

**REPORT OF WORK**  
**THE NORTHERN ONE GRAVEL DEPOSIT**  
**HOMFREY CHANNEL, BRITISH COLUMBIA, CANADA**

**NTS MAP 92K/2**

50°11'North, 124° 35'West

Mineral Tenures: NORTHERN GRAVEL – Tenure no. 544952  
SUPER MAMMOTH 5 – Tenure no. 549843

Report prepared by: Erik A. Ostensoe, P. Geo.

Report prepared for: Farshad Shirvani

Date of Report: September 24, 2007.

GEOLOGICAL SURVEY BRANCH  
MINERAL TENURE REPORT  
29337

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*Erik A. Ostensoe*

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## 0.0 SUMMARY

The Northern One aggregate deposit, characterized as a “raised delta” type, is located close to tidewater in a readily accessed coastal area of British Columbia that appears to be ideally suited with respect to production, processing and transportation factors. The property is in a very early stage of evaluation and will require a series of technical surveys, including those required to better determine the quality and yield of prospective sand and gravel products, the total volume of resource, deleterious components, if any, marketing studies and materials handling considerations. Extensive and elaborate environmental and other studies that will be required.

The Northern One deposit is located at Lloyd Point in Homfrey Channel, B. C. and occupies the valley and valley walls of Lloyd Creek, a high energy stream that flows westerly from a minor sub-range of the Coast Mountains. Sand and gravel deposits appear to be derived from till deposits created in Pleistocene to Recent time, possibly in a marine environment. Components vary from coarse boulders, some larger than one metre in diameter, to gravel and fine sand. The presence of small quantities of clay and similar fine fractions is recognized but particles in surface outcrops that have been examined are only very weakly cemented or are merely compacted: it is not known if similar conditions persist throughout the deposit.

A program of sampling was completed on the Northern Gravel and Super Mammoth 5 mineral tenures in mid-September, 2007. Four samples were obtained from the site and several samples were obtained from nearby locations: only one of the latter samples was analysed by sieve analysis methods. Although the samples have good characteristics for aggregates when compared to provincial MOT/Department of Highways specifications, much further work will be required before it is possible to draw any conclusions concerning the viability of an aggregate operation.

## 1.0 INTRODUCTION

A significant sand and gravel deposit with tidewater access has been identified at Lloyd Point in Homfray Channel, an arm of Toba Inlet, east of Campbell River, British Columbia, Canada. It has been subjected to a small amount of investigation and appears to have good potential to support a future sand, gravel and aggregate operation that will supply a range of raw materials to both the domestic and export building, landscaping and construction markets but much test work must be conducted to establish the size and quality of the deposit.

The so-called "Northern One" gravel deposit was discovered several decades ago by employees of a traditional mining company who were conducting exploration surveys in search of metallic ores. That company completed a small amount of testing work but subsequently closed its exploration office and failed to pursue the project. The area was re-visited in 2002 by a former employee of the mining company who staked six mineral claims to acquire much of the deposit and subsequently introduced the project to the present owner group. Concomitantly, the British Columbia Geological Survey, as part of a coastal resource review, identified the Lloyd Point/Lloyd Creek area as having significant aggregate potential.

An established engineering company was engaged in 2002 by a former owner to carry out various scoping studies, including a desktop review of literature and aerial photographs and a site reconnaissance, to obtain samples of bank-run materials for sieve analysis and other tests, and to advise the owner concerning possible issues to be addressed in environmental studies preparatory to establishing an aggregate plant. No site work was conducted in the period 2002 through August 2007 and at intervals the claims were allowed to expire. The property was acquired in 2006 and 2007 by the present owner.

Field work on the Northern One aggregate deposit resumed in September 2007 in order to obtain a small number of samples of possibly representative examples of the *in situ* aggregate material for testing purposes. Four samples (N-1, N-2, N-3 and N-4) were taken from shallow hand-dug pits and submitted to a testing laboratory for screen analyses. Samples from a nearby site were obtained for comparative purposes but only one (NG-1) was processed.

The author of this report is a consulting geologist who was engaged to visit the property and participate in the sampling. He examined in detail and sampled several outcroppings of the sand and gravel deposit and conveyed the samples to the laboratory. The laboratory is a full service testing facility and the company, for other clients, has performed a large number of aggregate analyses on samples similar to those submitted from the Lloyd Point "Northern One" deposit. Its work is well regarded and is accepted by various governmental and inspection agencies.

The author is not qualified to offer informed comment on aggregate analyses and has included that data without elaborate interpretation.

## 2.0 PROPERTY DESCRIPTION AND LOCATION

The Northern One property comprises two mineral tenures with total area approximately 250 hectares (Table 1). The tenures have not been legally surveyed. Titles are held by Farshad Shirvani under provisions of the British Columbia Mineral Act. Costs incurred in obtaining aggregate samples and the preparation of this report are being qualified in order to extend the expiry dates of the claims to their respective 2013 and 2014 anniversary dates.

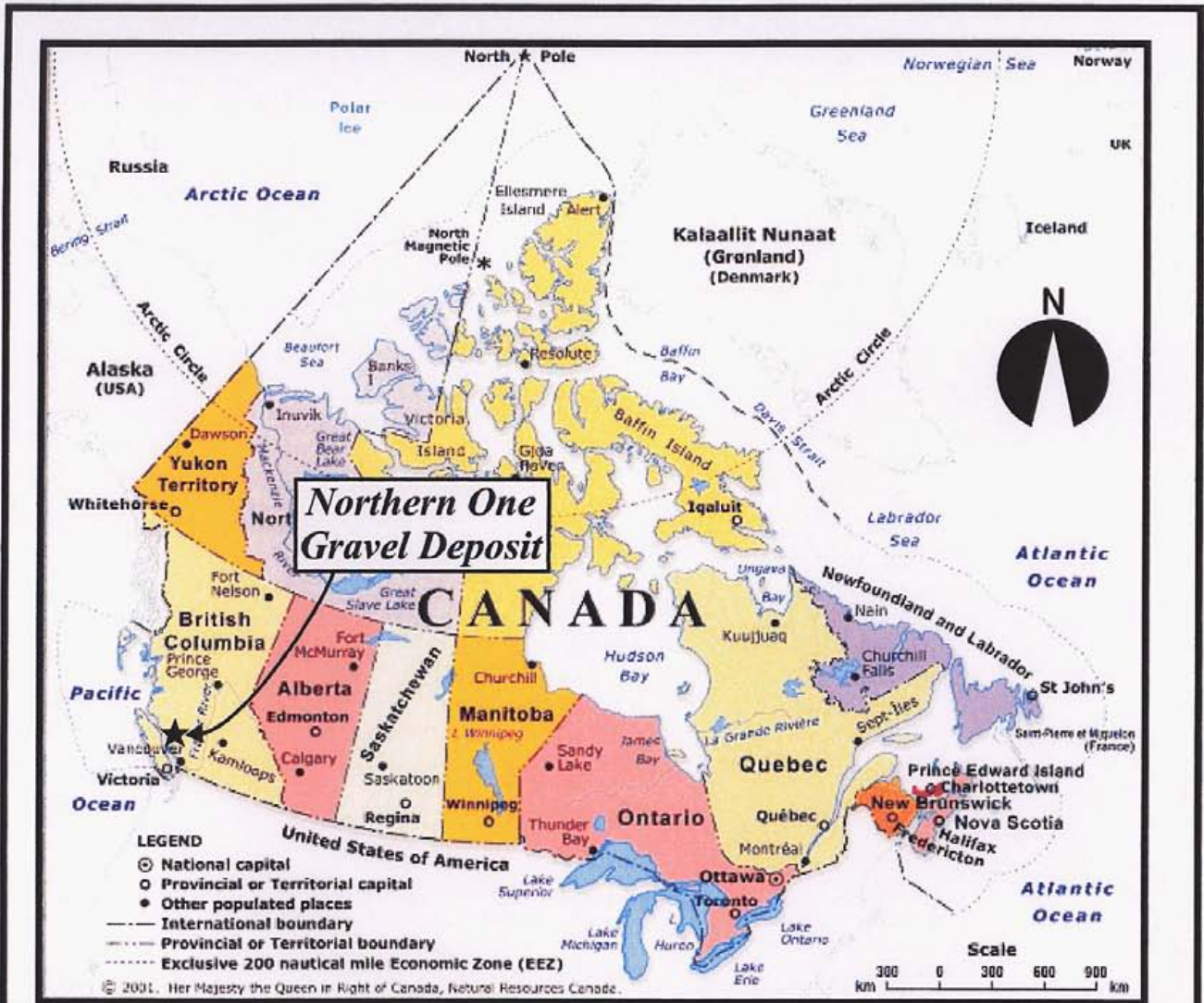
Permits will be required prior to commencement of exploration and/or development work on the tenures: such permits are customarily issued by the Ministry of Mines and may specify certain measures to protect the environment and to ensure appropriate reclamation following cessation of work. A nominal reclamation bond may be required and is returned to the operator when satisfactory reclamation is completed. The permitting process for Northern One property has not been initiated by the present owner pending financing and planning considerations.

Mineral Tenure	Name	Area hectares	Registered Owner	Date of Location	Date of Expiry*
544952	Northern Gravel	124.118	Farshad Shirvani	Nov. 6, 2006	Nov. 6, 2013*
549843	Super Mammoth 5	124.118	Farshad Shirvani	Jan. 19, 2007	Jan. 19, 2014*

**TABLE 1. Claims**                      \* pending

The Northern One tenures are located, as shown in figures 1, 2, 3 and 4 of this report, at Lloyd Point/Lloyd Creek, near tidewater on the southwest coast of the mainland of British Columbia. Geographic coordinates of the mid-part of the tenures are 124° 35' 35" W, 50° 11' 32"N. (UTM Zone 10, 386000 East, 5561000 North). Apart from remnants of logging roads and settings, there are no improvements or installations on the tenures and there are no known environmental liabilities.

