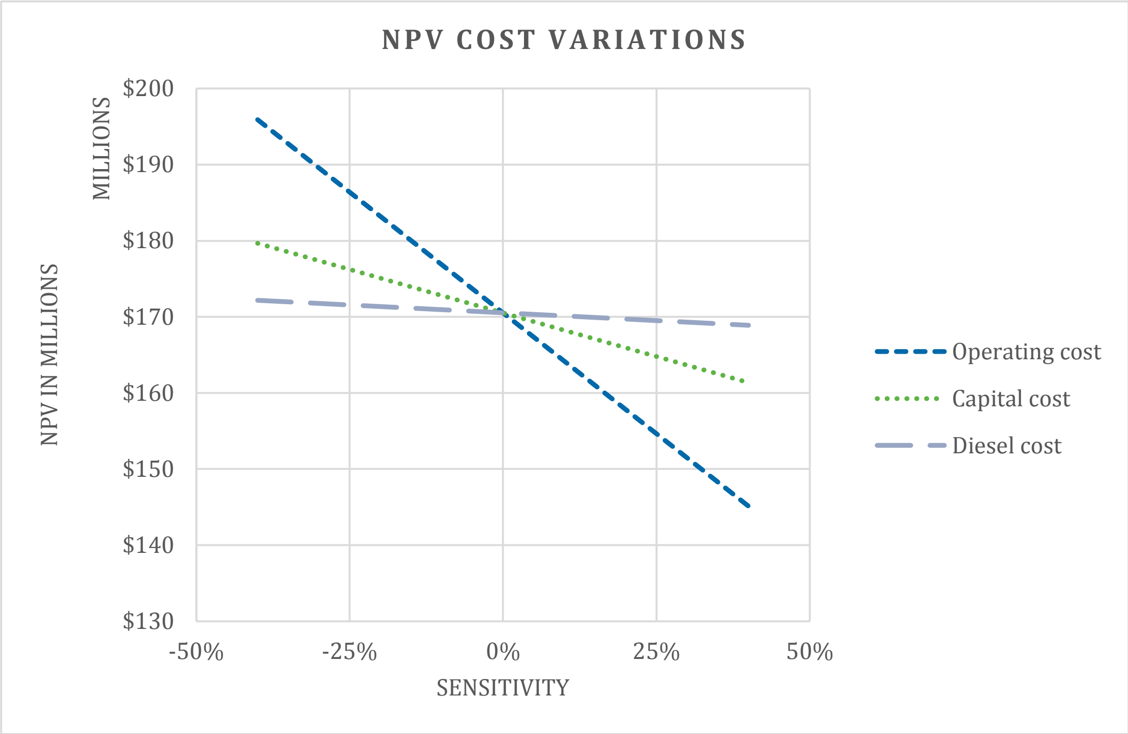

Figure 35: Cost sensitivities

22.7 Discount cash flow

The project cash flow used for this PFS is shown in Table 65. Taxation estimates have been provided by Chris Richards of TNG and have been checked by Claus Bech of Deloitte in Nuuk.

