2.1.3 Geotechnical Site Investigation (September 25th through 28th, 2015)

Mr. Ernest Palczewski, Geol.I.T. completed a geotechnical assessment of the project site on Sept 25th. Accompanying Mr. Palczewiski was Mr. Ashwani Sharma of the GON. The objectives of the assessment were to:

- Establish the geotechnical conditions along Airport Road, focussing on the identified crossing locations; and,
- To assess the location, quantity and quality of aggregate material available on the island.

Other activities completed during this site investigation included:

- Completing a condition assessment of all existing culverts through Airport Road;
- Examining a recently constructed bridge over the Kirchoffer River approximately 24 kilometres west of the Hamlet;
- Completing a photogrammetry survey of the site; and,
- Discussing the construction capabilities of the Hamlet with the local contractor.

Key findings of the site investigation are presented below. Complete findings of the geotechnical investigation are provided in a technical memorandum included in this report as Appendix B.

2.1.3.1 Aggregate Source Investigation

A substantial amount of earthwork will be required during the construction phase. The work includes retrofitting (raising) sections of Airport Road, constructing temporary by-pass roadways, and constructing the bridge abutments. An assessment of the quality, quantity and availability of aggregates in the vicinity of the project site was completed to confirm the availability of the materials needed to complete these works.

Numerous aggregate sources including sand, gravel and rip-rap were identified. Mr. Palczewski and Mr. Sharma visited nine areas and collected four representative samples for laboratory testing. Table 2-1 summarizes the type of material observed at each sources and provides field comments made by Mr. Palczewski. Each of these gravel sources have been identified on Figure 1-3.

Table 2-1 - Gravel Source Locations

Source #	Material Description	Field Comments
1	GRAVEL -Trace sand, trace silt	Closest source to Hamlet. Platey/obtate/shale like gravel.
2	GRAVEL – Some sand, trace silt	Typically used for local roads
3	GRAVEL – Some sand, trace silt	Large stockpile.
4	SAND AND GRAVEL, Trace Silt	Large stockpile. Typically used for local roads
5	SAND – some gravel to gravelly, some sand, trace silt	Very large stockpile. Similar material to Source #4 but larger gravel.
6	SAND and GRAVEL – some silt	Frozen. Smallest stockpile
7	Gravel	Clean gravel from riverbed. Well sorted/poorly graded.
8	Rip-Rap	Granite and Gniessic up to 1.0 m diameter. Medium sized source.
9	Sand – trace gravel	Very clean. Typically used for concrete.

Aggregate samples were taken from stockpile sources #1, #3, #4, and #9 and delivered to a laboratory for sieve analysis and moisture density relationship testing. Preliminary analysis of the laboratory results suggest that both Source #3 and Source #4 are good candidates for roadway construction material, depending on the required gradation. Samples from both sources yielded maximum achievable dry densities in excess of 2170 kg/m^3 at moisture contents of 7.2 and 8.8%. Complete laboratory results can be viewed in Appendix B.

Based on the findings of our investigation, we think there are sufficient sources of suitable aggregates available in the immediate vicinity of the project area to complete the project. Based on the limited amount of material needed to complete the proposed works, it is estimated that the available volumes are considerably greater than what will be required for this undertaking.

2.1.3.2 Subsurface Investigation

During the Feasibility Review, a new bridge was proposed at Crossing #4. The geotechnical investigation included a simple examination of the soils and bedrock in this area.

A bedrock outcrop was observed approximately 47 m west of Crossing #4 and consisted of granite and gneissic granite which showed low weathering, minimal fractures and was overall very competent, good quality rock. The same bedrock was seen east of Crossing #7.

No exposed bedrock was visible at Crossing #4. A loader was brought in after attempts to find bedrock using a geological hammer were unsuccessful. The loader dug a test hole adjacent to the southeast corner of Crossing #4 to a maximum depth of approximately 1.5 m and was unable to find bedrock. Digging deeper with the loader was decided against as this would mean a large excavation in a permafrost sensitive location with close proximity to flowing water of the stream. Attempts to secure the services of an excavator, backhoe, or drilling rig in the Hamlet were unsuccessful. While no bedrock was encountered at this depth, a change of lithology to grey clay/silt was noticed near the bottom of the test hole. This may be the marine sediments sometimes found in the troughs between bedrock ridges as noted in Section 2.1.1. A sample of the gravels overlying this located was collected for laboratory testing. Frozen soils were not encountered within the depth of the excavation (approximately 1.5m) but should be anticipated at depths not too much in excess of the depth of this excavation.

Visual examination of the existing bridge and the majority of the culvert installations do not show any major sign of movement due to permafrost degradation. In fact the gabion basket abutments at the location of the existing bridge appear to have remained very stable since installation.

2.2 Bridge Foundation and Road Embankment Recommendations

Although founded on overburden soils, the existing bridge abutments and existing culverts along the road show little to no deformation or instability caused by permafrost degradation. Similarly the road embankments seem to be stable in their current design configuration. The road embankment near a new bridge will likely be thicker near as the new bridge will likely have a higher deck elevation than does the current bridge. This will effectively increase the thermal protection for the underlying permafrost soils placed on the approach fills. A new bridge should not thermally impact the natural underlying permafrost soils and as such settlement or movement of the road embankment, approach fills and bridge abutments should not be an issue.

2.3 Bridge Inspection (October 9th, 2015)

On October 9th, a structural inspection of the existing bridge (Crossing #7) was completed by Mr. Darrel Gagnon, P.Eng., of Buckland & Taylor, accompanied by Mr. Ashwani Sharma of the GON. The purpose of the inspection was to assess the condition of the structure and to provide recommendations on its performance and lifespan.

Two reports were prepared based on observations of Mr. Gagnon's site visit. The first report described the overall condition of the bridge. The second report detailed the load rating capability of the structure. These reports are included in Appendix C. Key findings are summarized below.

- The bridge is 13.6 metres long with a drivable deck width of 4.55 metres. It spans an approximately 8 m wide channel;
- The approach roadway embankments were observed to be in good condition with no significant signs of erosion or slope instabilities, which was confirmed during the geotechnical site visit;
- Near vertical gabion basket walls protect both abutments; however, some were observed to have ruptured and lost some stone, likely due to ice forces;
- The precast concrete wing-walls were observed to be in good condition;
- Bridge foundations and bearings, if they exist, were buried and could not be viewed during the inspection;
- The bridge superstructure consists of two steel girders. Paint coatings on both girders have almost completely failed and surface corrosion is present on all visible surfaces; however, no significant loss of steel was observed. The girders are deemed to be in good condition with no significant defects;
- The bridge deck timbers were observed to be in good condition. These were replaced two years ago (2013). It is expected that with the repainting of the girders, the bridge service life could be extended by 30+ years. The bridge deck timbers will likely need replacing every 10 to 15 years once replaced. Barrier railing could also last 30 years if painted when required and baring significant vehicle impact damage;
- Minor impact damage was observed to the east end of the south barrier rail; otherwise, barrier railings, including the paint coatings, were observed to be in good condition; and,
- The deck timbers were found to be deficient for CL-625 loading requirements, upgrading the deck timbers from 3"x10" to 5"x10" will allow this bridge to meet CL-625 requirements.

Overall, the existing bridge was observed to be in good condition with only minor deficiencies that are not expected to significantly impact the load carrying capacity of the structure. If the bridge is to remain in service in its current location, repairs are recommended to the damaged gabion basket to reduce the risk of loss of material from the bridge abutment fill. Thicker timber decking is recommended for this bridge to meet CL-625 loading requirements.

3.0 PRELIMINARY DESIGN PROCESS

Following completion of the field investigations, Tetra Tech completed a review of the design constraints, confirmed the site hydrology, and developed bridge options for consideration and discussion with CGS.