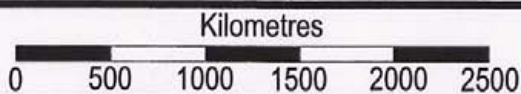
The claims occupy parts of the drainage basin of Lloyd Creek. The entire area was logged many decades ago and now has a substantial forest of second growth evergreen trees with lush undergrowth typical of the West Coast marine environment. Logging



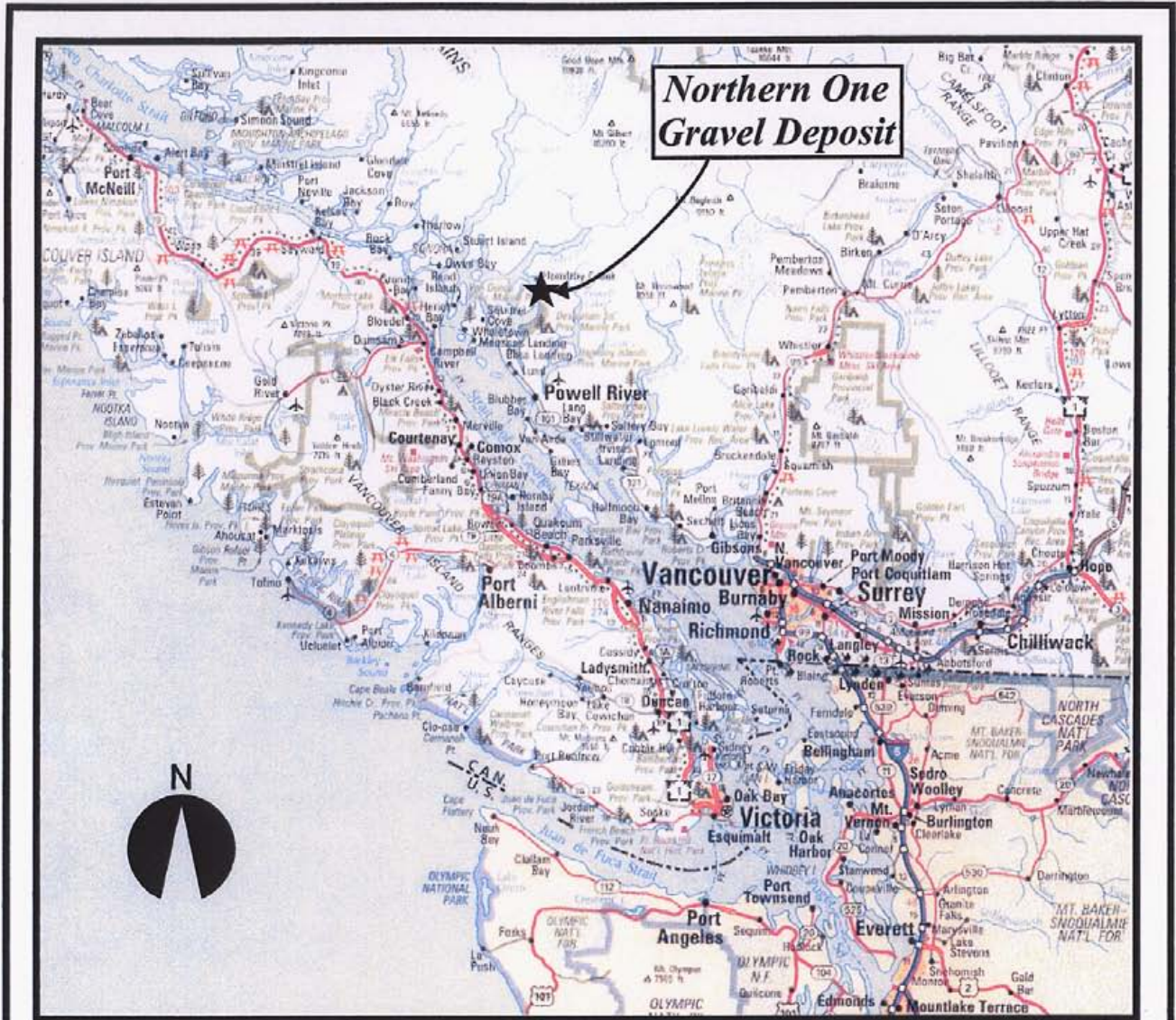
BaseMap Source: Natural Resources Canada On-Line Atlas of Canada:  
<http://atlas.gc.ca/site/index.html>

*Northern One Gravel Deposit*  
*Vancouver Mining Division, British Columbia, Canada*

**LOCATION MAP - NORTH AMERICA**



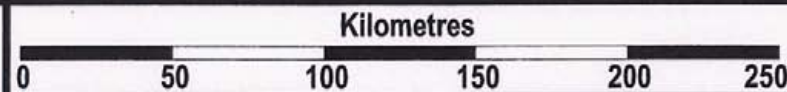
**Fig. 1**



BaseMap Source: Rand McNally Road Atlas(1999)

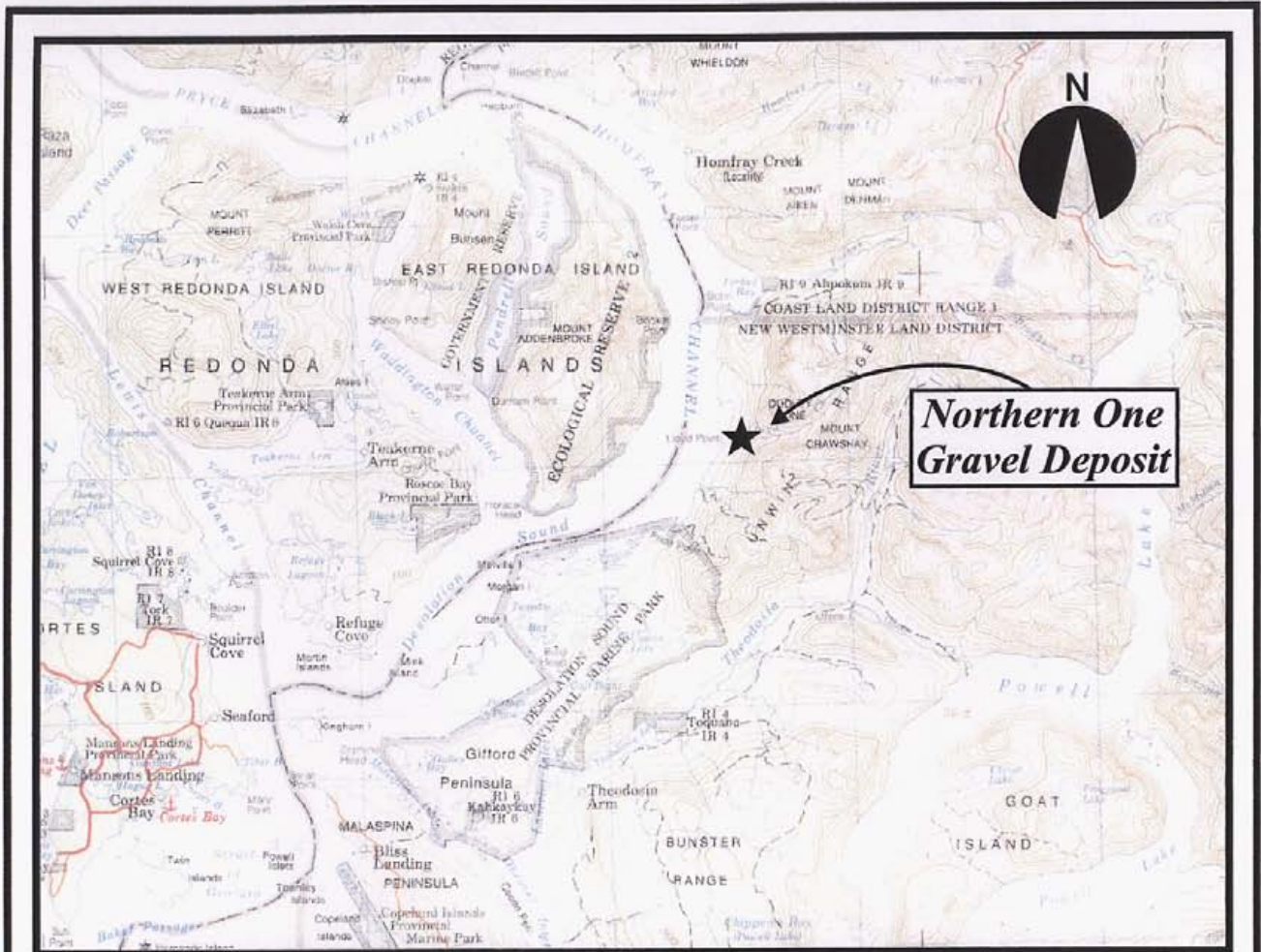
**Northern One Gravel Deposit**  
**Vancouver Mining Division, British Columbia, Canada**

**LOCATION MAP - BRITISH COLUMBIA**



**Fig. 2**





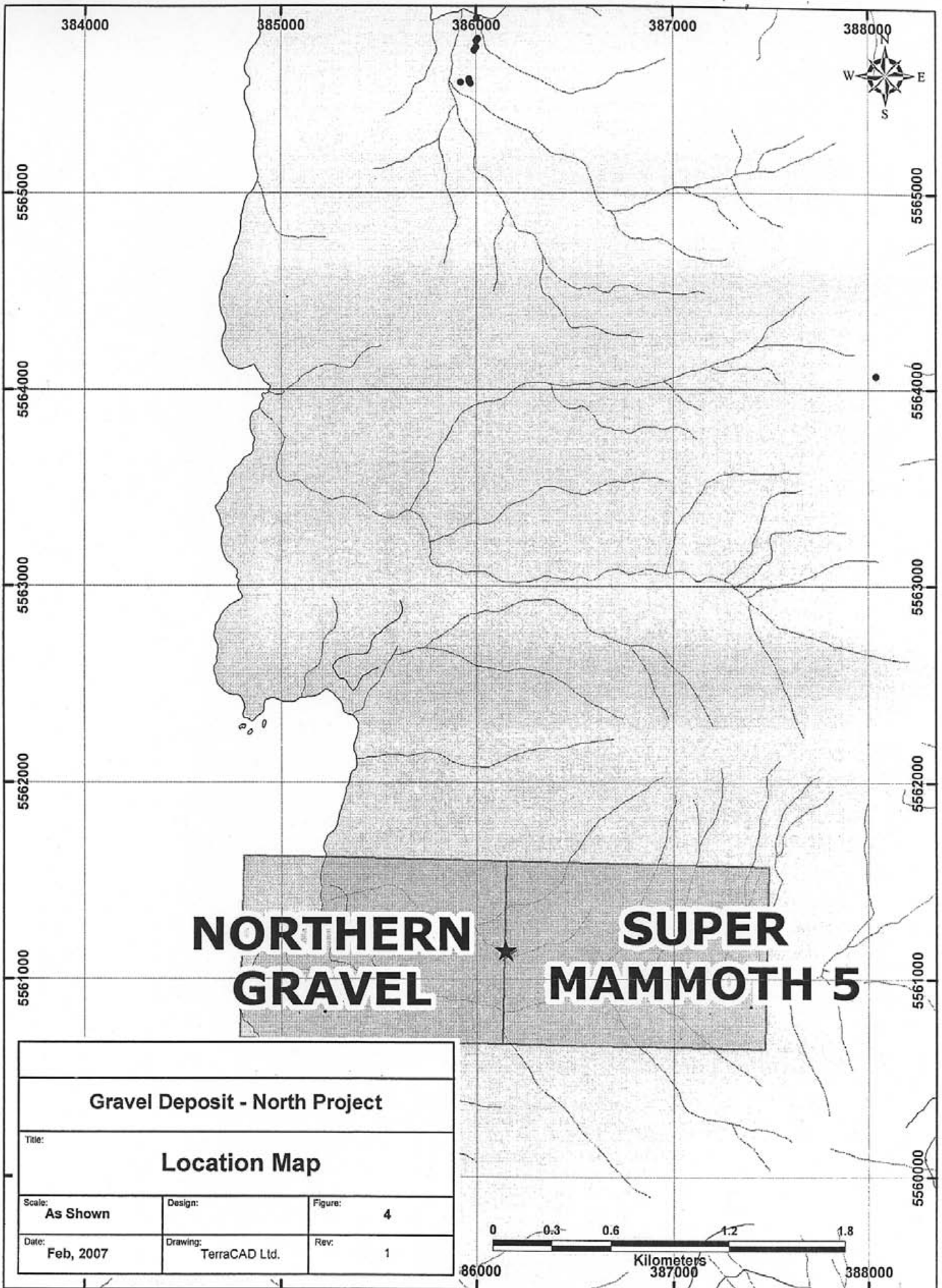
BaseMap Source: National Topographic System  
 1:250,000 Scale Map 92K

***Northern One Gravel Deposit***  
***Vancouver Mining Division, British Columbia, Canada***

**ACCESS MAP**



***Fig. 3***



384000

385000

386000

387000

388000

5565000

5565000

5564000

5564000

5563000

5563000

5562000

5562000

5561000

5561000

5560000

**NORTHERN  
GRAVEL**

**SUPER  
MAMMOTH 5**

**Gravel Deposit - North Project**

Title:

**Location Map**

Scale:

**As Shown**

Design:

Figure:

**4**

Date:

**Feb, 2007**

Drawing:

TerraCAD Ltd.