TRUE NORTH GEMS

Aappallutoq Prefeasibility Study: Cash flow forecast

Estimate of Income				>> Begin production								End <<	
Description	**Units**	**Total**		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
		Average		1	2	3	4	5	6	7	8	9	10
Production Summary (Production from Open Pit)													
Ore zone rock mined	Tonnes	**166,983**		2,507	11,215	14,572	20,055	20,080	20,734	23,003	27,382	27,434	
Diluted mill feed	Tonnes	**189,768**		2,849	12,745	16,560	22,792	22,820	23,564	26,142	31,118	31,178	
Corundum head grade	g/t	**292**		1,396	438	274	310	196	186	244	226	386	
Corundum mined	g	**55,470,216**		3,975,653	5,580,754	4,535,175	7,073,970	4,473,282	4,384,178	6,376,768	7,023,422	12,047,013	
Waste rock mined	Tonnes	**2,968,862**		17,485	167,729	485,012	449,311	571,179	484,642	407,319	249,920	136,266	
Strip ratio	N/A	**16**		6	13	29	20	25	21	16	8	4	
Corundum products from mine site													
Corundum recovered from the process DMS/Optical sorting	g	**52,696,705**		3,776,870	5,301,717	4,308,416	6,720,272	4,249,618	4,164,969	6,057,930	6,672,251	11,444,662	
Primary concentrate produced	g	**22,994,926**		1,648,089	2,313,476	1,880,036	2,932,482	1,854,379	1,817,441	2,643,460	2,911,528	4,994,035	
Secondary concentrate produced	g	**152,633,828**		10,939,548	15,356,203	12,479,149	19,464,989	12,308,842	12,063,662	17,546,543	19,325,899	33,148,992	
Total concentrate produced	g	**175,628,754**		12,587,637	17,669,680	14,359,185	22,397,472	14,163,221	13,881,103	20,190,003	22,237,427	38,143,026	
Concentrate shipped to HF facility in Nuuk	g	**175,628,754**		2,960,835	11,527,198	11,863,355	32,024,274	20,305,702	16,376,933	20,190,003	22,237,427	38,143,026	
Concentrate stored at mine site	g	**18,265,114**		9,626,803	6,142,481	2,495,830	0	0	0	0	0	0	
Concentrate inventory at year end	g	**43,661,200**		9,626,803	15,769,284	18,265,114							
Recovered corundum from HF process	g	**52,696,705**	1	1,250,899	3,689,995	3,653,537	9,246,243	5,861,340	4,819,849	6,057,930	6,672,251	11,444,662	
Overall HF corundum recovery from concentrate mass	g	**30**		42	32	31	29	29	29	30	30	30	
Total red corundum produced	g	**4,510,838**		107,077	315,864	312,743	791,478	501,731	412,579	518,559	571,145	979,663	
Total pink cordundum produced	g	**48,185,867**		1,143,822	3,374,131	3,340,794	8,454,764	5,359,609	4,407,270	5,539,371	6,101,106	10,464,999	
Saleable products													
Rough Top Ruby Saleable	g	**45,108**		1,071	3,159	3,127	7,915	5,017	4,126	5,186	5,711	9,797	
Rough Good Ruby Saleable	g	**451,084**		10,708	31,586	31,274	79,148	50,173	41,258	51,856	57,114	97,966	
Rough Moderate Ruby Saleable	g	**1,004,113**		23,835	70,311	69,617	176,183	111,685	91,840	115,431	127,137	218,073	
Rough Commercial Ruby	g	**3,010,533**		71,463	210,807	208,725	528,233	334,855	275,355	346,086	381,182	653,827	
Rough Top Sapphire Saleable	g	**481,859**		11,438	33,741	33,408	84,548	53,596	44,073	55,394	61,011	104,650	
Rough Good Sapphire Saleable	g	**4,818,587**		114,382	337,413	334,079	845,476	535,961	440,727	553,937	610,111	1,046,500	
Rough Moderate Sapphire Saleable	g	**10,726,174**		254,615	751,082	743,661	1,882,030	1,193,049	981,058	1,233,064	1,358,106	2,329,509	
Rough Commercial Sapphire	g	**32,159,248**		763,387	2,251,895	2,229,646	5,642,710	3,577,003	2,941,412	3,696,976	4,071,878	6,984,341	
Polished production													
Top Ruby Polished Volume	Ct.	**5,244**		124	367	364	920	583	480	603	664	1139	
Good Ruby Polishing Volume	Ct.	**52,438**		1245	3672	3636	9201	5833	4796	6028	6640	11389	
Moderate Ruby Polishing Volume	Ct.	**116,728**		2771	8174	8093	20481	12983	10676	13419	14780	25351	
Top Sapphire Polishing Volume	Ct.	**56,016**		1330	3922	3884	9829	6231	5123	6440	7093	12166	
Good Sapphire Polishing Volume	Ct.	**560,161**		13297	39224	38837	98287	62305	51235	64395	70925	121656	
Moderate Sapphire Polishing Volume	Ct.	**1,246,918**		29599	87313	86451	218786	138692	114048	143344	157880	270805	
Total polished gems	**Ct.**	**2,037,505**		**48,366**	**142,673**	**141,263**	**357,504**	**226,627**	**186,358**	**234,228**	**257,981**	**442,505**	
Rough production													
Top Ruby Rough Volume	g	**33,831**		803	2,369	2,346	5,936	3,763	3,094	3,889	4,284	7,347	
Good Ruby Rough Volume	g	**338,313**		8,031	23,690	23,456	59,361	37,630	30,943	38,892	42,836	73,475	
Moderate Ruby Rough Volume	g	**753,084**		17,877	52,733	52,212	132,137	83,764	68,880	86,573	95,353	163,555	
Commercial Ruby Rough Volume	g	**2,257,900**		53,597	158,106	156,543	396,174	251,141	206,516	259,565	285,886	490,370	
Top Sapphire Rough Volume	g	**361,394**		8,579	25,306	25,056	63,411	40,197	33,055	41,545	45,758	78,487	
Good Sapphire Rough Volume	g	**3,613,940**		85,787	253,060	250,560	634,107	401,971	330,545	415,453	457,583	784,875	
Moderate Sapphire Rough Volume	g	**8,044,630**		190,961	563,311	557,746	1,411,523	894,787	735,794	924,798	1,018,580	1,747,132	
Commercial Sapphire Rough Volume	g	**24,119,436**		572,540	1,688,921	1,672,234	4,232,032	2,682,752	2,206,059	2,772,732	3,053,909	5,238,255	