3.1 Design Constraints

The new crossing structure(s) must satisfy numerous design constraints. The primary constraints are identified below:

- The new crossings must provide sufficient hydraulic capacity to convey the 100-year peak instantaneous flow (94.2 m^3/s);

- During the 100-year event, the water level immediately upstream (north) of Airport Road cannot exceed 6.80 MASL. Above 6.8 m, the Post River will begin to drain (spill) east and flow through the culvert crossings closest to the tank farm. (this scenario is described in the hydrotechnical memorandum (Tetra Tech EBA, 2014);
- Arctic Sea Lift, the sole method of delivering construction supplies to Coral Harbour, have imposed weight restrictions on items for shipment. No individual item may weigh over 14 tons. This constraint limits the size and weight of certain types of bridges (see Appendix D). Although a final schedule has not been formalised at this stage, sea lifts are typically only available in June and August, thus placing a limit on the construction schedule;
- Access between the Hamlet and the airport must be maintained throughout construction;
- The proposed design is expected to improve or maintain the quality of existing fish habitat, including fish passage;
- The absence of a shallow layer of bedrock at Crossing #4 and #7 as well as possible presence of a sensitive permafrost layer under the proposed crossings;
- Speed limit on Airport Road set to 60km/h; and,
- Structures should meet CL-625 loading requirements/configuration.
- The final design should:
  - take advantage of materials which are available on the island (aggregates and rip-rap);
  - recognise the limitations of the equipment available on the island as well as the familiarity of the existing contractors with specific construction methods and materials;
  - take advantage of the local contractors utilizing available local labour and equipment. Designs requiring the use of specialized equipment which would need to be shipped to Coral Harbour should be avoided unless cost effective;
- Maintaining cost-effectiveness is a key goal of the design process. The optimal design will minimize lifecycle costs to the Government of Nunavut.

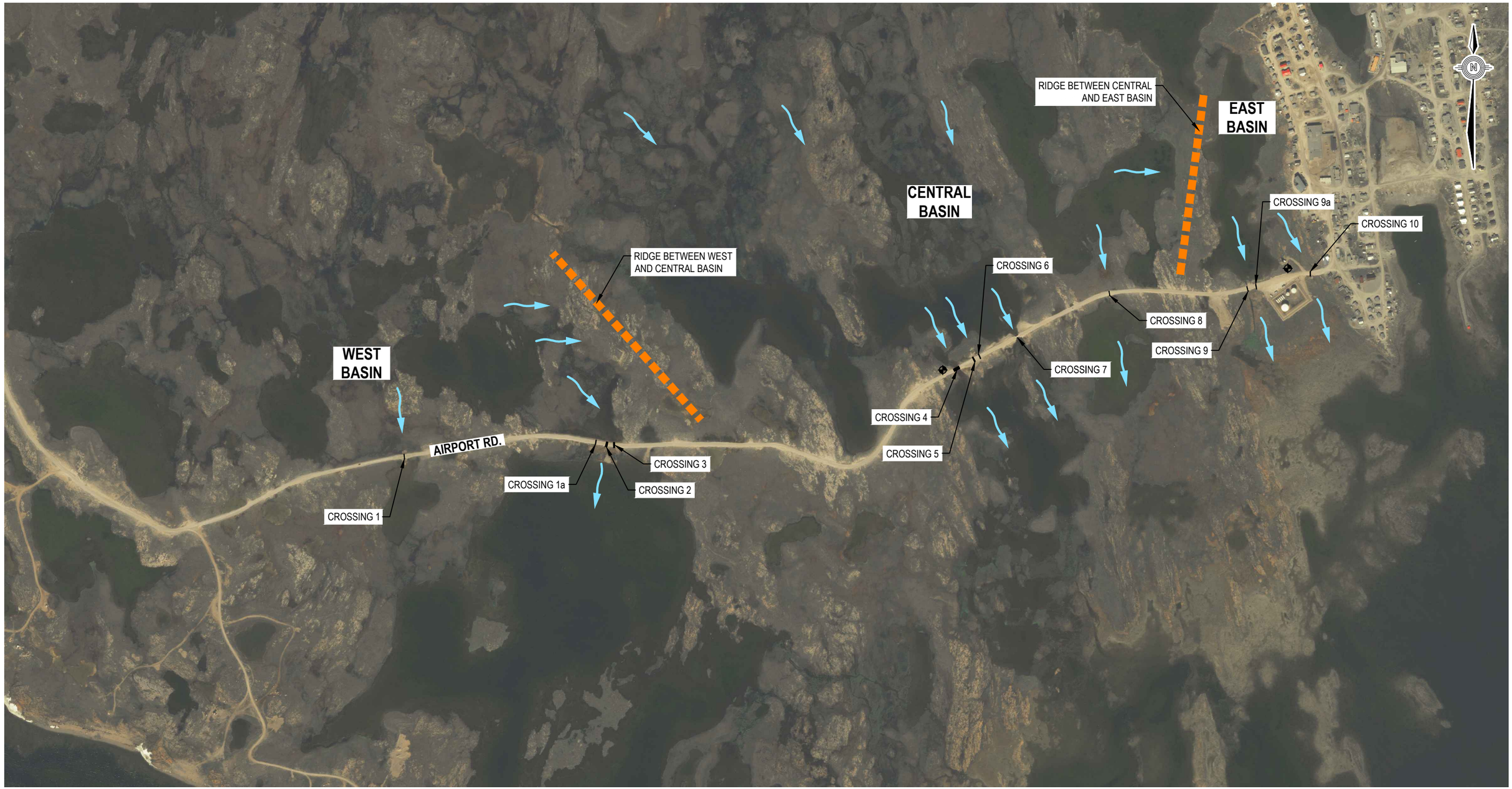
3.2 Site Hydrology/Hydraulics

The existing culvert/bridge crossings along Airport Road provide hydraulic capacity to convey 44 m3/s, which represents the 2-year peak instantaneous flow. Flows greater than 44 m3/s will force water to pond upstream of Airport Road, eventually spilling into, and inundating, the easternmost section of the river estuary, ultimately washing across Airport Road at the tank farm facility (Crossing #9 and Crossing #10).

As described in Tetra Tech Memorandum dated November 8, 2013, the Post River is divided into three separate areas: the West Basin, the Central Basin, and the East Basin. As detailed in the same report, the Post River drains through the Central Basin, while the fuel tank farm is located in the East Basin (See Figure 3-1).

The crossing replacements must provide a hydraulic capacity within the central basin of 94.2 m3/s. This represents the estimated 100-year peak instantaneous flow. Based on the water level monitoring conducted in 2013 and the site survey, once the water surface elevation reaches an elevation which is between 6.59 m and 7.00 m, water will flow over the divide between the central basin and the eastern basin. A water surface elevation of 6.8 m was established as the maximum design water surface elevation based on these findings.

A hydraulic model was developed for each design option in order to predict the resulting upstream water elevation under the 100-year design flow conditions.



DRAINAGE PLAN
SCALE: 1:10 000

ISSUED FOR REVIEW

LEGEND

Water Level Monitoring Location

NOTES

SCALE 1:10,000

100 0 100 200 400m

NUM	DATE	DWN	CKD	APR	DESCRIPTION
0	11/17/15	JDM	DNM	DNM	ISSUED FOR REVIEW

REVISIONS

PROFESSIONAL SEAL

CLIENT

Nunavut

TETRA TECH EBA | BUCKLAND & TAYLOR | COWI

AIRPORT RD. WASHOUT REHABILITATION
CORAL HARBOUR, NU

DRAINAGE PLAN

PROJECT NO.	OFFICE	DES	CKD	REV	DRAWING
V13203282	VANC	MAN	DNM	0	Figure 3-1
DATE	SHEET No.	DWN	APP	STATUS	
November 17, 2015	of	JDM	DNM	-	

Q:\Vancouver\Drafting\Engineering\V132\V13203282\V13203282 - Coral Harbour Airport Rd Design_R2.dwg [FIGURE 3-1] November 17, 2015 - 4:34:44 pm (BY: MANG, JUSTIN)

3.3 Options Review

During the Feasibility Review, a total of four primary approaches were identified for CGS to consider when addressing the drainage issues along Airport Road, these included:

- **Approach 1 – Maintain Existing System:** Leave the Airport Community Road drainage system in its current configuration, performing repairs as failures take place.
- **Approach 2 – Augment Existing Capacity of the System:** Replace Crossing 4 with a new crossing able to increase the system's overall capacity to match the 100-year peak flow of 94.2 m³/s. This assumed the existing bridge at crossing 7 will remain an integral component of the drainage system.
- **Approach 3 – Replace Existing System with One Crossing:** Construct a new crossing that is able to convey the entire 100-year peak flow of 94.2 m³/s and remove all the existing crossings including the eight culverts at Crossing 4 and the bridge at Crossing 7.
- **Approach 4 – Replace Existing System with Two Crossings:** Construct two new crossings that are able to convey the entire 100-year peak flow of 94.2 m³/s and remove/replace the existing crossings.