Rev:

**1**



86000

388000

access roads have deteriorated and are at present virtually overgrown but nevertheless can, with some effort, be reclaimed in order to provide access for crews and equipment.

The tenures as shown in Figure 4 are contiguous and extend from sea level to elevation 300 metres. The property fronts on an arm of Toba Inlet in what was formerly a very active logging area.

### **3.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY**

The Northern One aggregate site at Lloyd Point lies on the mainland of British Columbia, 50 km east of Campbell River. Campbell River on Vancouver Island is a town with population 31,000 that provides services and accommodations for a mixed population of fishermen, forest workers, miners, government employees and retirees. In season it supports a busy tourist scene that caters to, among others, sports fishermen, whale watchers, recreational divers and the boating fraternity. Smaller cruise ships en route to Alaska frequently have called to enable passengers to "explore" the native culture and the natural beauty of the area and the docking facilities have been enlarged to accommodate larger ships. Scheduled airline services and a recently up-graded provincial highway provide easy access to the area.

A second point of access to the Northern One site is by a 45 minute water taxi trip from Lund, a small community on the mainland coast, 28 km north of the city of Powell River.

The Northern One aggregate site is accessed exclusively from the shore: float-equipped aircraft and water taxis can land passengers on the beach. Heavily overgrown logging roads and logging debris are testimony to logging operations that removed merchantable timbers many decades ago. The mineral tenures extend from sea level at the mouth of Lloyd Creek easterly upstream to about 300 metres elevation.

The Lloyd Point area experiences a moderate coastal marine climate: annual precipitation is substantial, largely as rain in the winter months and amounting to about 400 mm. with occasional episodes of snowfalls. Maximum snowfall seldom exceeds one metre. Temperatures vary seasonally in the range -15° C. in winter to 25° C. in summer. Foggy conditions occur in all seasons and may interfere with water travel and aircraft.

The mineral tenures have a forest cover typical of the coastal rain forest conditions and comprising second growth hemlock, cedar, fir and alder trees. Largest trees attain more than 50 cm diameter. Undergrowth is in places dense and is largely moss, ferns and salmonberry bushes.

The Northern One area is close to Toba Inlet, one of the many coastal fiords of the Coast Mountains of British Columbia. Such fiords were modified during Pleistocene and Recent time by glacial action: the interior plains and high Coast Mountains accumulated vast amounts of snow and ice that formed great "rivers" of ice that flowed through the mountains to the Pacific Ocean. Large quantities of glacial till and glacialfluvial deposits of modified till were emplaced along the shorelines as the ice ablated and subsequently were to varying degrees further modified by streams and wave action. Several such deposits have been exploited as sources of construction aggregate materials, notably at Sechelt on the Sunshine Coast, at Port McNeil on Vancouver Island, and at several sites in the Fraser Valley. Deposit sizes and the quality of materials contained therein vary somewhat but commonly the most important considerations concerning exploitation are related to access and transportation.

The fiords of British Columbia are similar to those of Norway and New Zealand: notably narrow, their walls are very steep and arable land is limited.

*During Pleistocene time Pacific Ranges were probably largely covered by ice. .... Glacial action was particularly active in these mountains. Their position along the sea coast gave them a great and continual supply of snow, which, with the short distances and steep grades to sea-level, resulted in rapid ice flow and intense erosion. Thus was developed the great network of valleys, with long fiords in their seaward parts commonly excavated to 2000 feet [610 metres] and more below present sea-level (Bostock, 1948, p. 82).*

#### **4.0 HISTORY**

The so-called "Northern One" gravel deposit was discovered several decades ago by employees of a traditional metal mining company who were conducting exploration surveys in search of metallic ores. That company completed a small amount of testing work on the gravels but subsequently closed its exploration office and failed to pursue the project. The area was re-visited in 2002 by a former employee of the mining company who staked six mineral claims to acquire much of the deposit and subsequently vended the project to a private group that initiated work. The British Columbia Geological Survey, in as part of a coastal resource review, identified the Lloyd Point/Lloyd Creek area as having aggregate potential (BCGS, 2002).

An established engineering company, Levelton Engineering Ltd., was engaged in 2002 by the then owners to carry out various scoping studies, including a desktop review of literature and aerial photographs and a site reconnaissance, to obtain samples of bank-run materials for sieve analyses and other tests, and to advise the owners concerning issues to be addressed in environmental studies preparatory to establishing an aggregate plant. No

site work was pursued in the period 2002 through 2007 and at intervals the claims were allowed to expire and were subsequently re-staked.

Farshad Shirvani is the owner of the Northern Gravel and Super Mammoth 5 mineral tenures. He has assembled details of previous work on the properties and under his direction work on the aggregate deposit, known as the "Northern One" deposit, resumed in September 2007 in order to confirm and up-date previous analyses of bank-run materials and to obtain current data concerning various permitting issues, and market- and transportation-related factors.

No formal mineral resource and mineral reserve estimates were calculated by, or for, either the former or current owners and there has been no production of aggregate materials from the property. The then owner, in 2002, discussed the volume of gravel that may be present on the Northern One property:

*The gravel is found in a space of plus 5,000 feet (1500 m) in length, across a width of at least 1,300 feet (400 m), and with a minimum thickness as seen in exposures of 100 feet vertically (30 m), all the while climbing from sea level to plus 1,200 feet (365 m) elevation. The actual outer boundaries are believed to be larger, but we have seen gravel across these dimensions. The MINIMUM dimensions (sic.) calculate out close to 24,000,000 million (sic.) cubic yards.*

*Other estimates made using stereoscopic air photos and field traverses estimate there is room for 30 to 45 million cubic yards of gravel (Burton, 2002).*

**Note that the above-cited figures for possible volumes of aggregate materials were calculated without benefit of seismic or other geophysical survey work, auger drilling or other confirmatory work in the field and are of historic interest and should not be relied upon in any current evaluation of the deposit.**

## 5.0 GEOLOGICAL SETTING

The Northern One aggregate deposit is located near the estuary of Lloyd Creek, a small coastal stream that flows westerly from Mount Crawshay in the Unwin Range, a minor part of the Coast Mountains of southwestern British Columbia. The Coast Mountains comprise the largest mountain mass in Canada and extend the entire length of the Cordillera. They are dissected by large, deep, U-shaped valleys, and glaciers and ice-fields are present throughout the various ranges. Granitic batholiths underlie the greatest part of the Coast Mountains and are the source of most of the components of nearby occurrences of alluvial, glacialfluvial, morainal and till deposits that have been derived by glacial and other erosional processes.

The Northern One deposit is situated between sea level and about 300 metres elevation and comprises a weakly stratified, poorly sorted accumulation of sand and gravel with cobble and boulder-sized clasts. Very small amounts of clay and silt-sized components act as weak cementing agents that give sufficient competency to support shallow cutbanks. The deposit was likely formed by periglacial processes that prevailed at the time of waning glacial activity, when meltwaters attacked till accumulations that were deposited by valley glaciers. Much of the deposition occurred in a marine environment - the area may have been submerged as a result of crustal compression from ice loading. However, the continental scale accumulation of huge quantities of ice also lowered sea levels and the subsequent rising sea level occurred in step with post-glacial rebound.

## 6.0 DEPOSIT TYPE

*"Sand and gravel are unconsolidated aggregates of highly siliceous, usually quartzose grains, ranging in size from material as fine as clay to material ordinarily called boulders. The finer aggregates are known as sand and the coarser as gravel. It is apparent that there is a continuous gradation in size from the finest silt to the largest boulders, and various authorities differ as to just where the dividing lines should be drawn. The dividing line between sand and gravel is variously placed at from 0.1 to 0.25 in. There seems to be no definite upper limit to the size of gravel, but commercial grades do not usually contain pebbles much larger than 2 ½ or 3 in. Siliceous aggregates of such fine grain size that individual grains cannot be distinguished by the unaided eye and in which the characteristic sandy texture is not evident are usually called silts.*

*There is a complete gradation in coherence from unconsolidated sands and gravels through partly indurated aggregates, friable sandstones, firm sandstones, and conglomerates, to metamorphosed sandstones or quartzites" (Ladoo and Myers, 1951, p. 453).*

*"Capsule description: Surficial sediment of sand and gravel deposited as a stream channel fill, fan or delta, usually in late-glacial or post-glacial period. Deposition may have occurred in contact with glacier ice (e.g. esker, came complexes, crevasse fillings), or beyond the ice margin (e.g., outwash plain, raised delta)( Hora, 2007).*

Sands and gravels are secondary accumulations of products of the disintegration of rocks, by chemical or mechanical means. Silica is the most persistent component of most rocks, with other minerals being gradually or rapidly dissolved or broken down into fine silt and carried away by flowing water, wind, waves or glaciers.

Deposits of sand and gravel occur practically everywhere and customarily have been produced from sites located close to the point of consumption. Exceptions are sands of exceptional quality, purity or with unique properties that enable the end user to absorb heavier transportation charges.

Sand and gravel sources located close to major construction markets have in recent years been a depleting resource accompanied by market demand that increases steadily but with increasingly difficult obstacles in the path of developing replacement sources, be they environmental (water use and degradation), social (noise, dust, traffic considerations) or worries about secondary effects, such as changing the landscape, altering water courses, and congestion on shipping routes.

Factors to be considered in developing sand and gravel deposits include (1) purity of sand, (2) physical characteristics, (3) uses, (4) conditions of mining or quarrying, (5) washing or sorting requirements, (6) fuel, if drying should be required, (7) water sources and supplies, (8) transportation, and (9) distance from point of consumption [adapted from Industrial Minerals by Ladoo and Myers, 1951, p. 460].

The Northern One property comprises an apparently substantial, but essentially uninvestigated, deposit of sand and gravel of the "raised delta" nature. It forms low bench-like accumulations of glacio-fluvial deposits near and upstream from the Lloyd Creek stream estuary. Materials initially were deposited as tills by glacial action and have been in part transported by streams to their present locations; other parts remain *in situ*. Components are relatively coarse-grained and where viewed near Lloyd Creek exhibit gently to steeply dipping foreset beds that overlie finer-grained bottomset beds.