Total rough gems	g	**39,150,384**		**938175**	**2767496**	**2740153**	**6934682**	**4396005**	**3614886**	**4543447**	**5004188**	**8583497**	
Gross market values													
Top Ruby Rough		**$7,170,372**		$170,208	$502,093	$497,132	$1,258,124	$797,545	$655,830	$824,295	$907,884	$1,557,260	
Good Ruby Rough		**$31,175,529**		$740,036	$2,183,012	$2,161,443	$5,470,105	$3,467,586	$2,851,437	$3,583,889	$3,947,324	$6,770,697	
Moderate Ruby Rough		**$20,819,018**		$494,196	$1,457,815	$1,443,412	$3,652,936	$2,315,654	$1,904,190	$2,393,321	$2,636,023	$4,521,471	
Commercial Ruby Rough		**$0**		$0	$0	$0	$0	$0	$0	$0	$0	$0	
Top Sapphire Rough		**$45,957,391**		$1,090,923	$3,218,086	$3,186,291	$8,063,752	$5,111,740	$4,203,444	$5,283,189	$5,818,945	$9,981,019	
Good Sapphire Rough		**$199,814,743**		$4,743,146	$13,991,679	$13,853,438	$35,059,793	$22,224,958	$18,275,845	$22,970,386	$25,299,762	$43,395,736	
Moderate Sapphire Rough		**$133,436,286**		$3,167,473	$9,343,643	$9,251,326	$23,412,930	$14,841,827	$12,204,609	$15,339,624	$16,895,181	$28,979,672	
Commercial Sapphire Rough		**$0**		$0	$0	$0	$0	$0	$0	$0	$0	$0	
Price escalation due to market growth and marketing at 2.5 % per year				1.00	1.03	1.05	1.08	1.10	1.13	1.16	1.19	1.22	
Total rough sales		**$496,238,306**		**$10,405,982**	**$31,463,737**	**$31,931,689**	**$82,831,886**	**$53,821,156**	**$45,364,215**	**$58,442,407**	**$65,978,145**	**$115,999,091**	
Top Ruby Polished		**$1,310,962**		$31,119	$91,798	$90,891	$230,023	$145,815	$119,906	$150,706	$165,989	$284,715	
Good Ruby Polished		**$5,243,849**		$124,477	$367,191	$363,563	$920,094	$583,262	$479,623	$602,825	$663,956	$1,138,858	
Moderate Ruby Polished		**$4,669,123**		$110,834	$326,947	$323,717	$819,251	$519,336	$427,056	$536,755	$591,186	$1,014,039	
Commercial Ruby Polished		**$0**		$0	$0	$0	$0	$0	$0	$0	$0	$0	
Top Sapphire Polished		**$5,601,607**		$132,969	$392,243	$388,367	$982,866	$623,055	$512,345	$643,952	$709,254	$1,216,556	
Good Sapphire Polished		**$28,008,035**		$664,847	$1,961,214	$1,941,837	$4,914,332	$3,115,273	$2,561,725	$3,219,759	$3,546,268	$6,082,781	
Moderate Sapphire Polished		**$24,938,354**		$591,980	$1,746,265	$1,729,011	$4,375,721	$2,773,839	$2,280,960	$2,866,874	$3,157,597	$5,416,108	
Commercial Sapphire Polished		**$0**		$0	$0	$0	$0	$0	$0	$0	$0	$0	
Price escalation due to market growth and marketing at 2.5 % per year				1.00	1.03	1.05	1.08	1.10	1.13	1.16	1.19	1.22	
Total polished sales US $		**$78,981,776**		**$1,656,226**	**$5,007,799**	**$5,082,279**	**$13,183,604**	**$8,566,228**	**$7,220,213**	**$9,301,751**	**$10,501,146**	**$18,462,529**	
Polishing costs RUBY	$1.18	**$205,804**		$4,885	$14,411	$14,269	$36,111	$22,891	$18,824	$23,659	$26,058	$44,697	
Polishing costs Sapphire	$1.03	**$1,918,987**		$45,552	$134,374	$133,046	$336,708	$213,445	$175,518	$220,604	$242,975	$416,765	
Net revenue from sales US $		**$573,095,291**	**$1**	**$12,011,770**	**$36,322,751**	**$36,866,653**	**$95,642,671**	**$62,151,048**	**$52,390,086**	**$67,499,895**	**$76,210,258**	**$134,000,158**	**$0**
Mine site operating expenses													
Mining	$201	**$38,087,814**		$565,181	$2,507,758	$4,775,692	$4,958,453	$5,664,683	$5,277,785	$5,176,079	$4,850,100	$4,312,083	
Crushing and process mine site	$46	**$8,659,839**		$172,358	$985,892	$1,012,848	$1,056,884	$1,057,087	$1,062,340	$1,080,560	$1,115,725	$1,116,146	
Mine site G and A	$67	**$12,754,458**		$429,234	$1,486,683	$1,535,150	$1,538,184	$1,545,014	$1,544,888	$1,545,267	$1,569,082	$1,560,956	
Mine site power	$57	**$10,869,903**		$390,602	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	$1,309,913	
Transport relating to mine site	$10	**$1,989,360**		$157,200	$207,360	$207,360	$207,360	$238,160	$207,360	$207,360	$207,360	$349,840	
TNG Greenland overheads	$146	**$27,686,197**		$2,375,965	$2,940,485	$4,161,045	$3,034,784	$3,034,784	$3,034,784	$3,034,784	$3,034,784	$3,034,784	
HF facility in Nuuk and sorting	$29	**$5,520,851**		$152,246	$514,877	$517,165	$862,126	$622,099	$545,334	$629,082	$672,626	$1,005,296	
Marketing	$40	**$7,509,600**		$1,001,600	$1,001,600	$1,001,600	$750,800	$750,800	$750,800	$750,800	$750,800	$750,800	
TNG corporate fees	$18	**$3,506,400**		$467,600	$467,600	$467,600	$350,600	$350,600	$350,600	$350,600	$350,600	$350,600	
	$0	**$0**											
Total operating costs in CAD$	**$614**	**$116,584,423**		**$5,711,986**	**$11,422,166**	**$14,988,374**	**$14,069,104**	**$14,573,139**	**$14,083,803**	**$14,084,444**	**$13,860,988**	**$13,790,418**	
Total operating costs in US$	**$495**	**$94,019,696**	**$1**	**$4,606,441**	**$9,211,424**	**$12,087,398**	**$11,346,052**	**$11,752,531**	**$11,357,906**	**$11,358,423**	**$11,178,216**	**$11,121,305**	**$0**
Operating cash flow US$		**$456,510,868**		**$7,405,330**	**$27,111,327**	**$24,779,255**	**$84,296,619**	**$50,398,517**	**$41,032,180**	**$56,141,472**	**$65,032,042**	**$122,878,853**	**$0**
Capital costs US$		**-$25,280,169**	$1	-$20,609,408.18	-$1,410,724.80	-$3,260,036.09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Less capital for leasing US$		**$0**											
Reclamation escrow and closure expenses		**-$2,062,858**		-$2,062,858									
Working capital (change)		**$0.00**		-$5,458,729	$5,458,729	$0	-$2,918,002	-$46,365	$57,064	-$24,590	$8,097	-$47,514	$2,971,310
Payable Gross Royalty		**-$31,637,104.55**		-$663,421	-$2,005,934	-$2,035,768	-$5,280,852	-$3,431,306	-$2,892,144	-$3,725,929	-$4,206,361	-$7,395,389	$0
Corporate Taxes Payable		**-$102,803,982.71**		$0	-$1,029,664	-$4,946,560	-$19,606,514	-$11,304,418	-$9,049,242	-$12,763,743	-$14,960,740	-$29,143,102	$0