Approaches 2 and 4 were recommended as being the most favourable designs to consider. Both Approaches consisted of two bridges located within the Central Basin, the difference being that Approach 2 relied upon the assumption that the existing bridge at Crossing #7 could be kept in service while Approach 4 included the disposal of the existing Crossing #7 bridge and the construction of two new bridges. As detailed in Section 2.2, our inspection of the existing bridge at Crossing #7 revealed the bridge girders are in good condition and that once the abutments and the deck are upgraded, the existing bridge could continue to serve its purpose for another 30+ years. For this reason we are recommending to proceed with Approach 2 by upgrading the existing bridge and by constructing an additional bridge in the Central Basin.

While a vast selection of bridge designs do exist, the low traffic volume of the roadway, the simplicity of design desired, and the remoteness of the jobsite limited the practical bridge alternatives. To aid in the selection process, a number of other bridges installed throughout the Northwest Territories and Nunavut were researched to determine their appropriateness for use in Coral Harbour. The majority of bridges installed in the arctic regions follow the same basic design of two parallel steel girders seated on either a timber or concrete sills with bin-wall abutments and either timber or steel grill road decking. In most cases the bridge superstructures are fully contained underneath the roadway surface.

Bridge superstructures partially or fully above the road surface have been avoided as there is a risk of vehicles or equipment hitting and damaging the vulnerable structural members, particularly for narrow bridges. Girders used for these remote bridges are typically transported by barge in sections directly to the site where they can then be manoeuvered by a loader or excavator into position and bolted together onsite. Due to equipment limitations, heavier (longer) bridges are frequently erected using temporary gravel or snow berms allowing the equipment to position the girders onto the bridge abutments. Once assembly is complete, the berm can then be removed from under the bridge, leaving the bridge freestanding in its final position.

Bin-wall type abutments are most common in the North, likely due to the ease of assembly, the corrosion resistance (by using a thicker gage of steel), and the near-vertical nature of their design (increasing the cross-sectional area under the crossing). Where possible, these abutments are typically installed in wide channels at an elevation which leaves the abutments dry for the majority of the year. Year-round exposure to water promotes corrosion and decreases the expected bin-wall lifespan. Other common abutment types used in the North include sloped soil abutments protected with rip-rap and near-vertical gabion basket abutments.

We have considered a number of alternatives for each of the components making up a bridge crossing (superstructure, decking, and abutments). Consideration for each alternative was primarily based on criteria including: present and future cost, lifespan, local labour knowledge, constructability, and construction schedule. Other important criteria such as environmental impacts and disruptions to traffic along Airport Road are expected to be consistently minimal, regardless of which design components are implemented. Table 3-1 summarizes the key benefits and disadvantages of each component alternative. Photographs depicting each type of component have been included as Figures 3-2 through 3-5.

Table 3-1 – Bridge Component Consideration

Component	Cost	Pros	Cons
Superstructure			
2-Girder	$350,000	▪ Similar to existing bridge ▪ Simple assembly ▪ Local labour familiarity with the erection process	▪ Thick superstructure limits freeboard
Modular Panel Bridge	$340,000	▪ Provides additional freeboard ▪ Light weight ▪ Simple assembly	▪ Key structural components are above the driving surface, susceptible to damage ▪ Limits movement of goods
Decking			
Timber	$40,000	▪ Lightweight ▪ Simple installation ▪ Simple and easier to replace ▪ Similar to existing deck	▪ Shorter Lifespan (10 to 15 years)
Composite	$85,000	▪ Longer lifespan ▪ Deck shares some of the tension stresses, resulting in a shallower superstructure	▪ High replacement cost ▪ Installation is temperature sensitive
Abutments			
Bin-Wall	$82,000	▪ Maximizes hydraulic capacity of a crossing ▪ Local contractor familiar with installation practices	▪ Susceptible to corrosion damage
Sloped, Riprap Protected	$40,000	▪ Easy to install and replace ▪ Not dependent on manufacturing time ▪ Relies on locally available materials	▪ Reduces cross sectional area of channel

Figure 3-2: Dual Girder Bridge with Composite Deck and Sloped Riprap Abutments

Figure 3-3: Modular Panel Bridge with Riprap Abutments

Figure 3-4: Dual Girder Bridge with Binwall Abutments (Kirchoffer River Bridge)

Figure 3-5: Composite Deck on Modular Panel Bridge

Recognising that in 1999 Surespan (hired by Government of Northwest Territories) had supplied and constructed a two girder bridge across the nearby Kirchoffer River on Southampton Island, the Tetra Tech team explored the possibility of constructing a similar crossing across the Post River. Based on discussions with the local contractor and Surespan, the bridge was erected using snow to support the girders. Following the initial discussions and site visit, Tetra Tech contacted Surespan and Rapid-Span for budgetary quotes and technical information. As discussed above, this bridge design has been effectively implemented in the North on many occasions and based on the familiarity of the local contractors with the erection procedures, we are recommending that this type of bridge be used to cross the Post River. As detailed in Figures 3-4 we believe that constructing a bridge of similar configuration to the Kirchoffer River will likely be the most practical and cost effective option available.

4.0 PROPOSED PLAN

Based on the work completed to date, we have identified a proposed plan that satisfies the identified design constraints.
The proposed plan includes:

- Replacement of the existing eight culverts at Crossing #4 with the bridge currently in place at Crossing #7.
- The bridge will be founded on new bin-wall abutments;
- Construction of a new, 30 m long bridge at Crossing #7, founded on a pre-cast concrete sill on an earth-filled abutment protected by rip-rap;
- Removal of the twin 1.2 m diameter culverts at Crossing #5 and the 1.2 m diameter culvert at Crossing #6, followed by re-installation of these three culvert at Crossings #9 and #9a to improve the hydraulic capacity of the East Basin;
- Removal of the existing culvert crossing at Crossing #10 to protect the existing fuel line to the Hamlet and re-directing the flow through Crossings #9 and #9a; and,
- Construction of temporary access roads around crossings during construction to maintain 24-hour access between the Hamlet and airport.

Figures 1-3 through 1-10 present the layout of this proposed plan. Proposed bridge and channel dimensions are illustrated in the same figures.

This proposed plan will result in two bridge crossings within the Central Basin. The main crossing (Crossing #7) will convey the Post River flow on a year-round basis. Crossing #4 will serve as an auxiliary crossing, providing conveyance during spring freshet.

Under design flow conditions, we estimate that Crossing #7 would convey 69 m3/s while Crossing #4 would convey the remaining 25 m3/s. The corresponding upstream water level during this event would be approximately 6.8 masl, reducing the risk of the Post River spilling into the East Basin.

The increase in hydraulic capacity at Crossing #9 and #9a will further reduce the risk of inundation within the East Basin during freshet or heavy rainfall. The removal of the culvert at Crossing #10 will protect the existing fuel pipeline to the Hamlet.

Bin-wall abutments have been favoured at Crossing #4 as the near vertical configuration helps maximize the hydraulic capacity underneath the shorter bridge structure. Some corrosion is expected as the bin-walls will be in direct contact with water; however, corrosion will be minimal due to the limited number of months the crossing will

be exposed to water. To further extend the lifespan of the abutments alternate options including aluminum coated steel panels and thicker gage steel panels could be used. We have recommended sloped rip-rap abutments at Crossing #7. Sloped abutments were favoured over bin-wall type abutments due to a lower initial installation cost, easier replacement process, and high risk of bin-wall corrosion in this perennial watercourse.

As detailed in this section, Tetra Tech has shifted the main crossing upgrades to Crossing #7 for three reasons. The first is based on the absence of bedrock at a shallow depth at Crossing #4. The second is based on the fact that the Post River never dries up, forcing the contractor to divert water regardless of the proposed solution. Finally, the proposed improvements were shifted to Crossing #7 in recognition of the fact that the main stem of the river is located at Crossing #7 and the river will continue to naturally favour that route over Crossing #4.