The Northern One aggregates deposit at Lloyd Point appears to have formed in conformity with a common depositional history: glacial transport, deposition in a terrestrial or marine environment, followed by partial erosion and re-deposition by stream action, and possibly by mass transport (i.e. land slides, debris flows). Exploration work to determine the characterization of the resource, its quantity and its quality, will require several surveys. Initial quality determination will be obtained by sampling and analyzing a relatively small number of samples obtained from surface exposures: samples, which will be relatively small (i.e. each less than 100 kg.) will be taken using hand tools, transported off-site and processed by a commercial laboratory. Data will be delivered as screen-size fractions. Larger samples may then be obtained from pits and other exposures using mechanized equipment: obviously larger samples will be considered more reliable than the smaller samples. They may be processed on site using portable screen decks and other equipment appropriate for handling the "raw" materials and the screened products. Technical analyses will be applied to determine the suitability of the various products in the aggregate market: parameters will include strength, sphericity, chemical stability, impurities, et al. The resource will be quantified by a combination of surveys: the surface extent may be approximated using photogrammetric methods,

possibly utilizing satellite imagery or conventional aerial photography, supplemented by "ground truthing" to establish the reliability of the analysis. Depths of the deposit will be determined by seismic and/or radar techniques, followed by auger drilling: of primary importance will be determination of the topography of the underlying bedrock. The presence of potentially troublesome clay layers, aquifers and/or boulder beds may be indicated but likely will not be confirmed.

The foregoing description of a sampling scenario is an approximation of the initial stages of future investigations of the Lloyd Creek deposit. Specialist Quaternary geologists may be engaged to evaluate the geological controls and to complete the technical evaluation of the resource. Potential purchasers will be in part guided in their evaluations by reference to physical and chemical parameters specified in ASTM and CSA Standards" (Hora, op cit., p. 3) and by various highway and municipal builders' guidelines.

## **7.0 EXPLORATION**

Exploration and evaluation of the Lloyd Creek sand and gravel resource is in a very early stage.

A limited amount of prospecting and sampling was completed in 1971 by a previous owner and fourteen samples of "bank run" material were tested at that time by a commercial laboratory [Coast Eldridge Professional Services Division of Warnock Hersey International Limited] that performed grading analyses, organic impurities tests and visual analyses and prepared a brief tabulation of aggregate gradations and a general discussion of the material and anticipated problems in the processing and utilization

Claims were staked in 2002 by a geologist who recognized the potential value of the Lloyd Creek deposit. A comprehensive overview report was prepared by that owner who succeeded in getting, from an established construction company an offer of assistance "...in financing, developing infrastructure and processing gravel aggregates for both domestic and foreign markets". The latter company engaged Levelton Engineering Ltd. of Nanaimo and Richmond, B. C. who conducted sieve analyses and Relative Density and Absorption tests on four samples, and organic impurities tests on three samples provided by the owners, conducted a site visit and met with personnel from the Environmental Assessment Office of the provincial government and with members of the BC Forest Service. to confirm and up-date previous analyses.

The 10 mm retained and 14 mm retained screen fractions from one of the samples tested were combined and examined petrographically by F. Shrimmer, P. Geo., of Levelton Engineering Ltd. He reported that particle geometry was generally 'cubic' and that particle shapes were characterized as "subround" to "subangular", with only occasional



rounded particles. Dominant rock types were igneous, with minor amounts of metamorphic rocks. Characteristics relevant to engineering uses were also considered: these included "...porosity, strength, tenacity, presence or absence of vugs, voids, fissures, cracks, coatings and impurities in the particles" (Shrimer, 2002, p. 3). A "Petrographic Number" of 110 was calculated; this number is an aid in comparing a particular aggregate product to similar materials in general commercial use and on that basis Shrimer believed that the Lloyd Point materials were "...equivalent in physical quality to typical commercial supplies of aggregate in use in many areas of British Columbia and Washington" (Shrimer, 2002, p. 3).

Levelton outlined a limited program of seismic refraction surveying as a basis for developing subsurface profiles and cross sections through the deposit. Geological reconnaissance and drilling (using a Becker hammer drill) to enable development of a geological model were also recommended. That work was never completed and the project languished for several years until the claims lapsed and were subsequently acquired in 2007 by the present owner.

The present owner has not undertaken any elaborate technical work to determine the quality and volume of aggregate material at the Lloyd Creek site but with his direction, four 13 kg. samples of "bank-run" material were taken under the author's supervision, transported securely to a recognized laboratory and processed by passing the material through a series of graduated sized screens (Figure 5). The purpose of the sampling was to obtain a broader view of the composition and variability of the deposit. Samples were taken from several sites that exhibit slight variation in appearance and character. Sample locations are shown in Figure 6 of this report and the screen analyses are included as Appendix 1.

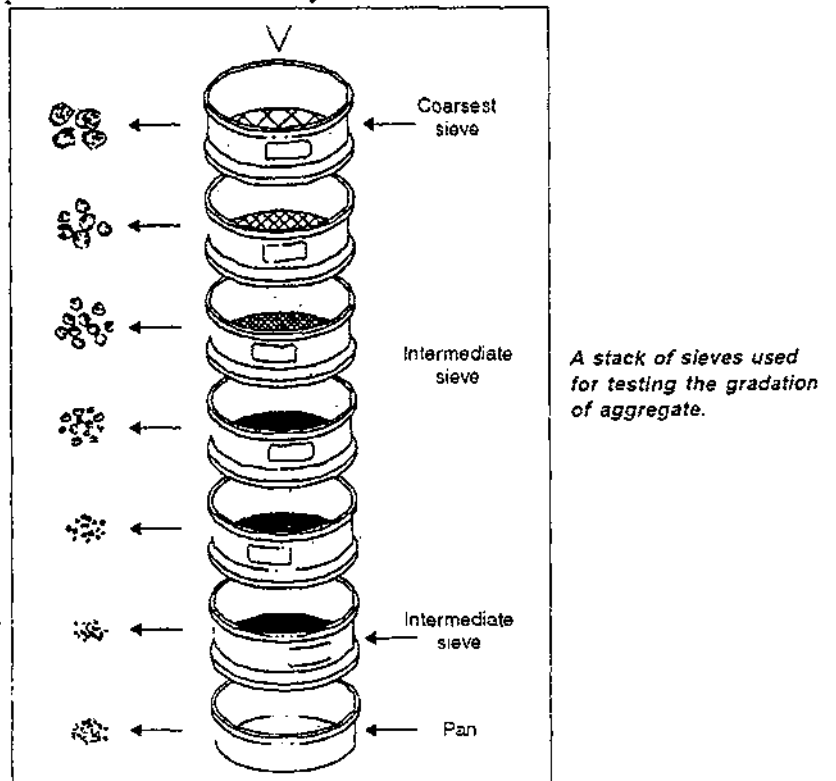
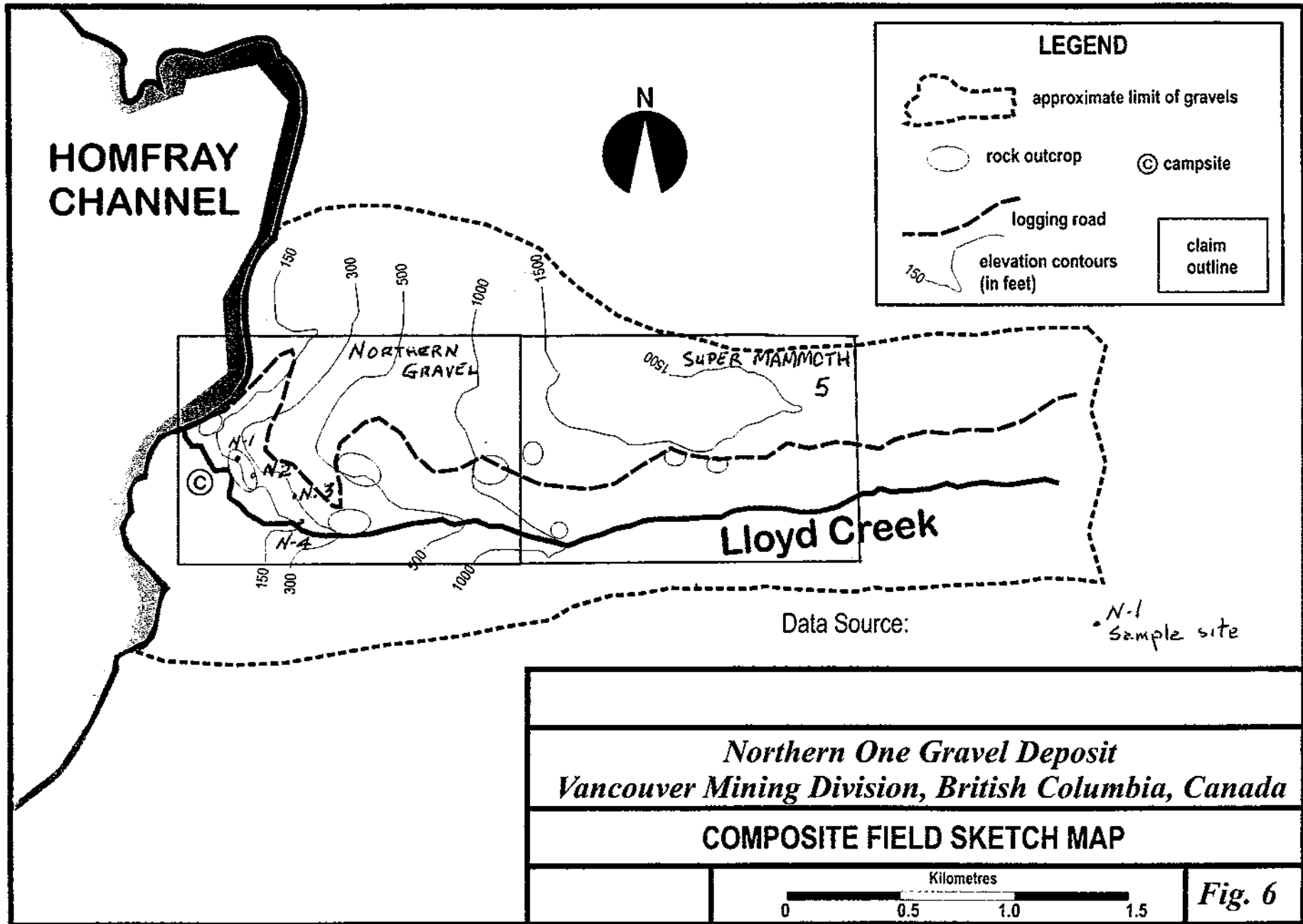


Figure 5. Sieve Assembly Diagram



The samples are thought to be representative of the *in situ* resource but it is not possible to confirm their reliability – large cobbles and boulders were excluded from the samples. Surface materials may have been oxidized or partially oxidized and otherwise modified by weathering processes. The field examination carried out by the author of this report was at best incomplete: it was not possible to gain access to all parts of the mineral tenures due to terrain and vegetation considerations. Physical limitations determined that samples had to be obtained from areas readily accessible from the beach so that they could be safely conveyed to a laboratory. Additionally, several other quality tests that could have been performed on the sample materials were not requested but in due course may be obtained.

The data from the samples is representative only of the near surface portion of the deposit and, although admittedly imperfect in terms of sampling the entire resource, form the basis for recommendations that are presented in a later part of this report.