Surplus Royalty Payable		**-$35,515,597.45**	-$119,257	-$1,626,487	-$1,270,326	-$6,682,754	-$3,624,619	-$2,815,627	-$4,180,186	-$4,994,793	-$10,201,548	$0
Pre-tax cash flows												
Pre-tax project cash flow		**$451,732,568**	-$20,725,666	$31,159,331	$21,519,219	$81,378,617	$50,352,151	$41,089,245	$56,116,882	$65,040,139	$122,831,339	$2,971,310
Cumulative cash flow		**-$20,725,666**	-$20,725,666	$10,433,666	$31,952,885	$113,331,502	$163,683,653	$204,772,897	$260,889,780	$325,929,919	$448,761,258	$451,732,568
Pre tax net present value	8%	**$275,289,425**										
IRR		166%	1.0	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Pre tax payback period		1.7										
Post -tax cash flows												
Post - tax project cash flow		**$281,775,883**	-$21,508,345	$26,497,246	$13,266,564	$49,808,497	$31,991,807	$26,332,232	$35,447,025	$40,878,246	$76,091,299	$2,971,310
Cumulative cash flow		**-$21,508,345**	-$21,508,345	$4,988,902	$18,255,466	$68,063,963	$100,055,771	$126,388,003	$161,835,028	$202,713,274	$278,804,573	$281,775,883
Post tax net present value	8%	**$170,520,131**										
IRR		122%	1.0	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Post tax payback period		1.8										
Peak funding		**-$21,508,345**										