5.0 COST ESTIMATE

A summary of the Class “C” (+/- 30%) cost estimate is presented as Table 5-1. A detailed breakdown of the summary is provided in Table 5-2. The detailed design phase will provide additional information required to develop a more accurate (Class “A”) cost estimate.

In summary, Tetra Tech has estimated the total construction cost should be approximately $1,500,000 not including taxes or engineering services. As described in the enclosed summary, the costs have been broken down to match the proposed phasing plans detailed in Figures 1-5 through 1-8.

Given the nature of the project site, we have included a 30% contingency in the Class-C cost estimate which is standard for this level of design. Given the isolated location of the site there can be additional challenges with respect to construction machinery breakdown, parts availability and supplies, and extreme weather conditions to mention a few. All of these factors can impact both the cost and the project schedule. A part of the contingency recognises this aspect of the project. As the project progresses through to detailed design, Tetra Tech will further investigate the cost risks to the GON.

Table 5-1 – Construction Cost Estimate Summary

Description – Project Phase		Total
Preliminaries		$81,000
Phase 1 - Construction of Temporary Bypass Road at Crossing #7		$50,690
Phase 2 - Removal and Upgrade of Existing Bridge at Crossing #7		$613,180
Phase 3 - Relocation of Temporary Bypass Road to Crossing #4		$23,760
Phase 4 - Culvert Removal and Installation of Bridge at Crossing #4		$294,600
Phase 5 - Replace Culvert Crossing 9, Removal of Culvert Crossing 10		$19,260
Miscellaneous		$54,000
Sub-total		**$1,136,490**
Project Contingencies	30.0%	$340,947
Total Estimated Construction Cost		**$1,477,437**

6.0 ENVIRONMENTAL APPROVALS

The rehabilitation of the culvert/bridge crossings of Airport Road in Coral Harbour will require a Type B Water Licence to be issued by the Nunavut Water Board (NWB). Initial communications with the NWB suggested that this project may also require a land use plan conformity determination to be conducted by the Nunavut Planning Commission (NPC) and a screening determination to be conducted by the Nunavut Impact Review Board (NIRB).

Follow-up communications between Tetra Tech and the NPC determined that the Coral Harbour Airport Road stream crossing rehabilitation project did not need to be reviewed by the NPC because it fell within the exemption of certain works and activities from the *Nunavut Planning and Project Assessment Act (NUPPAA)* definition of the term "project". Citing from an email communication received from Mr. Jonathan Savoy, Senior Planner of the NPC dated September 18, 2015:

"After reviewing your draft proposal (**Coral Harbour Airport Community Road Washout Rehabilitation Project - Draft NPC Application 148146**), the Nunavut Planning Commission (NPC) has determined that it falls within the exemption of certain works and activities from the *Nunavut Planning and Project Assessment Act* (*NUPPAA*) definition of the term "project". The NPC only has a statutory mandate to review "projects", and does not presently have jurisdiction to review your proposal.

Section 2 of the NUPPAA defines the term "project" to mean:

...the carrying out, including the construction, operation, modification, decommissioning or abandonment, of a physical work or the undertaking or carrying out of a physical activity that involves the use of land, waters or other resources. It does not include

(a) the undertaking or carrying out of a work or activity if its adverse ecosystemic impacts are manifestly insignificant, taking into account in particular the factors set out in paragraphs 90(a) to (i);

(b) the undertaking or carrying out of a work or activity that is part of a class of works or activities prescribed by regulation; or

(c) the construction, operation or maintenance of a building or the provision of a service, within a municipality, that does not have ecosystemic impacts outside the municipality and does not involve the deposit of waste by a municipality, the bulk storage of fuel, the production of nuclear or hydro-electric power or any industrial activities.

Specifically, your proposal involves municipal works or activities identified under part (c) of the above, and does not need to be reviewed by the NPC".

Subsequently, on September 18, 2015 Mr. Savoy also advised that:

"Because the activities are not a "project" under NUPPAA, NIRB screening is also not required (NIRB now only receives proposals forwarded to them by the NPC).

You are able apply for any permits or licenses you may need, including to the Nunavut Water Board (NWB). The NPC will be communicating with the NWB regarding this and other matters but for clarity it may be helpful to provide a copy of my previous message when contacting the NWB."

The Water Licence application is currently in preparation and is anticipated to be ready for submittal to the Nunavut Water Board by early December, 2015. Typically, after completing and confirming any pre-licensing land use or development impact requirements, it is reasonable to allow approximately three (3) months for the processing of a type B application.

Tetra Tech has also contacted the Department of Fisheries and Oceans (DFO) suggesting that a Request for Review to DFO will not be necessary as the proposed works will not result in serious harm to fish. Based on a number of sources, no references were found to suggest the presence of fish within the Post River. In fact, during conversations with Troy Netser, the Wildlife Guardian, and Louisa Kudluk, Manager at Aiviit Hunters & Trappers Organization in Coral Harbour, neither of them were aware of any fishing or fish migrations in the Post River.

The watercourse in question divides and has a number of outlets to the harbour depending on flows. Under freshet conditions, the river has frequently flooded the airport road resulting in washouts and damage to the supports of an existing fuel line to the Hamlet. The proposed project will replace an existing bridge with a larger clear span bridge to increase channel capacity, and on another arm of the river, a bank of 8 culverts will be replaced with a clear span bridge. Even if the river did support fish migrations, these changes would improve fish migration and fish habitat conditions. All construction work will have to be conducted following the terms that will be developed as part of a project-specific construction environmental management plan, with the objective of avoiding or minimizing adverse effects to the Post River or to downstream coastal waters and habitats.

7.0 PROJECT SCHEDULE

Recognising that the Post River does not stop flowing through the summer, the contractor selected for this project will have to dewater the construction site before being able to build the proposed abutments. The end of the summer is likely the most favourable time of the year as the temperatures are still higher than 0^0 C and the flow rates are at their lowest. The key to the completion of the project before the end of 2016 is to secure the shipment of the bridge components over the course of the summer of 2016. Although construction could be extended into the fall, Tetra Tech is still recommending to complete the works before the end of September, while temperatures are above freezing and material used to build the abutments can be appropriately compacted

A detailed project schedule is included in Appendix E.

8.0 RECOMMENDATIONS

Based on analysis to date and design alternatives explored, we recommend that the design solution presented in Section 4.0 be progressed to the preliminary, and ultimately, detailed design phase. Due to anticipated tendering, manufacturing, and shipping timelines, this future design process and decisions regarding it should be completed in a timely manner to maximize the possibility of a Summer 2016 construction window.

9.0 LIMITATIONS OF REPORT

Site hydrology estimates are based on the use of a regional hydrological analysis utilizing flow data collected at hydrometric stations with watersheds deemed to share hydrological similarities to the Post River watershed. Due to the remote arctic location, only a small quantity of hydrometric data was available. The correlations and conclusions drawn from these data sets are strong; however, the small sample size of the available data should be recognized.

This design was completed under the assumption that all hydraulic crossings on Airport Road will undergo regular maintenance such that optimal hydraulic capacity is retained. No allowance has been made for possible restrictions to available flow capacity due to crossing damage, channel aggradation, or general blockages.

10.0 CLOSURE

This report and its contents are intended for the sole use of the Government of Nunavut and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Government of Nunavut, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Tetra Tech EBA's General Conditions are attached to this report.

Respectfully submitted,
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REFERENCES

Airphoto Analysis Associates 1971. Airphoto Interpretation for Route Location, Southampton Island. Report submitted to Department of Indian Affairs and Northern Development, Ottawa, Ontario.

EBA Engineering Consultants Ltd., 2005. Sewage Dike Evaluation, Coral Harbour, NU. Submitted to Jacques Whitford Environment Limited, Yellowknife, Nothwest Territories, April 2005. EBA File 1700147

Environment Canada, 2014. National Climate Data and Information Archive, Coral Harbour, Nunavut. Retrieved from: http://www.climate.weatheroffice.gc.ca/climateData/canada e.html

Exp Services Inc., 2013. First Air Hangar, Rankin Inlet Airport, Nunavut. Submitted to Mosher Engineering Limited/Inukshuk Construction Limited, August 2013. Exp File OTT-00213804-A0

Tetra Tech EBA, 2014. Review of Adfreeze Pile Foundation Design, Coral Harbour, NU. Submitted to Northwestel Inc., Whitehorse, Yukon Territory, December 2014. Tetra Tech EBA File W14103201-02

Thurber Consultants Ltd., 1985. Geotechnical Evaluation for Proposed Arena, Coral Harbour. Report submitted to Department of Public Works and Highways, Government of the Northwest Territories, Yellowknife, NWT (file: 15-22-60).