Four samples of Lloyd Point *in situ* gravels and one sample of similar looking materials from a site 4.5 km north of Lloyd Point, were submitted to Metro Testing Laboratoires Ltd. of Burnaby, B. C. Samples were washed to remove possible clay and other particles that might exaggerate the size of aggregate components. Analyses are reported in terms of “Gravel sizes” in the range of 3 inches to 3/8 inches (9.5 mm) and “Sand sizes and fines”, from 4.75 mm (No. 4 Screen) to 75 microns (No. 200 screen) and the Metro Testing Laboratories Ltd. sieve analyses are included as Appendix 1 of this report. The reports include a graphic depiction of the size distribution of the materials sampled. “Table 202-C – Aggregate Gradations” [Table 2 of this report] from British Columbia Ministry of Transport website is a standard reference for judging the suitability of aggregates for purposes of road building surfacing and sub-surfacing aggregate.

Sieve analyses, as shown in the graphic displays, exhibit similarities between the four samples from Lloyd Point with sample N-3 being generally finer-grained than the other three samples from that area. Sample NG-5 is much coarser grained than is the Lloyd Point material. As a generality, the Lloyd Point aggregates appear to offer potential to provide commercial grade products of the character described in the BC MOT specifications.

## **8.0 PROGRAM OF WORK**

Four samples of bank-run material from the Lloyd Creek aggregate property were obtained by the author of this report, with the assistance of the owner, Mr. Farshad Shirvani. Locations of samples were determined and recorded by use of GPS methods: a hand-held Garmin Model GPSmap 60Cx instrument provided locations with about 6

metre accuracy (Figure 6). Sample sites were selected on the basis of accessibility, amount of possible disturbance if any, and ease of working with hand tools, namely a miner's pick and a spade.

Samples were taken by clearing away vegetation and obviously transported material and digging to a convenient depth. Cobbles and boulders were excluded from the sample but an attempt was made to include all other material encountered. Samples were placed in standard "rice" bags that were then sealed with an appropriate closure. Samples of 13 kg (30 lbs.) weight were taken. Samples were placed in woven plastic bags, commonly referred to as "rice bags" and were hand carried to the nearby beach where they were taken in a float-equipped aircraft to Sechelt and thence by truck to a testing laboratory in Burnaby, B. C. Samples were identified by markings on the exterior of the bags and by tags placed inside.

Samples were recognized to be less than ideal for the purposes of evaluating the quality of the deposit, however it was also recognized that they were obtained as part of a preliminary assessment and that the results would not be relied upon exclusively in any subsequent evaluation. The number of samples (4) was insufficient and the distribution of the samples relative to the apparent extent of the deposit was skewed due to access and transport considerations resulting in useful but non-representative data.

A listing of samples, their location, and size, along with a brief description of each, is presented in Table 3 of this report. Sample locations are plotted on Figure 6. Screen analyses are presented in Appendix 1.

Each sample was washed and then dried before being processed in its entirety through a bank of graduated screens mounted in a column. The column vibrated with an oscillating motion sufficient to ensure that "under size" components passed through to the next smaller size screen (Figure 5). The "over size" portion that remained on each screen was subsequently weighed and the weight recorded manually. Weights and sizes were reported to the author in industry-standard fashion and are included in Appendix 1 of this report. Following the screen testing, all fractions were returned to the appropriate sack and in due course will be placed in a secure storage facility for possible future examination and/or further analysis.

ID	Zone	Easting	Northing	Elevation_m	Weight (kg)
N1	10	385158	5561032	92.7	13
N2	10	385175	5561053	75.6	13
N3	10	385229	5560997	98.4	13
N4	10	385228	5560942	-4.921	13
Ng5	10	385921	5565558	58.3	13

**Table 2. Sample Locations**

Sample N-1 - 13 kg sample from high cut bank. Excludes larger cobbles. Sub-angular .  
Sample N-2 - 13 kg sample from east end of high cut bank exposure - similar in appearance to sample N - 1.  
Sample N-3 - 13 kg sample from below vegetation layer in forested area.  
Sample N-4 - 13 kg sample from cut bank below waterfall.  
Sample NG-5 - 13 kg sample of aggregate at nearby location, about 4.5 km north of Northern One, et al. claims.

### **Table 3. Sample Descriptions**

Samples were appropriately processed in the laboratory but no quality control measures were introduced beyond observing that the facility appeared to be exemplary in terms of cleanliness, the equipment, of recent vintage, and the personnel, competent. The author is confident that the data obtained from the laboratory is of good quality and wholly adequate for purposes of a preliminary assessment of the deposit.

## **9.0 ADJACENT PROPERTIES**

There are no other substantial aggregate deposits known or under study in the immediate vicinity of the Northern One property but as part of his field examination of the Lloyd Creek deposit, the author also examined and took five samples of "raw" aggregate from the near shore portion of the estuary of an unnamed similar but smaller stream located approximately 4.5 km north of Lloyd Creek, identified in Figure 6 as "NG" location. Only one of the samples, identified as "NG-5", from that site was processed and the remaining samples have been placed in storage. The very limited amount of examination and testing indicated that this second site may be of interest as an additional source of aggregate.

## **10.0 DISCUSSION OF PROGRAM OF WORK**

A small amount of test work, as discussed above in the "Exploration" section, was performed on samples of sand and gravel from the Northern One property.

Work done on fourteen samples in 1971 for a former owner included grading analyses, organic impurities tests and a visual examination. Few details are available concerning the size and quality of the samples, methods of acquiring the samples, transportation of samples, laboratory procedures and equipment employed and treatment of data obtained. Although the laboratory was part of an analytical and testing company that operated on a worldwide scale, that sampling and testing program is considered to be of historic interest

**TABLE 202-C - AGGREGATE GRADATIONS**

SIEVE SIZE	Percent Passing (%) Sieve Size							
	Surfacing Aggregates	25 mm Base Course			Sub-Base Aggregates			Bridge End Fill
(mm)	HFA	WGB	IGB	OGB	SGSB	IGSB	OGSB	BEF
75	---	---	---	---	100	100	100	100
50	---	---	---	---	---	55 - 100	70 - 100	30 - 100
37.5	---	---	---	---	---	40 - 80	50 - 85	---
25	100	100	100	100	---	---	---	---
19	85 - 100	80 - 100	65 - 100	75 - 100	15 - 100	17 - 40	15 - 55	20 - 100
9.5	60 - 85	50 - 85	30 - 70	30 - 65	0 - 100	---	---	---
6.3	---	---	---	---	---	---	0 - 20	---
4.75	40 - 70	35 - 70	15 - 40	5 - 30	---	---	---	10 - 60
2.36	---	25 - 50	10 - 30	0 - 10	---	10 - 25	0 - 10	---
1.18	20 - 50	15 - 35	---	---	---	---	---	6 - 32
0.600	---	---	---	---	0 - 100	---	---	---
0.300	10 - 30	5 - 20	5 - 15	0 - 8	0 - 15	4 - 15	0 - 8	4 - 15
0.075	5 - 15	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5	0 - 5

TABLE 4. MOT Table 202-C. AGGREGATE GRADATIONS

only and the results obtained are of limited application as any part of current studies of the deposit. Nonetheless, their test results from three composite samples prepared from the 14 bank-run samples were closely uniform: coarse aggregate (3" to No. 4 screen) 59.1 to 62%, and fine aggregate, (passing #4 sieve) 38% to 40.9%. The lab also reported the material, in general, is of "fair to good" quality and that "the proportioning of coarse to fine aggregate is favourable and will result in a high yield of usable material" (Shankoy, 1971).

Levelton Engineering Ltd. was engaged in 2002 by a former owner to undertake a "desk top" review of the Northern One aggregate site, to make a site visit, to consult with government agencies, and to process a small number of samples. Levelton also presented a proposal to initiate the process leading to obtaining a Ministry of Energy, Mines and Petroleum Resources permit to carry out exploration work on the site and to commence environmental reviews. Unpublished data from studies of samples of aggregate obtained at that time from the site have been reviewed as part of the present program of work: materials were assigned a "good" category, meaning "...that the coarse aggregate would be equivalent in physical quality to typical commercial supplies of aggregate in use in many areas of British Columbia and Washington. Aggregate of these engineering and petrographic qualities might be suitable for use as road base, structural fill, asphalt/pavement aggregate, concrete aggregate, and other applications" (Levelton, op cit. p. 3).

The potential for Alkali-Aggregate Reaction, the potential for reaction with alkali compounds in concrete, was not examined.

The present owner of the Northern One property determined that the merits of the deposit and its application in the aggregate industry would be well served by further testing as recommended by Levelton Engineering Ltd. The author of this report, in a consulting capacity, on September 11, 2007, obtained samples of representative materials from four sites on the property, the locations of which were decided in the field (Figure 6) on the basis of accessibility, degree of possible disturbance if any, and the appearance of the *in situ* sand and gravel. Samples were placed in woven plastic bags, commonly referred to as "rice bags" and were hand carried to the nearby beach where they were taken in a float-equipped aircraft to Sechelt and thence by truck to a testing laboratory in Burnaby, B. C. Four samples were obtained: details of their location as determined by GPS observation, their appearance, and several other parameters were recorded in a notebook.

Samples were delivered to Metro Testing Laboratories Ltd. in Burnaby, B. C. and placed in a secure, locked compound. Laboratory personnel subsequently processed the raw samples by passing the entire sample through a series of stacked screens: oversized fractions that remained on each successive screen from three inches to 75 micrograms were weighed and weights were reported in a sieve analysis report. Screen analyses obtained in the laboratory from the Northern One samples are included in Appendix 1 of

this report. Industry standards for aggregate materials used in road building were obtained from the British Columbia Ministry of Transportation website (Table 4). It appears from those guidelines that the most desired products for road building purposes are in the range of one inch to 600 micrograms (i.e. 30 mesh). Of concern are impurities in the sand and gravel, i.e. clay and soft or oxidized clasts, that decrease the strength of the product or require additional screening or washing stages of processing, and chemical components that may create undesirable reactions. Sieve analysis reports include graphic presentations of the distribution of size fractions in samples N-1 to N-4 inclusive and NG-5. These results are not representative of much of the Northern One deposit. Further research and consultation with specialists in the testing and user industries is required in order to determine what further testing will be required.

## 11.0 RESOURCE AND RESERVE ESTIMATES

No attempt has been made as part of this review to determine in any meaningful way the volumes of "bank-run" and/or marketable sand and gravel that are present on the Northern One deposit site. A former owner of the deposit, Alex Burton, P. Eng., P. Geo., observed that

*The perched delta gravel can be seen from near sea level to an elevation of 1200 feet (365 m) about one mile from the shore. One exposure of gravel is 100 feet thick from the surface to the point where it is covered with talus. There is no bedrock exposed below this gravel exposure" (Burton, 2002).*

Burton also calculated that "The gravel is found in a space of plus 5,000 feet (1500 m) in length, across a width of at least 1,300 feet (400 m) and with a minimum thickness as seen in exposures of 100 feet vertically (30 m). (Burton, op cit.)

and that "This (sic) MINIMUM dimensions calculate out close to 24,000,000 million (sic) cubic yards" (Burton, op cit.). Burton also quoted "Other estimates made using stereoscopic air photos and field traverses estimate there is room for 30 to 45 million cubic yards of gravel".