23.0 ADJACENT PROPERTIES

The Company currently has a Prospecting License covering the southwest coast of Greenland (an area covering all of onshore Greenland south of latitude 78 N and west of longitude 44 W. A Prospecting License grants the owner non-exclusive rights to explore for mineral resources in the region with the exceptions for areas covered under exploitation or exploration licenses.

Refer to Section 4.2.2 which summarizes what the exploration licences are. Siggartartulik and Kigutilik prospects are considered high priority targets for further exploration and once the surface mineralization has been proven up, they may provide secondary pit operations in support of the Aappaluttoq Mine.

There are no similar adjacent properties that have been placed in operation or explored in any manner that would provide information leading to a better understanding of this property.

24.0 OTHER RELEVANT DATA AND INFORMATION

As per agreements made between TNG and LNSG, LNSG are currently undertaking construction of the mine infrastructure. At the time of a site visit by Mr. M. Horan of Tetra Tech, LNSG had mobilised equipment to site including temporary construction camps, earthmoving equipment and temporary fuel and explosive storage facilities. It is understood that construction is ongoing and is on track for completion in July/August of 2015.

Novus Engineering are sourcing bids for process equipment and with lead times, the process equipment is planned to be onsite for construction during July 2015, ready for commissioning in August 2015.

At the time of writing, the following Table 66 has been completed at the mine site:

Table 66: Construction completed by LNSG prior to release of this technical report

Task	Month completed
Completion of the 5 kilometer transport route from the outer port to camp;	January 2015
Completion of the foundations for the recreation facility and the majority of camp accommodations;	January 2015
Completion of blasting and backfilling of the helipad area;	January 2015
Commencement of work on the track from the mine camp to the explosives depot;	January 2015
Completion of excavation for the fuel storage depot with final installation of the fuel depot still to be completed;	January 2015
The maintenance workshop has been procured and delivery to mine site is expected in the Spring.	January 2015
Delivery of the primary jaw crusher to site.	December 2014
Initiation of aggregate production for work tracks and making of concrete.	December 2014
Access route from the camp to the inner port has been completed.	December 2014
The access route from the outer port to the camp is highly advanced with blasting currently in progress to complete the final section.	December 2014
Ground preparation for the helipad has commenced.	December 2014

Table 66: Construction completed by LNSG prior to release of this technical report

Task	Month completed
Commencement of blasting and installation of the water line, sewer line, electricity cabling and foundation work for the camp.	December 2014
Installation of the pier foundation is completed allowing the construction of the outer port to continue.	December 2014
Commencement of planning for the site environmental monitoring.	December 2014
Upgrading and winterization of the current exploration camp;	November 2014
Installation of a small construction camp at the outer port;	November 2014
Construction of a temporary safety compliant explosives depot;	November 2014
The fabrication of the landing dock;	November 2014
Development of a 1.5 kilometer construction route from the outer port toward the main camp site;	November 2014
Heavy equipment including haul trucks, a blasting drill rig, front end loaders and excavators are on site and active;	November 2014
Blasting to prepare the permanent camp site, helipad area and the future road network;	November 2014

24.1 Security and logistics

TNG have engaged with contract security services for security of facilities and transportation of gems. This includes security at the mine site, through provision of 24 hr, 365 day per year security staff, supported by sophisticated camera networks. The security contractor will provide transport and logistic services for the rough gemstones from Nuuk to markets or gemstone cutting facilities.