Thurber Consultants Ltd., 1979. Water Supply System Design Brief, Coral Harbour. Report submitted to Government of Northwest Territories, Department of Public Works

APPENDIX A
TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

DESIGN REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This Design Report pertains to a specific site, a specific development, and a specific scope of work. The Design Report may include plans, drawings, profiles and other support documents that collectively constitute the Design Report. The Report and all supporting documents are intended for the sole use of Tetra Tech EBA’s Client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, analyses or other contents of the Design Report when it is used or relied upon by any party other than Tetra Tech EBA’s Client, unless authorized in writing by Tetra Tech EBA. Any unauthorized use of the Design Report is at the sole risk of the user.

All reports, plans, and data generated by Tetra Tech EBA during the performance of the work and other documents prepared by Tetra Tech EBA are considered its professional work product and shall remain the copyright property of Tetra Tech EBA.

2.0 ALTERNATIVE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless so stipulated in the Design Report, Tetra Tech EBA was not retained to investigate, address or consider, and has not investigated, addressed or considered any environmental or regulatory issues associated with the project specific design.

4.0 CALCULATIONS AND DESIGNS

Tetra Tech EBA has undertaken design calculations and has prepared project specific designs in accordance with terms of reference that were previously set out in consultation with, and agreement of, Tetra Tech EBA’s client. These designs have been prepared to a standard that is consistent with industry practice. Notwithstanding, if any error or omission is detected by Tetra Tech EBA’s Client or any party that is authorized to use the Design Report, the error or omission should be immediately drawn to the attention of Tetra Tech EBA.

5.0 GEOTECHNICAL CONDITIONS

A Geotechnical Report is commonly the basis upon which the specific project design has been completed. It is incumbent upon Tetra Tech EBA’s Client, and any other authorized party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the geotechnical information that was reasonably acquired to facilitate completion of the design.

If a Geotechnical Report was prepared for the project by Tetra Tech EBA, it will be included in the Design Report. The Geotechnical Report contains General Conditions that should be read in conjunction with these General Conditions for the Design Report.

6.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

CORAL HARBOUR FIELD SUMMARY REPORT SEPTEMBER 2015

TETRA TECH

SUMMARY REPORT

FOR INTERNAL USE

Date:	October 6, 2015	**File:**	V13203282-01
Location of Project:	Coral Harbour, Nunavut		
Location of Excavation:			
Field Personnel:	Ernest Palczewski		
Project Manager:	David Moschini		

Site Observations:

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by the Government of Nunavut to assist the Hamlet of Coral Harbour, NU with the implementation of a series of solutions intended to protect Airport Community Road from future washouts. The geotechnical field investigation was carried out by Mr. Ernest Palczewski, Geol.I.T., of Tetra Tech EBA's Edmonton Arctic Engineering Group accompanied by Mr. Ashwani Sharma of the Government of Nunavut. Mr. Palczewski and Mr. Sharma arrived to site on September 25, 2015 and departed September 28, 2015.

The field investigation consisted of the following tasks:

- Determine the type, quality, and depth to bedrock at Crossing 4 (eight culverts);
- Investigate and photograph the conditions of the existing culverts, staff gauges, and fuel pipelines along Airport Community Road;
- Investigate potential gravel sources around the Hamlet. Specifically a permeable, impermeable, and rip-rap source;
- Perform an elevation and photographic survey in the areas surrounding Crossings 4 and 7 (existing bridge);
- And, determine the Hamlet's construction capabilities.

2.0 BEDROCK

No exposed bedrock was visible at the vicinity of the eight culverts at Crossing 4. A loader was brought in after attempts to find bedrock using a geological hammer were unsuccessful. The loader dug a test hole adjacent to the southeast corner of Crossing 4 to a maximum depth of approximately 1.5 m and was unable to find bedrock. Digging deeper with the loader was decided against as this would mean a large excavation in a permafrost sensitive location with close proximity to flowing water of the stream. Attempts to secure the services of an excavator, backhoe, or drilling rig in the hamlet were unsuccessful. While no bedrock was encountered at this depth, a change of lithology to grey clay was noticed near the bottom of the test hole. A sample of the gravels overlying this located was collected for laboratory testing.

Tetra Tech EBA Inc.
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
Tel 780.451.2121 Fax 780.454.5688

Outcropping bedrock was observed approximately 47 m west of Crossing 4 and consisted of granite and gneissic granite which showed low weathering, minimal fractures and was overall very competent, good quality rock. The same bedrock was seen east of Crossing 7, therefore it can be interpreted it exists in the area under Crossing 4.

3.0 CULVERTS

Most of the culverts servicing airport community road are in good condition. Refer to the site photos for upstream and downstream views of all culverts. Notes include:

- Culverts at Crossings 8 and 9 sag slightly in the middle under the road.
- Crossing 8 downstream is becoming clogged with material, may need cleaning.
- The flow channel downstream of Crossings 9 and 9a is in very good condition, looks like it can handle high flows.
- Crossings 5 and 6 look like they have been dry for most of the summer.
- The culverts are covered by approximately 0.5 m of road fill. “The hamlet does not have traditional compactor – we use one we drag behind a truck, we do have a grader” – Darryl Nakoolak (local site contact/wildlife protection)
- The ends of a few culverts are dented but this would not appear to affect the flow of water significantly. The ends of the culverts at Crossing 3 appear to be in the worst condition.
- Staff gauges are in good condition and still attached to their original locations.

4.0 EXISTING BRIDGE

The existing bridge at Crossing 7 was constructed by placing gabion baskets filled with rock on top of the existing gravel. No evidence of piling or drilling to bedrock was observed. A concrete footing was placed on top of the baskets with the road rails sitting on top. The gabion baskets are beginning to deteriorate in certain locations, mainly in the corners, however the bridge appears level and in overall good condition. Refer to the photos for the condition of gabion basket at the existing bridge.

When asked about as-builts for the existing bridge, Mr. Sharma stated that they have been looking for such information and that “Economic development and transportation could not find anything on the existing bridge built in the 1980’s”

The existing bridge was marked by the steel company “Tri-North Steel” with a phone number 539-7600.

5.0 KIRCHOFFER BRIDGE

While at site Mr. Palczewski was made aware of the Kirchoffer Bridge located approximately 24 km west of the hamlet. According to the local contractor this bridge was built in Edmonton and assembled and erected on site by the local contractor in 1999. It has an approximately 80 m long span with a bin wall foundations which appear to be sitting on concrete footings poured directly onto the bedrock. Refer to photos for details.

6.0 GRAVEL SOURCES

The area around the Hamlet has abundant gravel sources ranging from clean sand to well graded gravels and rip-rap. During the site visit, Mr. Palczewski and Mr. Sharma visited nine areas and collected four samples for laboratory testing. Table 1.0 presents the coordinates and elevations of the nine potential gravel source locations.