**Note that the above figures and calculations were prepared by a former owner and have not be confirmed in any way and should not be relied upon in any evaluation of the Northern One deposit.**

Figure 7 of this report illustrates the possible distribution of aggregates in and near the valley occupied by Lloyd Creek. The east-west dimension as shown measures 4 km in length and the north-south (width) dimension is as much as 2 km. Depths are completely unknown but are expected to vary considerably over short distances due to the concealed sub-gravel topography of the bedrock.



## **12.0 INTERPRETATION AND CONCLUSIONS**

A preliminary assessment of the Northern One deposit that is the subject of this report indicates that data obtained from a site visit and from four samples of bank-run materials, combined with earlier work by Levelton Engineering and others, suggest that there may be sufficient sand and gravel resources capable of being processed into marketable products to sustain a removal operation over a period of several or many years. Screen analyses suggest that a substantial percentage of the raw resource can be recovered in size ranges that are highly marketable in the construction and other building sectors. Permitting issues and environmental and transportation considerations may offer the greatest challenges to development of an aggregate plant at the Lloyd Point site.

The present study has considered the Northern One site in a superficial manner: much further work must be completed to adequately assess the resource. Although the surface dimensions of the occurrence can be readily estimated by inspection aided by photogrammetric techniques, little is known about the depths of sand and gravel. Such data may be obtained by means of refraction seismic surveys and by drilling holes to the bedrock interface. Similarly, many more screen analyses and turbidity tests will be required to determine the quality of gravels, there have been no market studies conducted to determine if markets exist, nor have any environmental baseline studies been initiated.

Despite the above-noted caveats, work on the Northern One property has demonstrated with a reasonable degree of assurance that a substantial volume of sand and gravel with an attractive mix of size fractions and a low level of undesirable components, is present. Further work, involving specialists in the fields of environmental studies, aggregate deposit distribution, usage and marketing, and marine transportation, is fully warranted.

## **13.0 RECOMMENDATIONS**

Extensive field studies are required to determine the quantity and quality of the aggregate resource at Lloyd Point. Test work will enable better evaluation of the resource and will provide samples of the product that can be used in market investigations.

Phase 1 of such studies will require permitting, followed by establishment of a camp, either on shore or floating, as a base from which line cutters, geophysical operators, samplers and others can comfortably work. Field work may be at times difficult, with heavy rainfalls, strong winds and bitter conditions.

Phase 1 work should commence with clearing of the former logging road in order to get access to the length of the property. That road is expected to have a favourable grade and good foundation and when cleared will be of great value. The machinery taken to the site

for road improvement purposes should also be suitable for trenching work, i.e. an excavator. A grid of north-south cut lines should then be established across the width of the probable sand and gravel resource. Initially the grid can comprise lines at 200 metre spacing, sufficient to enable a geophysical seismic or similar survey to determine the shape of the underside (bottom) contact of the aggregate with bedrock. Spacing and depths of test pits or trenches will be determined following the geophysical survey. Similarly, a procedure to analyse the aggregate on site using screen decks or other methods will be devised in consultation with testing laboratories and practical operators in the sand and gravel business.

**Phase 2** work will comprise additional testing, including further grid preparation with lines at 100 metre spacing, geophysical surveys, bulk testing of resource, preparation of samples of product for marketing purposes, market studies, transportation studies, consultation with other stakeholders, environmental studies.

#### **14.0 REFERENCES**

The following sources were consulted in the preparation of this report:

Bostock, H., 1948, Physiography of the Canadian Cordillera, Geol. Survey of Canada, Memoir 243.

BCGS Staff, 2002, Sunshine Coast Aggregate Potential Mapping Project, British Columbia Geological Survey Branch, Open File 2002-14.

Burton, Alex, P. Eng., P. Geo., 2002, Report on the Northern One Gravel Deposit Located on the Coast of British Columbia, Canada, private report

Hora, Z. D., 2007, Sand and Gravel, B 12, Mineral Deposit Profiles, B. C. Geological Survey, available on line from Ministry of Energy, Mines and Petroleum Resources.

Ladoo and Myers, 1951, Industrial Minerals, McGraw Hill.

Shrimer, F. H., P. Geo., 2000, Engineering Geology of Aggregates British Columbia, Contribution to "Industrial Minerals with emphasis on Western North America"

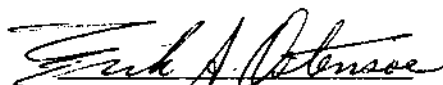
2002, Petrographic Examination of Aggregate (ASTM C-295), Technical Report prepared for Levelton Engineering Solutions for client

Shankoy, B. T., 1971, Aggregate Evaluation, Project No. V-305, Warnock Hersey International, report of testing for client

## 15.0 AUTHOR'S QUALIFICATIONS

I, **Erik A. Ostensoe**, am a consulting geologist with office and residence in Vancouver, British Columbia. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (Member No 18727). I graduated from the University of British Columbia, Vancouver, B.C. in 1960 with a Bachelor of Science degree in Honours Geology, and that I completed course requirements for a Master of Science degree at Queen's University, Kingston, Ontario. I have worked for more than forty years in the mining and mineral exploration industries in most parts of western North America and, to a lesser extent, elsewhere as an employee of major companies, as a consultant to junior and other companies, and as a self-employed geologist. In the period September 7 through September 11, 2007 I examined parts of the Northern One aggregate deposit located at Homfrey Channel, east of Campbell River, British Columbia, took samples of the sand and gravel aggregate deposit for testing purposes and subsequently prepared the accompanying report "**A REVIEW OF THE NORTHERN ONE GRAVEL DEPOSIT, HOMFREY CHANNEL, BRITISH COLUMBIA, CANADA, NTS MAP 92K/2**" on the basis of technical reports by professional geoscientists who have worked on the property, published literature concerning the evaluation of aggregate deposits, and from technical analyses performed on samples of sand and gravel from the Northern One site and from personal observations and impressions from my own site visit. All sources of information included in this report are acknowledged appropriately in the text

Signed and sealed at Vancouver, British Columbia, the 24th day of September, 2007.

  
Erik A. Ostensoe, P. Geo.,

APPENDIX 1.

SIEVE ANALYSIS REPORTS

Metro Testing Laboratories Ltd.



**METRO TESTING LABORATORIES LTD.**

6991 Curragh Avenue, Burnaby B.C., V5J 4V6  
Tel: (604) 436-9111 Fax: (604) 436-9050

**SIEVE ANALYSIS REPORT  
8 16 30 50 SERIES**

PROJECT NO. 10739  
CLIENT ERIK OSTENSOE  
C.C.

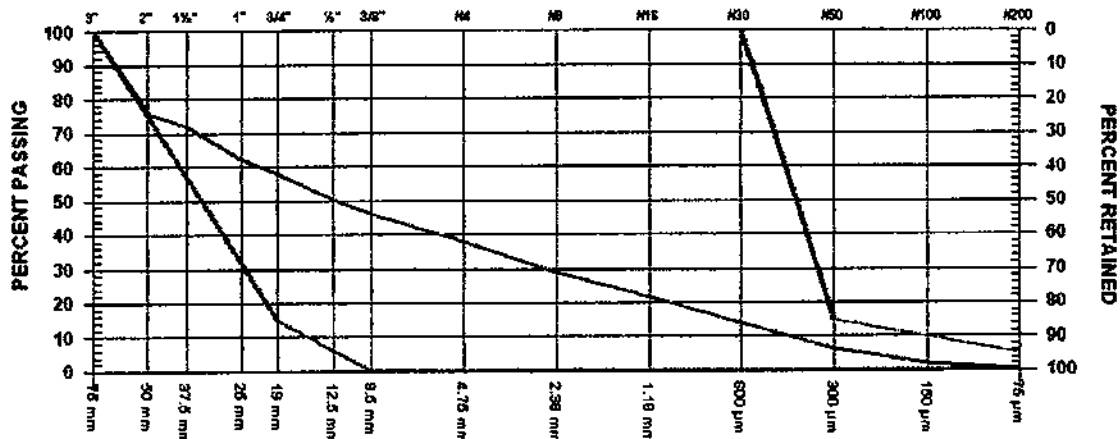
TO  
ERIK OSTENSOE  
4306 W. 3RD AVENUE  
VANCOUVER, BC  
V6R 1M7

ATTN: ERIK OSTENSOE

PROJECT GRAVEL TESTING  
SOILS  
CONTRACTOR ERIK OSTENSOE

SIEVE TEST NO. 1      DATE RECEIVED 2007.Sep.12      DATE TESTED 2007.Sep.22      DATE SAMPLED 2007.Sep.12

SUPPLIER	N/A	SAMPLED BY	CLIENT
SOURCE	N/A	TESTED BY	BS
SPECIFICATION	MOTH: SELECT GRAN SUB-BASE	TEST METHOD	WASHED
MATERIAL TYPE	N-1		



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3" 75 mm	100.0	100 - 100
2" 50 mm	75.9	
1 1/2" 37.5 mm	72.0	
1" 25 mm	62.0	
3/4" 19 mm	58.0	15 - 100
1/2" 12.5 mm	50.3	
3/8" 9.5 mm	45.9	0 - 100

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4 4.75 mm	37.7	
No. 8 2.36 mm	29.0	
No. 16 1.18 mm	21.9	
No. 30 600 µm	14.2	0 - 100
No. 50 300 µm	6.3	0 - 15
No. 100 150 µm	2.0	
No. 200 75 µm	0.6	0 - 5

COMMENTS  
USED MOT SGSB SPECIFICATION AS REFERENCE. N-1



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## SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 10739  
CLIENT ERIK OSTENSOE  
C.C.

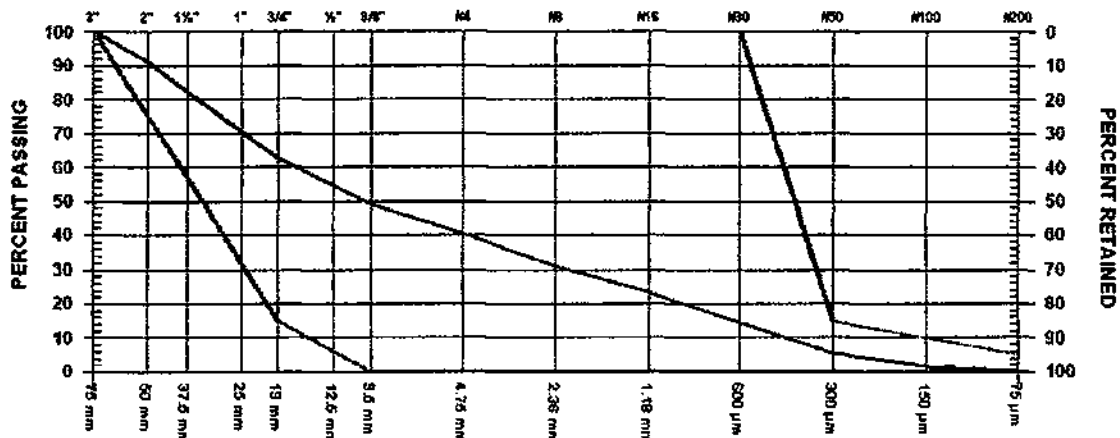
TO  
ERIK OSTENSOE  
4306 W. 3RD AVENUE  
VANCOUVER, BC  
V6R 1M7

ATTN: ERIK OSTENSOE

PROJECT GRAVEL TESTING  
SOILS  
CONTRACTOR ERIK OSTENSOE

SIEVE TEST NO. 2      DATE RECEIVED 2007.Sep.12      DATE TESTED 2007.Sep.21      DATE SAMPLED 2007.Sep.12

SUPPLIER	N/A	SAMPLED BY	CLIENT
SOURCE	N/A	TESTED BY	BS
SPECIFICATION	MOTH: SELECT GRAN SUB-BASE	TEST METHOD	WASHED
MATERIAL TYPE	N-2		



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3"      75 mm	100.0	100 - 100
2"      50 mm	91.3	
1 1/2"    37.5 mm	82.3	
1"      25 mm	70.3	
3/4"    19 mm	62.6	15 - 100
1/2"    12.5 mm	54.3	
3/8"    9.5 mm	48.8	0 - 100

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4      4.75 mm	40.4	
No. 8      2.36 mm	31.1	
No. 16     1.18 mm	23.3	
No. 30     600 µm	14.6	0 - 100
No. 50     300 µm	5.7	0 - 15
No. 100    150 µm	1.6	
No. 200    75 µm	0.6	0 - 5

COMMENTS  
USED MOT SGSB SPECIFICATION AS REFERENCE. N-2



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## SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 10739  
CLIENT ERIK OSTENSOE  
C.C.