Workers travelling to and from the mine site will be provided with boat transport from Qeqertarsuaatsiat, where commercial transport is available to Nuuk or Paamiut. Materials and consumables will be transported to site by boat from Nuuk, with LNSG providing occasional barge services as required for bulk items.

25.0 CONCLUSIONS

On the basis of geological modelling, mining criteria and assumptions used, processing assumptions and criteria and estimated capital and operating costs as well as independent assessments of Rubies and Sapphires, Tetra Tech finds that the Aappaluttoq project has economic potential, which is not sensitive to operating or capital costs.

25.1 Project opportunities

TNG are currently evaluating the use of Selfrag technology for use at the mine in separating gems from matrix (waste rock). If proved to work, and the system is integrated into a mine processing circuit, this may greatly reduce the volume of optical sorted dirty concentrate, thus reducing consumption of HF during the cleaning process; saving operating costs and reducing the time between mining and possible sales.

Additional revenue streams are also being evaluated, including sale of the non-gem material currently not included in this PFS economic models.

There is also potential for deepening of the pit, as the pit design does not mine all resources and the pit design is considered sub-optimal, in addition there are additional targets for further exploration at Siggartartulik and Kigutilik which are located less than 10km away from Aappaluttoq.

25.2 Project risks

Though mining is inherently a risky enterprise and residual risk remains regarding geology and distributions of corundum within the current reserves as well as risk relating to operating costs and gem recoveries, Tetra Tech considers that the revenue generated from sales of gemstone includes the most risk. This is due to complexity involved in assigning value to gemstones produced thus far through bulk sampling as well as demand and supply pressures which are likely to result in price variation throughout the planned mine life.

26.0 RECOMMENDATIONS

26.1 Geology

Tetra Tech recommends that as this project moves forward, the block model is updated to include colour, quality and size distribution of corundum materials. As mining progresses this information can be compared with actual recoveries. This reconciliation can help to gain understanding of controls on distribution of gem quality corundum, which would be used in future exploration.

The resources for the property have not been classified as measured due to a degree of reduced confidence in the geological database; specifically the lack of specific down-hole survey data, incomplete sampling throughout the mineralized zone, and lack of oriented down-hole structural data. It is recommended that future drill programs practice continuous sampling throughout the host zone intercepts with samples on either side to provide constraints on the mineralized solid.

26.2 Mining and geotechnical

Tetra Tech has provided mining plans for the purpose of completion of the PFS as opposed to planning for operations. Due to the low tonnage in the first year and the outcropping nature of the mineralisation, the initial mine planning is not critical. Once mining commences and a better understanding of operational parameters and constraints are available including dilution and mining recovery, it is advised that mining plans are reproduced. It is further advised that the new mining plans, and potentially a revised understanding of geology gained through mining, should be provided to the Greenland permitting authorities, so as to ensure that any changes to the mining schedule can be disclosed to the government to avoid any permit related issues.

Tetra Tech recommends that TNG and LNSG consider the use of a small bull dozer (equivalent of CAT D6/7) for handling of waste rock, especially when dumping into water. In addition, the bulldozer would be available to assist with construction of mine haul roads and other infrastructure during mining.

It is also recommended that a geotechnical study is performed on the rock mass to be mined for the project and that the results are used for revising the mine plan.

It is recommended that True North Gems Inc. conduct site investigations followed by a hydrogeology study to better the understanding of the potential ground water in the open pit.

26.3 Infrastructure

During discussions prior to the latest site visit by Tetra Tech, TNG noted that a dock will be built at the site and it was mentioned that this might be a sheet pile type structure. Examination of the aerial photos of the shoreline indicates similar soil/rock conditions to that found on shore. As such, it might not be possible to drive sheet piles into the seabed in this type of material and an alternate dock design may have to be considered. It is therefore recommended that a simple geotechnical investigation may need to be undertaken in the proposed location of the dock to enable the development of the most appropriate most appropriate of dock design.

26.4 Budget for recommendations

TNG have estimated that additional drilling of the deposit as per recommendations above would cost US $250,000. Tetra Tech estimate that TNG or LNS should budget US$350,000 to US$450,000 to purchase a bulldozer for the site.