Table 1.0 Gravel Source Locations

Source #	Easting	Northing	El. (m)	Sample Taken
1	389 345	7 115 245	11	Yes
2	389 388	7 115 289	15	No
3	388 154	7 115 264	9	Yes
4	388 015	7 115 930	13	Yes
5	387 793	7 116 126	10	No
6	386 127	7 120 321	53	No
7	387 726	7 115 877	7	No
8	393 841	7 115 356	8	No
9	394 262	7 118 619	25	Yes

The sources are further described below, see photos for reference and approximate source size:

1. GRAVEL – Trace Sand and Silt

   - First stop on Airport Road towards Airport, closest to Hamlet
   - “they use for river bottoms” – Darryl
   - Plated/oblate/shale like gravel
   - Sample Taken
   - Across from this gravel pile was Till - some gravel, some to trace sand and silt (may be too fine, potential for fines to wash out)

2. GRAVEL – Some Sand, Trace Silt

   - Across the Road from Sample 1
   - “we use for roads” – Darryl

3. GRAVEL – Some Sand, Trace Silt (higher fines content than sample #2)

   - ~7km away from Hamlet on Airport Community Road
   - Large stockpile
   - Sample Taken

4. SAND and GRAVEL –Trace Silt

    - Use for roads as well
    - Large stockpile
    - Sample Taken

5. SAND – Some Gravel to Gravelly, Some Sand, Trace Silt

    - Located across the road from #4
    - Similar to #4 but larger gravel
    - Very large stockpile

6. SAND and GRAVEL – Some Silt

    - By the Airport – old tank farm area
    - Frozen
    - Smallest stockpile

7. Gravel (River Bed)

    - Clean gravels from the riverbed, well sorted/poorly graded
    - No sample taken because could not get to stockpile on other side of the river

8. Rip-Rap

    - Granite and Gniessic granite up to 1m diameter
    - Medium sized source
    - There is a second potential rip-rap source on the way to the Kirchoffer Bridge

9. SAND - Trace Gravel

    - Located east of the Hamlet, “past the dumps”
    - Very clean
    - “Use for concrete” – Darryl
    - Sample Taken

7.0 LOUIE BRUCE (CONTRACTOR WHO WORKED ON EXISTING BRIDGE PHONE NUMBER: 867.925.8119)

Louie Bruce is the local contractor in the hamlet, the following are his comments when speaking with him on September 28, 2015:

- “Bedrock is very deep, and the ground is frozen.” Referring to Crossing 4. Mr. Palczewski tried digging the clay with a shovel and it was not frozen (max active layer this time of year), but it was very stiff and difficult to dig.
- “Existing bridge is made up of Gabion baskets sitting on gravel, not drilled/piled to bedrock.”
- “Second bridge to airport is not sitting on bedrock either” – similar in size and length as Crossing 4 bridge, not the Kirchoffer bridge.
- “Permafrost underneath bridge” in Crossing 4
- “New bridge needs a low railing to allow transport of cabins or machinery on low-boys.”
- “Bridge needs to handle 35 ton truck”
- “Existing bridge is 4.3 m (14’) wide, would like to have a wider bridge.”
- “Half-moon (flat bottom) culverts would work better. Culvert is better and cheaper than a bridge, I know, I live here. Our company worked on those” – We don’t believe he is accounting for or knows the severity of a 1:100 year event.
- “Only flooded one summer, after they put in culverts at crossings 5 and 6 it never flooded.”
- “Pipeline foundations were re-built after flood.”

Attached:

Photos and site map:
Q:\Vancouver\Engineering\V132\Projects\V13203282 - Coral Harbour Design and Construction

On Site Technician:

Senior Reviewer:

Prepared by:
Ernest Palczewski, B.Sc., Geol.I.T.
Geologist, Arctic Region
Direct Line: 780.451.2130 x353
Ernest.Palczewski@tetratech.com

Needs Review by:
Kevin Jones, P.Eng.
Vice President, Arctic Region
Direct Line: 780.451.2130 x271
Kevin.Jones@tetratech.com

APPENDIX C

CORAL HARBOUR BRIDGE INSPECTION REPORTS OCTOBER 2015

Inspection Report for Bridge at Crossing 7 on Airport Road, Coral Harbour, Nunavut

Load Rating Report for Bridge at Crossing 7 on Airport Road, Coral Harbour, Nunavut

BUCKLAND & TAYLOR | COWI
101-788 Harbourside Drive, North Vancouver, BC, Canada V7P 3R7
E-mail: mainoffice@b-t.com Tel: (604) 986-1222
Web: www.b-t.com Fax: (604) 986-1302

Our Reference: 2178-tet-001-l-dpg.docx

Our File: 2178

By Email

2015 November 13

Tetra Tech EBA
Suite 1000, 885 Dunsmuir St.
Vancouver, BC V6C 1N5

Attention: Mr. David Moschini, P.Eng., Senior Project Manager

Dear Sirs,

Re: Inspection Report for Bridge at Crossing 7 on Airport Road, Coral Harbour, Nunavut

This letter report describes the findings of Buckland & Taylor Ltd.'s (B&T) visual inspection of the existing bridge at Crossing 7 on Airport Road in Coral Harbour, Nunavut. This work was conducted on behalf of Tetra-Tech EBA (TTE) as part of the Airport Community Road Washout Rehabilitation project for the Government of Nunavut (RFP #KIVAE 12-30134).

The inspection was conducted on 2015 October 8 by Darrel Gagnon, P.Eng. of B&T. He was accompanied by a representative of the Government of Nunavut and the Hamlet of Coral Harbour provided site transportation, access to the underside of the bridge and bear monitoring services.

In general, the bridge was observed to be in good condition with only minor condition deficiencies that are not expected to significantly impact the load carrying capacity of the bridge.

Bridge Description

Crossing 7 is located on Airport Road and crosses the Post River in Coral Harbour. Figure 1, in Appendix A, shows a general view of the bridge at Crossing 7. The single lane 13.6 m long bridge spans an approximately 8 m wide channel. The bridge head slopes are supported by vertical gabion basket walls and precast concrete wingwalls at each corner of the bridge. Bridge foundations and bearings, if they exist, are buried in the approach fills. The bridge superstructure consists of two sets of joined pairs of W610X155 steel girders, with a center to center spacing between the pairs of girders of 2.3 m. The girders support a timber deck that provides a clear width of 4.55 m. The timber deck is comprised of 3"X10" (actual dimensions) timbers spanning transversely over the girders and topped by 3"X10" timbers running longitudinal along the bridge deck. Bridge railings are supported independently of the timber deck by what appear to be steel W shape members running transversely over the girder tops between every third transverse deck timber. The W shapes support barriers consisting of vertical posts with top and bottom rails all constructed from steel HSS members. No approach barriers or guard railings are present on the approaches to the structure. No drawings of the bridge are available and all reported dimensions are based on measurements obtained during the inspection.

Inspection Findings

The approach roadway embankments were observed to be in good condition with no significant signs of erosion or slope instabilities, as shown in Figures 2 and 3.

Gabion baskets walls that support the approach fills at the bridge abutments were observed to be in fair to good condition. The east and west gabion basket walls are shown in Figures 4 and 5, respectively. The walls appear to be in nearly vertical positions with possibly very slight forward leans and small bulges on the front faces of some individual gabion baskets. One gabion basket on the upstream edge of the west abutment is ruptured, likely due to ice forces, with some loss of filler stone, as shown in Figure 6. The damage to this basket does not currently appear to be impacting the stability of the approach fill but ongoing deterioration of the basket could eventually result in loss of fill material or slips in the embankment slope. No significant loss of section was observed on the wire mesh forming the gabion baskets but the galvanized coating on the wire mesh is now gone from the base to just above the current water level.

The precast concrete wingwalls located on sides of the bridge at each abutment were observed to be in good structural condition and appropriately placed to retain the approach roadway fills.

Bridge foundations and bearings, if they exist, are buried in the approach fills and could not be viewed during the inspection. A subsequent conversation with a NWT Ministry of Transportation employee indicated that the bridge may have been originally installed on a bin wall foundation. While there appears to be sufficient room behind the gabion basket walls for bin walls to still be present, no signs of bin walls were evident during the inspection.

The steel girders were found to be in good condition with no significant defects observed, see Figures 7 and 8. Paint coatings on the girders have almost completely failed and surface corrosion is present on all visible surfaces, as shown in Figure 9. However, no significant loss of steel section was observed which indicates a low rate of corrosion to date. No signs of more advanced corrosion were observed when the approach fill was removed from small areas of the buried girder ends.

The bridge deck timbers were observed to be in good condition and no nail heads protruded above the deck surface. See Figures 2 and 3. Hamlet staff indicated that the bridge deck timber were replaced two years ago.

Except for minor impact damage on the east end of the south barrier rail, the barrier railings, including the paint coatings, were observed to be in good condition. A general view of the barrier railings is shown in Figure 10. Although the barriers are in good condition, they are unlikely to meet the current bridge design code requirement for crash testing or pedestrian usage. No approach barriers or hazard markers are present on the roadways at the bridge location.

Summary

The bridge at Crossing 7 was observed to be in good condition with only minor deficiencies that are not expected to significantly impact the load carrying capacity of the structure. If the bridge is to remain in service at this location, repairs are recommended for the damaged gabion basket to reduce the risk of loss of material from the bridge abutment fill..