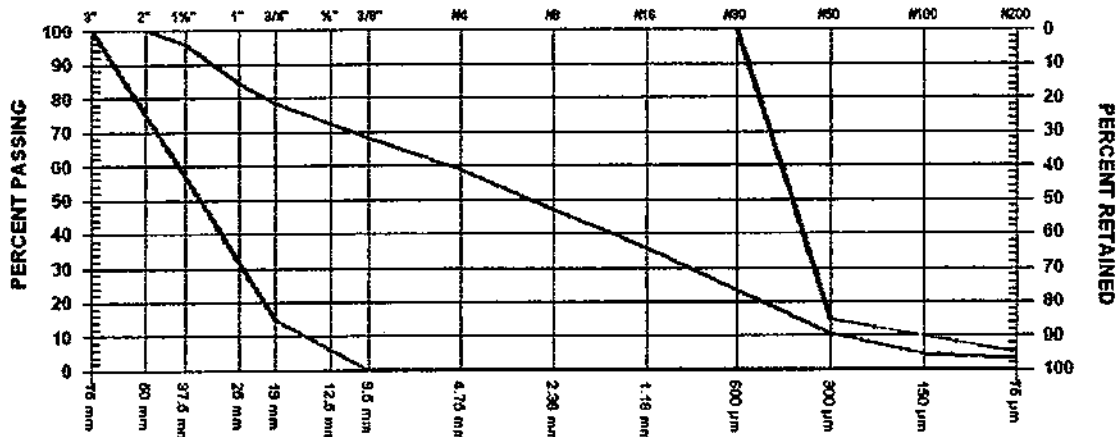
TO  
ERIK OSTENSOE  
4306 W. 3RD AVENUE  
VANCOUVER, BC  
V6R 1M7

ATTN: ERIK OSTENSOE

PROJECT GRAVEL TESTING  
SOILS  
CONTRACTOR ERIK OSTENSOE

SIEVE TEST NO. 3      DATE RECEIVED 2007.Sep.12      DATE TESTED 2007.Sep.22      DATE SAMPLED 2007.Sep.12

SUPPLIER	N/A	SAMPLED BY	CLIENT
SOURCE	N/A	TESTED BY	BS
SPECIFICATION	MOTH: SELECT GRAN SUB-BASE	TEST METHOD	WASHED
MATERIAL TYPE	N-3		



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3" 75 mm	100.0	100 - 100
2" 50 mm	100.0	
1 1/2" 37.5 mm	95.8	
1" 25 mm	84.5	
3/4" 19 mm	78.4	15 - 100
1/2" 12.5 mm	72.3	
3/8" 9.5 mm	68.1	0 - 100

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4 4.75 mm	58.8	
No. 8 2.36 mm	46.8	
No. 16 1.18 mm	35.8	
No. 30 600 µm	23.3	0 - 100
No. 50 300 µm	10.6	0 - 15
No. 100 150 µm	4.9	
No. 200 75 µm	3.2	0 - 5

COMMENTS  
USED MOT SGSB SPECIFICATION AS REFERENCE. N-3



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 8 16 30 50 SERIES**

PROJECT NO. 10739  
 CLIENT ERIK OSTENSOE  
 C.C.

TO  
 ERIK OSTENSOE  
 4306 W. 3RD AVENUE  
 VANCOUVER, BC  
 V6R 1M7

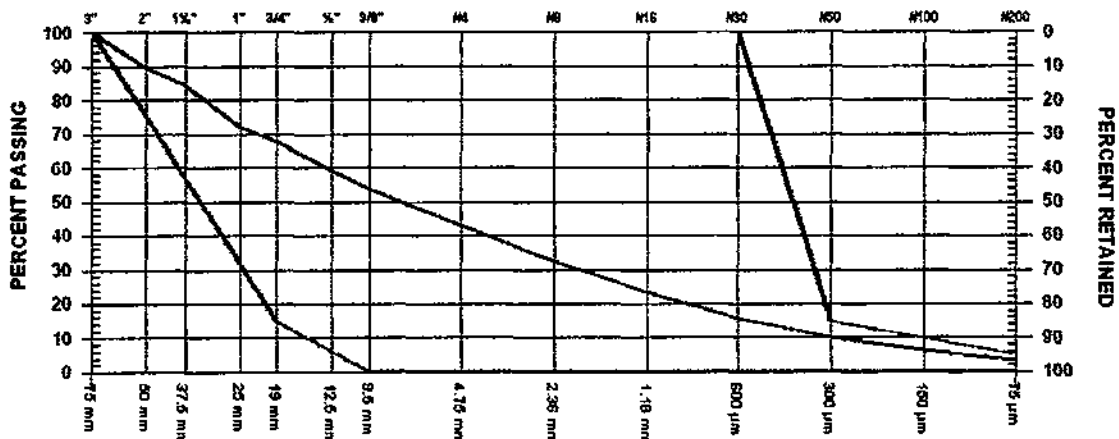
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PROJECT GRAVEL TESTING  
 SOILS  
 CONTRACTOR ERIK OSTENSOE

SIEVE TEST NO. 4      DATE RECEIVED 2007.Sep.12      DATE TESTED 2007.Sep.21      DATE SAMPLED 2007.Sep.12

SUPPLIER N/A  
 SOURCE N/A  
 SPECIFICATION MO TH: SELECT GRAN SUB-BASE  
 MATERIAL TYPE N-4

SAMPLED BY CLIENT  
 TESTED BY BS  
 TEST METHOD WASHED



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3" 75 mm	100.0	100 - 100
2" 50 mm	89.5	
1 1/2" 37.5 mm	84.4	
1" 25 mm	72.0	
3/4" 19 mm	67.7	15 - 100
1/2" 12.5 mm	59.3	
3/8" 9.5 mm	53.6	0 - 100

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4 4.75 mm	43.2	
No. 8 2.36 mm	32.3	
No. 16 1.18 mm	23.4	
No. 30 600 µm	15.9	0 - 100
No. 50 300 µm	10.3	0 - 15
No. 100 150 µm	6.4	
No. 200 75 µm	3.5	0 - 5

COMMENTS  
 USED MOT SGSB SPECIFICATION AS REFERENCE. N-4





**METRO TESTING LABORATORIES LTD.**

6991 Curragh Avenue, Burnaby B.C., V5J 4V6  
 Tel: (604) 436-9111 Fax: (604) 436-9050

**SIEVE ANALYSIS REPORT  
 8 16 30 50 SERIES**

PROJECT NO. 10739  
 CLIENT ERIK OSTENSOE  
 C.C.

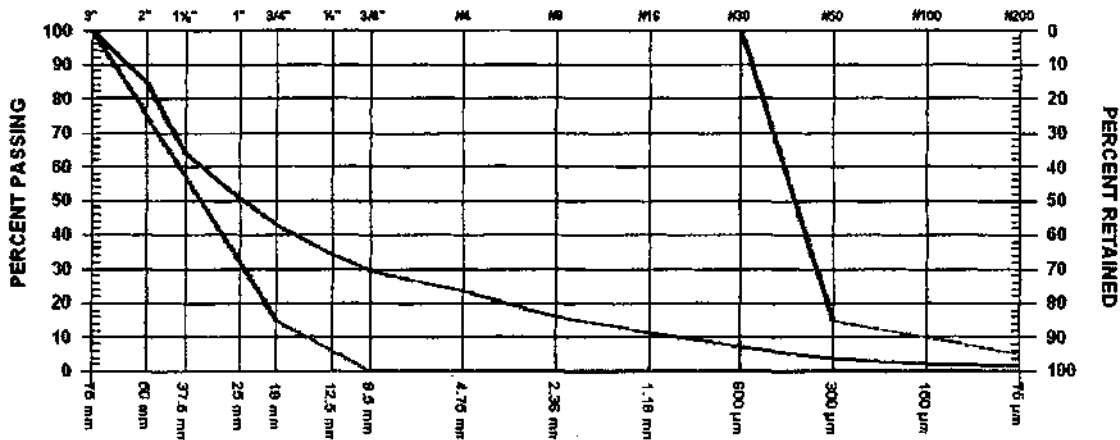
TO  
 ERIK OSTENSOE  
 4306 W. 3RD AVENUE  
 VANCOUVER, BC  
 V6R 1M7

ATTN: ERIK OSTENSOE

PROJECT GRAVEL TESTING  
 SOILS  
 CONTRACTOR ERIK OSTENSOE

SIEVE TEST NO. 5      DATE RECEIVED 2007.Sep.12      DATE TESTED 2007.Sep.21      DATE SAMPLED 2007.Sep.12

SUPPLIER N/A      SAMPLED BY CLIENT  
 SOURCE N/A      TESTED BY BS  
 SPECIFICATION MoTH:SELECT GRAN SUB-BASE      TEST METHOD WASHED  
 MATERIAL TYPE NG-5



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3" 75 mm	100.0	100 - 100
2" 50 mm	84.8	
1 1/2" 37.5 mm	64.0	
1" 25 mm	50.5	
3/4" 19 mm	42.8	15 - 100
1/2" 12.5 mm	34.1	
3/8" 9.5 mm	29.4	0 - 100

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4 4.75 mm	23.3	
No. 8 2.36 mm	16.3	
No. 16 1.18 mm	11.5	
No. 30 600 µm	7.1	0 - 100
No. 50 300 µm	3.8	0 - 15
No. 100 150 µm	2.3	
No. 200 75 µm	1.6	0 - 5

COMMENTS  
 USED MOT SGSB SPECIFICATION AS REFERENCE. NG-5

APPENDIX 2.

AGGREGATE EVALUATION

Warnock Hersey International Limited



WARNOCK HERBY  
INTERNATIONAL LIMITED

125 East 4th Ave., Vancouver 10, B.C. Phone 878-4111

COAST ELDRIDGE  
PROFESSIONAL SERVICES DIVISION

REPORT OF: Aggregate Evaluation  
AT Vancouver Laboratory  
PROJECT: V-305  
REPORTED TO:

FILE NO. 480-033-C.1  
DATE Sept. 14/71  
REPORT NO. 1/71  
ORDER NO.  
Project No. V-305

Vancouver, B.C.  
~~ATTENTION.~~

## I. INTRODUCTION

As requested we tested fourteen samples of Bank-Run material to evaluate the quality of a deposit for commercial use.