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CERTIFICATES OF QUALIFIED PERSONS

CERTIFICATE

I, Lara Reggin., P. Geo., hereby certify that:

1. I am a Senior Project Geologist and Project Director for Tetra Tech EBA Inc. with a business address at Suite 1000, 885 Dunsmuir Street, Vancouver, B.C. V6C 1N5.
2. I am a graduate of the University of British Columbia in 1995 with a Bachelor of Science degree in Geological Sciences.
3. My relevant experience for the purpose of the Technical Report (defined below) is:
   - Review and report as a geologist and consultant on numerous exploration and mining projects within Canada for due diligence, operations and regulatory requirements, including:
     - Geotechnical, Preliminary Assessment and Prefeasibility reports for the Yellowknife Gold Project, NWT from January 2005 to 2009.
     - Technical Report on the Courageous Lake Deposit, NWT.
     - Geotechnical Preliminary Assessment of the DO27 Project, NWT
     - Technical Report on the Bonanza Ledge Gold Deposit, Wells, B.C.
   - Mine geologist with duties including reserves and grade control at operational mine sites including:
     - Echo Bay Mines Lupin Gold Mine, Nunavut, Canada;
     - Echo Bay Mines, Ulu advanced exploration project (gold), Northwest Territories;
     - Battle Mountain Gold's Golden Giant Gold Mine, Ontario, Canada;
4. I am registered as a Certified Professional Geologist registered with the Association of Professional Engineers and Geoscientists of the Province of British Columbia (Reg.# 28236). I have worked as a geologist for a total of 15 years since my graduation from UBC.
5. I am a "Qualified Person" for the purposes of National Instrument 43-101.
6. I am responsible for the preparation of the technical report titled "Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland", effective date January 31st 2015 and dated March 17th 2015 (the "Technical Report"). I am responsible for Sections 1.1 through to 1.4, Sections 2 through to 14 and Section 26.1.
7. I have visited the Aappaluttoq property between the 2nd and 4th of November 2010, and 2 additional days in Nuuk which will serve as the site for post-processing work.
8. I am independent of True North Gems applying the test set out in Section 1.5 of National Instrument 43-101. I was previously involved with the project as a co-author of the original Pre-Feasibility Study completed in 2011, prior to which I had no involvement with the property or True North Gems.
9. I have read National Instrument 43-101, and the Technical Report has been prepared in compliance with the Instrument.

10. As of the date of this Certificate and the Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

PROFESSIONAL
PROVINCE OF
L. D. REGGIN
#28256
BRITISH COLUMBIA
GEOSCIENTIST

Lara Reggin
Senior Project Geologist
Tetra Tech EBA Inc.

March 17th 2015

CERTIFICATE

I, Mark Patrick Horan hereby certify that:

1. I am a Senior Mining Engineer with Tetra Tech EBA Inc. with a business address at 885 Dunsmuir Street, Vancouver, British Columbia, Canada;
2. I am a graduate of the University of Witwatersrand, 1997, with a BSc. Mining Engineering and I am a graduate of Rhodes University, 2002, with an MSc. Since 1998 to present I have been employed in the mining industry in various roles; I have worked in gold, coal, chrome and industrial minerals. I have previously been author of technical reports for mining operations in South Africa, Mexico and Canada;
3. My relevant experience includes 15 years of mining engineering;
4. I am a Registered Professional Engineer, with the Association of Professional Engineers and Geoscientists of British Columbia, registration number 170768;
5. I am a "Qualified Person" for the purposes of National Instrument 43-101;
6. I am responsible for the preparation of the technical report titled "Updated Pre-Feasibility Study on the Aappaluttoq Ruby Project, Greenland", effective date January 31, 2015 and dated March 17, 2015 (the "Technical Report"). I am responsible for sections 1.5 through to 1.15, sections 15 through to 25, sections 26.2 through 26.4 and section 27;
7. I visited the property in Greenland for personal inspection on October 14, 2014;
8. I am independent, as described in Section 1.5 of National Instrument 43-101, of True North Gems Inc., the corporation for which I prepared portions of the Technical Report, and I have had no prior involvement with True North Gems Inc. or the property;
9. I have read National Instrument 43-101, and the Technical Report has been prepared in compliance with the Instrument; and
10. As of the date of this Certificate and the Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Mark Horan
Senior Mining Engineer
Tetra Tech EBA Inc.

March 17 2015