Yours truly,

BUCKLAND & TAYLOR

Darrel Gagnon, P.Eng.

Reviewed by Rodger Welch, P.Eng.

Appendix A - Photographs

Figure 1 – General view of bridge at Crossing 7 looking downstream.

Figure 2 – Approach roadway embankment looking east towards Coral Harbour.

Figure 3 – Approach roadway embankment looking west towards Airport.

Figure 4 – East abutment gabion basket wall looking east from downstream side of bridge.

Figure 5 – West abutment gabion basket wall looking west from upstream side of bridge.


Figure 6 – Ruptured gabion basket on upstream corner of west abutment fill.

Figure 7 – Steel girders looking east from near midspan.

Figure 8 – Steel girders looking west from near midspan.

Figure 9 – Typical condition of paint coating on steel girders.

Figure 10 – General view of bridge barrier rail.

BUCKLAND & TAYLOR | COWI
101-788 Harbourside Drive, North Vancouver, BC, Canada V7P 3R7
E-mail: mainoffice@b-t.com Tel: (604) 986-1222
Web: www.b-t.com Fax: (604) 986-1302

Our Reference: 2178-tet-002-l-dpg.docx

Our File: 2178

By Email

2015 November 13

Tetra Tech EBA
Suite 1000, 885 Dunsmuir St.
Vancouver, BC V6C 1N5

Attention: Mr. David Moschini, P.Eng., Senior Project Manager

Dear Sirs,

Re: Load Rating Report for Bridge at Crossing 7 on Airport Road, Coral Harbour, Nunavut

This letter report describes the findings of Buckland & Taylor Ltd.'s (B&T) load rating of the existing bridge at Crossing 7 on Airport Road in Coral Harbour, Nunavut. This work was conducted on behalf of Tetra-Tech EBA (TTE) as part of the Airport Community Road Washout Rehabilitation project for the Government of Nunavut (RFP #KIVAE 12-30134).

The load rating is conducted in accordance with CAN/CSA-S6-14 (S6-14) Section 14 EVALUATION. Bridge component types and dimensions are based on measurements obtained on site during a visual inspection conducted on 2015 October 8 by Darrel Gagnon, P.Eng. of B&T. Inspection results are reported under separate cover but no defects or other conditions were observed that would significantly impact the results of the load rating.

Heavy vehicle traffic using the Airport Road generally consists of tandem axle dump trucks, smaller sized front end loaders and an excavator. The S6-14 CL-625 design/evaluation load model was selected as the evaluation vehicle as it reasonably represents all these vehicles.

Bridge Description

Crossing 7 is located on Airport Road and crosses the Post River in Coral Harbour. Figure 1, in Appendix A, shows a general view of the bridge at Crossing 7. The single lane 13.6 m long bridge spans an approximately 8 m wide channel. The bridge head slopes are supported by vertical gabion basket walls and precast concrete wingwalls at each corner of the bridge. Bridge foundations and bearings, if they exist, are buried in the approach fills. The bridge superstructure consists of two sets of joined pairs of W610X155 steel girders, with a center to center spacing between the pairs of girders of 2.3 m. The girders support a timber deck that provides a clear width of 4.55 m. The timber deck is comprised of 3"X10" (actual dimensions) timbers spanning transversely over the girders and topped by 3"X10" timbers running longitudinal along the bridge deck. Bridge railings are supported independently of the timber deck by what appear to be steel W shape members running transversely over the girder tops between every third transverse deck timber. The W shapes support barriers consisting of vertical posts with top and bottom rails all constructed from steel HSS members.

Load Rating Results

Based on S6-14 Section 14, a nominal yield strength of 250 MPa was selected for the steel girders based on the year of construction being 1984. Although this is likely a conservative yield strength value for the time period, it did not impact the results of the evaluation. The steel girders were found to provide sufficient capacity for the CL-625 loading located in any positon on the deck.

Based on a visual assessment, the deck timbers were considered to be Douglas Fir. The deck timbers were found to be deficient for the CL-625 loading if the truck is placed immediately adjacent to the bridge railing, as is required by S6-14. If the truck loading is more centered on the bridge, at least 450 mm clear from the bridge railing, the deck timbers provide the required capacities.

Discussion and Recommendations

The bridge provides sufficient capacity to carry all vehicles legally permitted on the national highway system without permits, if the vehicles remain 450 mm or more from the faces of the bridge railings. Most drivers crossing the bridge will naturally center themselves on the bridge deck which is one reason that the bridge deck has provided good service to date. However, this does not guarantee that some vehicles will not be offset enough to be within 450 mm of the bridge railing.

The bridge deck timbers can be brought into compliance for the CL-625 loading placed anywhere on the bridge deck. by either adding curbs to the deck that prevent the truck from getting closer than 450 mm to the bridge railings or by replacing the existing 3"X10" transverse timbers with 5"X10" Douglas Fir Grade No. 1 or better timbers.

Yours truly,

BUCKLAND & TAYLOR

Darrel Gagnon, P.Eng.

Reviewed by Rodger Welch, P.Eng.

Appendix A

Figure 1 – Existing bridge at Crossing 7 Airport Road, Coral Harbour, NU

APPENDIX D
SEA LIFT INFORMATION

Sealift rates for the 2015 season

Nunavut Arctic Resupply of Dry Cargo

Port of Loading: Ste-Catherine, Quebec, Canada

Destinations		Northbound rate per revenue ton of 1,000 kg or 2.5 m³	Northbound rate per 20' standard container (rate per unit)	Retrograde cargo rate per revenue ton or 1,000 kg or 2.5 m³	Retrograde per 20' full standard container (rate per unit)	Retrograde rate per 20' empty standard container (rate per unit)	Retrograde rate for empty drums and cylinders (rate per unit)	Lateral cargo rate per revenue ton of 1,000 kg or 2.5 m³	Lateral rate per 20' standard container (rate per unit)
HIGH ARCTIC	Arctic Bay Clyde River Grise Fjord Nanisivik Pond Inlet Qikiqtarjuaq Resolute Bay	388,43 $	5 981,80 $	252,48 $	3 888,17 $	722,63 $	42,83 $	252,48 $	3 888,17 $
FOXE BASIN	Igloolik Hall Beach Repulse Bay	365,13 $	5 623,07 $	237,33 $	3 654,99 $	722,63 $	42,83 $	237,33 $	3 654,99 $
IQALUIT	Iqaluit	297,14 $	4 577,15 $	193,14 $	2 974,36 $	722,63 $	42,83 $	193,14 $	2 974,36 $
SOUTH BAFFIN	Cape Dorset Kimmirut Pangnirtung	336,82 $	5 187,05 $	218,94 $	3 371,58 $	722,63 $	42,83 $	218,94 $	3 371,58 $
KIVALLIQ FROM STE-CATHERINE (MONTREAL)	Arviat Baker Lake Chesterfield Inlet Coral Harbour Whale Cove Rankin Inlet	361,43 $	5 566,14 $	234,93 $	3 617,99 $	722,63 $	42,83 $	234,93 $	3 617,99 $
*** KITKMEOT SEE NOTE ON PAGE 2	Bathurst Inlet Umingmaktok Cambridge Bay Kugluktuk Gjoa Haven Taloyoak	~~450,12 $~~ 438,86 $	~~6 931,73 $~~ 6 758,43 $	~~292,56 $~~ 285,24 $	~~4 505,62 $~~ 4 392,97 $	722,63 $	42,83 $	~~292,56 $~~ 285,24 $	~~4 505,62 $~~ 4 392,97 $
SANIKILUAQ	Sanikiluaq	376,26 $	5 794,47 $	244,57 $	3 766,41 $	722,63 $	42,83 $	244,57 $	3 766,41 $

Sealift rates for the 2015 season

Nunavut Arctic Resupply of Dry Cargo

Port of Loading: Churchill, Manitoba, Canada

Destinations		Northbound rate per revenue ton of 1,000 kg or 2.5 m^3	Northbound rate per 20' standard container (rate per unit)	Retrograde cargo rate per revenue ton or 1,000 kg or 2.5 m^3	Retrograde per 20' full standard container (rate per unit)	Retrograde rate per 20' empty standard container (rate per unit)	Retrograde rate for empty drums and cylinders (rate per unit)
KIVALLIQ FROM CHURCHILL	Arviat Whale Cove Rankin Inlet Chesterfield Inlet Baker Lake Coral Harbour	$255,72	$3938,15	$166,22	$2559,80	$722,63	$42,83

Notes:

- ✓ Rates are applied per metric ton of 1,000 kilograms or per 2.5 cubic meters, depending on which method produces the greater income per package;
- ✓ Our rate for standard containers reflects the price of a container with the following dimensions: 20' Length X 8' Width X 8' 6" Height;
- ✓ Kugaaruk : The Canadian Coast Guard handles the cargo from Nanisivik and Kugaaruk;
- ✓ Dangerous goods: the adjustment factor is 20% premium above the applicable rate;
- ✓ Maximum container weight allowed: 14,250 kg including the weight of the empty container which is 2,500 kg;
- ✓ Retrograde cargo: cargo carried from North to South;
- ✓ Lateral cargo: cargo shipped between two communities in the North;
- ✓ Taxes not included.