Three composite samples were prepared by quartering each sample and then combining half of all samples from each of the three groups, identified as cut No. 1, 2 and 3.

The test program consisted of grading analyses, organic impurities tests and a visual examination of the material.

This report presents a tabulation of aggregate gradations, followed by a general discussion of the material and anticipated problems in the processing and utilization.

The results of grading analyses are calculated for the most common types of aggregate use and compared with D.O.H. and A.S.T.M. grading limits.

II. TEST RESULTS

A. Proportioning of Aggregates

	Cut # 1	#2	#3
<u>Coarse Aggregate</u>			
3" - 1 1/2"	13.0%	15.0%	20.7%
1 1/2" - # 4	<u>45.2%</u>	<u>47.0%</u>	<u>40.4%</u>
	58.1%	62.0%	61.1%
 <u>Fine Aggregate</u>			
(Passing #4 Sieve)			
	40.9%	33.0%	33.9%
	<hr/>	<hr/>	<hr/>
	100.0 %	100.0%	100.0%

B. GRADATIONS ( Calculated For Use In Concrete)

	CUT #1	#2	#3	ASTM SPECIFICATIONS C 33 - 67
<u>Coarse Aggregate</u>				
<u>SIEVE SIZE</u>	<u>PERCENTAGE PASSING</u>			
1-1/2"	100	100	100	95 - 100
1"	74.2	82.2	80.0	-
3/4"	60.8	69.0	68.1	35 - 70
1/2"	41.4	46.8	47.4	-
3/8"	29.8	36.4	34.8	10 - 30
#4	0	0	0	0 - 5
<u>Fine Aggregate</u>				
#4	100	100	100	95 - 100
8	82.4	78.6	88.1	80 - 100
16	57.6	51.9	66.7	50 - 85
30	33.9	29.7	44.4	25 - 60
50	13.4	9.8	16.8	10 - 30
100	4.3	2.7	3.5	2 - 10
200	1.9	1.3	1.1	MAX. 3.0
<u>Fineness Modulus</u>	3.03	3.28	2.80	2.3 - 3.1

C. ORGANIC IMPURITIES TEST

Colour No.	2	2	3	Not darker than #3
------------	---	---	---	-----------------------

D. GRADATIONS ( Calculated For Use As Granular Road-Base Material)

<u>SIEVE SIZE</u>	CUT #1	#2	#3	DOH SPECIFICA TIONS
	<u>PERCENTAGE PASSING</u>			<u>202.4</u>
3"	100	100	100	100
2½"	93.0	93.3	97.0	-
2"	95.0	92.6	86.2	-
1½"	83.0	85.0	79.3	60 - 100
1"	74.3	76.6	71.2	-
¾"	63.3	70.4	63.4	40 - 80
½"	59.5	60.0	53.0	-
⅜"	54.2	55.1	52.9	30 - 60
#4	40.8	33.0	33.8	20 - 45
8	33.6	29.9	34.2	15 - 35
16	23.5	19.7	25.9	10 - 25
30	13.8	10.9	17.2	-
50	5.5	3.6	6.6	4 - 16
100	1.8	1.0	1.4	-
200	0.8	0.5	0.4	2 - 9

E. GRADATIONS (Calculated For Use In Bituminous Concrete Paving)

<u>SIEVE SIZE</u>	<u>CUT #1 #2 #3</u>			<u>DOH SPECIFICATIONS</u>
	<u>PERCENTAGE PASSING</u>			<u>223.12</u>
3/4"	100	100	100	100
1/2"	87.2	85.1	87.4	70 - 100
3/8"	79.5	73.2	79.6	55 - 90
#4	59.8	53.9	58.6	35 - 70
8	49.3	42.4	51.6	25 - 57
16	34.4	28.0	39.1	18 - 45
30	20.3	15.5	26.0	13 - 34
60	8.0	5.2	9.9	8 - 26
100	2.6	1.5	2.1	5 - 17
200	1.1	0.7	0.6	2 - 8

PERCENTAGE OF  
 OVERSIZE EXCLUDED  
 (LARGER THAN 3/4")

31.6	29.8	33.5	-
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### III. DISCUSSION

The material, in general, is of fair to good quality.

The coarse aggregate consists of sound, durable gravel with traces of soft, flat and elongated pieces.

The soft particles are mostly pieces of coarse-grained granite with oxidized planes within the particle.

The coarse aggregate is slightly coated and may require washing to make it acceptable for use in concrete.

The removal of the silty sand coating will demand very little processing and should in our opinion present no problems.

The fine aggregate consists of fairly coarse-graded sand with some soft micaceous particles.

The proportioning of coarse to fine aggregate is favourable and will result in a high yield of usable material.

The grading of the fine aggregate, although slightly coarse, is acceptable for use in concrete.

The fine aggregate is deficient in material passing a No. #50 sieve and will require a fine blend sand before it can be used for paving or as road material.

In our opinion, the material tested is of promising quality and warrants a more detailed type of investigation.

Such an investigation should include a closer examination of the deposit, especially for finer sand, to make the material acceptable for the different commercial applications and standard qualification tests, listed below, which are usually conducted on material for which a service record has not been established.

Petrographic examination  
Freezing and Thawing of Concrete  
Sodium Sulphate Soundness  
Los Angeles Abrasion  
Alkali Reactivity

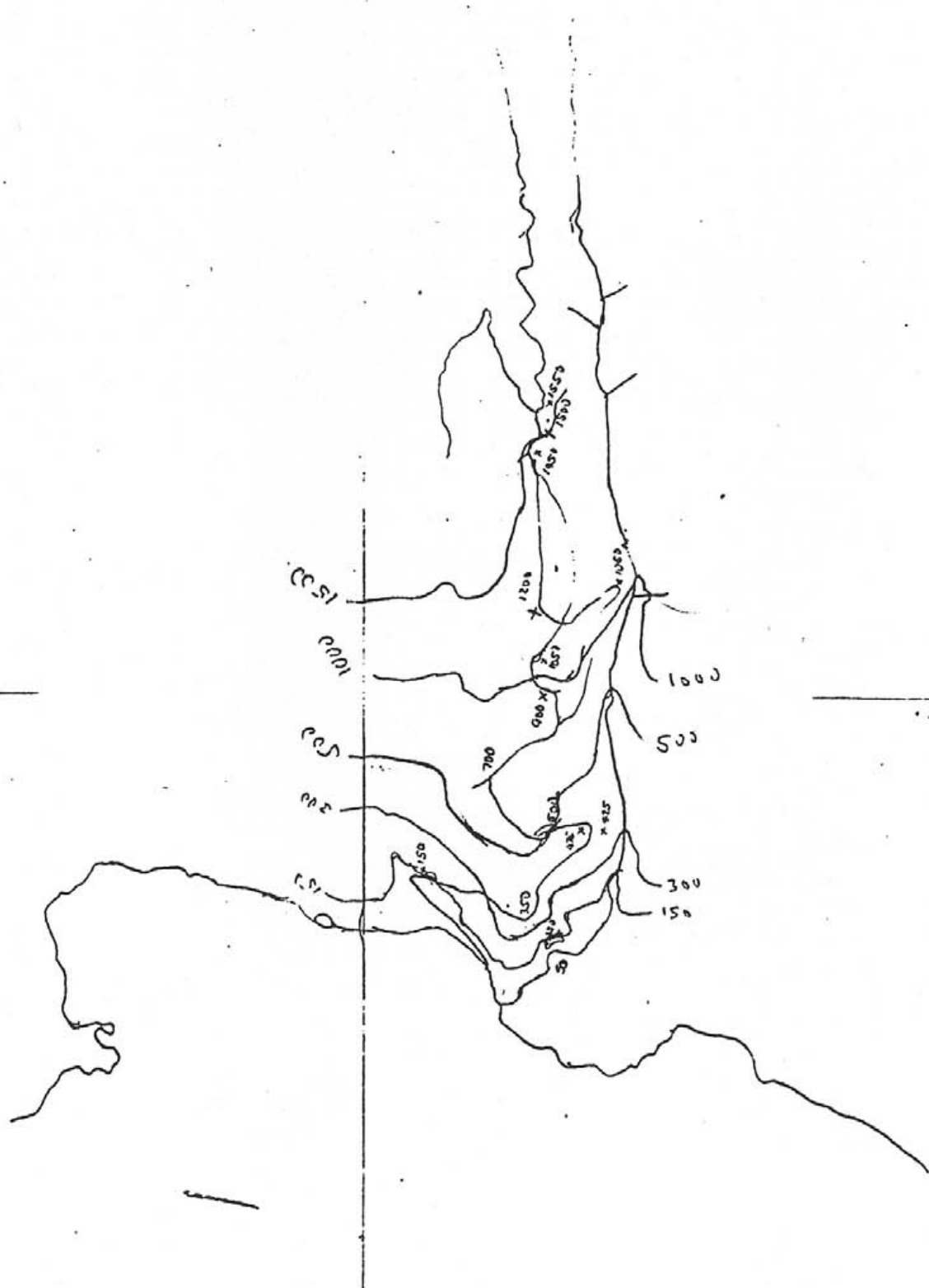
Yours very truly,

WARNOCK HERSEY

B. T. Shankey, Physical Testing

Laboratory Supervisor: P. Regier





APPENDIX 3.  
ITEMIZED COST STATEMENT

## STATEMENT OF REPRESENTATION WORK – Northern One Gravel Deposit

The following expenditures were incurred in performing the field work and related work on the Northern Gravel, tenure no. 544952, and Super Mammoth 5, tenure no. 549843, and in preparation of a comprehensive report of work

### Professional fees –

Erik Ostensoe, P. Geo. – field examination in period September 7 through 11, 2007: four days @ \$500 per day \$2000.00  
- research and report preparation in period September 1 through 24, 2007: three days @ \$500 per day \$1500.00

GST @ 6% of professional fees \$ 525.00

Farshad Shirvani, M. Sc. – field examination in period September 7 through 11, 2007; four days @ \$500 per day \$2000.00  
GST @ 6% of professional fees \$ 120.00

Terracad GIS Services Ltd. - preparation of illustrations to accompany technical report twenty hours @ \$60 per hour \$1200.00  
GST @ 6% of invoice \$ 72.00

Expenses incurred in field examination, sampling, processing of samples, per attached listing \$3678.64

Expenses incurred in printing and binding copies of assessment report, allow \$100.00

Total amount of expenditures \$11,195.64

Tenure no. 544952 – Northern Gravel - 124.12 hectares  
Tenure no. 549843 – Super Mammoth 5 – 124.12 hectares

Three years on each @ \$4/hectare/year = \$496.48/claim/year X 2 claims = \$2978.88

Four years on each @ \$8/hectare/year = \$992.96/claim/year X 2 claims = \$7943.68

Seven years assessment work on both tenures = \$10922.56

Excess credit = \$ 273.08

This statement was prepared by Erik Ostensoe, P. Geo. for Farshad Shirvani, September 24, 2007.