*** A discount for the 2015 Season, on the Kitikmeot Region was established to celebrate the new partnership with Kitikmeot Corporation.

Desgagnés Transarctik Inc.




PACKAGING AND SHIPPING GUIDE

Packaging standards

for
Arctic Sealift

Nunavut Sealift & Supply Inc.

Desgagnés Transarctik Inc.

Taqramut Transport Inc.

REVISED EDITION
March 2015

Desgagnés Transarctik Inc.

6565, boulevard Hébert
Ste-Catherine (Québec)
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info@transarctik.desgagnes.com

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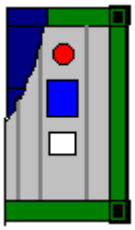

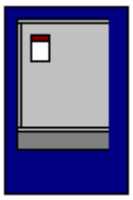

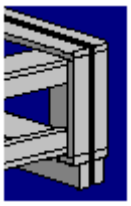

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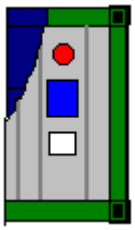
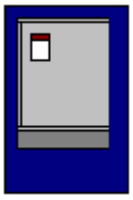
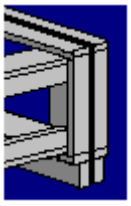
INTRODUCTION







The main objective of this guide is to raise sealift users' awareness on the required sealift packaging standards, for the various commodities they ship to or from the North, or from a village to another (lateral). Compliance to these standards from the sealift users and shippers will ultimately make packaging an investment, rather than just a sealift expense.

Our extended Northern sealift experience has indicated that adequate packaging is the first important element to consider for safe and successful shipping of various types of cargo. From the moment it is packaged till it reaches its final destination, an average cargo unit will have to sustain the stress of being handled an average of 8 to 10 times, in addition to the stacking stress, and this, in environments that are as varied as unusual in cargo-handling operations. A crate or parcel must be built to sustain all types of weather conditions, as well as to endure the many handling stages during the loading and offloading of vessels and barges. Hence, a suitable and adequate packaging will not only make handling more secure for the included commodities, but will also be safer during the loading of vessels and barges, as well as during the unloading of cargo at destination.

As important a suitable and adequate packaging is, shipping procedures and the accuracy of the information and instructions contained in the accompanying documents are also very important factors for the success of Sealift Operations.

The information contained in this document is provided mainly as recommendations to the shippers, and it covers a large sampling portion of the various types of cargo usually carried within sealift operations. This information also remains as an indicator of Desgagnés Transarctik Inc. (DTI) standards, which are also applied for Nunavut Sealink and Supply Inc. (NSSI) and Taqramut Transport Inc. (TTI)

For additional information on the subject, do not hesitate to contact us. It will be our pleasure to assist you.

DESGAGNÉS TRANSARCTIK INC

Revised March 2015

For additional information, please consult our Web Site:
www.arcticsealift.com, or call toll free: 1(866)732-5438

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PACKAGING AND SHIPPING GUIDE

PART 1 — SHIPPING

NORTH. RETROGRADE. LATERAL

NOTICE

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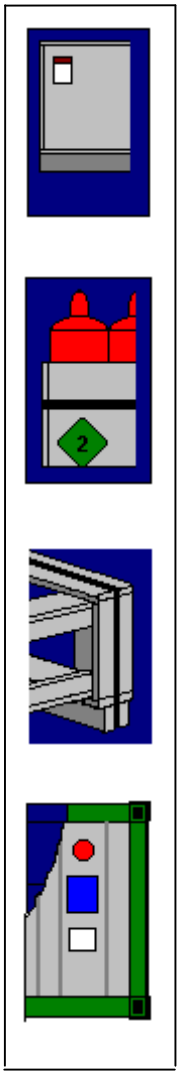

BOOKING CARGO SPACE

The first step in processing a sealift shipment is to book cargo space, on one of our vessels. This will allow us to confirm with you the necessary space for each and every shipment on the selected voyage and vessel. Once space is booked, you will receive a confirmation number and upon receiving that you may start the planning of your cargo delivery.

The reservation forms and booking notes are available on our web site: www.arcticsealift.com

ANTICIPATED CARGO LIST

For each destination, you should provide a complete and extensive list of the anticipated cargo with your request for the booking of space. The regular updating of the anticipated cargo list allows us to foresee and determine the needs in vessels, as well as to plan the itineraries. For further details and information, please consult our website.

SHIPPING NOTICE

The "Shipping Notice" is a document that you must complete and include with each of your cargo shipments to the dock facilities. This includes the most important information needed throughout the sealift process. It allows the Carrier to process subsequent administrative documents, starting with provisional dock receipts, then manifests and leading ultimately up to invoicing. Therefore, the precision in a shipping notice information will serve to guarantee you quality service throughout the sealift process and stages. The standard 'Shipping Notice' form is also available on our web site.

HAZARDOUS MATERIAL

Shipping "hazardous materials" or dangerous goods must be done in compliance with the most up-to-date Federal safety standards, rules and regulations. These goods must also be accompanied by the appropriate documentation. Information on this subject is available on our Web site.

DELIVERY APPOINTMENT

An appointment must be set up at least 24 hours in advance for all ground shipments to designated maritime shipping terminals. For lateral and backhaul transports, you must be present at the beach upon the ship's arrival. You may contact us for further details

For appointments, please call (450) 635-7700

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PACKAGING AND SHIPPING GUIDE

PART 2 — RECEIVING - NORTH

NOTICE

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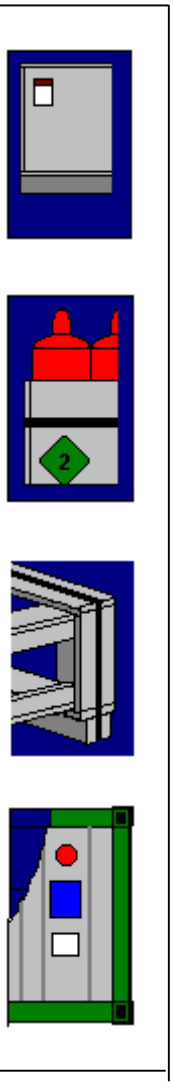

SHIP ARRIVAL AT DESTINATION

Once the ship has reached the destination, customers (consignees) must present themselves at the dock site or landing beach, and contact their maritime carrier representative (sealift company), who will provide them with a copy of their respective manifest, describing their cargo. This document contains all pertinent information necessary for cargo verification and inspection.

If for any reason, a customer cannot be present at ship arrival, he or she may designate a representative to act on his or her behalf. The representative should be in possession of documentation attesting to this right.

CUSTOMER'S PRESENCE

The customer, or representative, must be present at the dock site or landing beach, or for the least can be reached at all time and remain available upon a very short notice, for the duration of the unloading operations, in order to verify each of his or her cargo units once these are offloaded.

CARGO INSPECTION

At the dock site or landing beach, cargo units are verified and accepted by the customer (consignee) or representative, before he or she can declare repossession of said cargo. Responsibility for the transported goods is transferred from the carrier to the customer once he or she has declared ownership by signing the manifest. Annotations are added, for damages or shortage if any.

ACCEPTANCE OF CARGO

It is important to note that the maritime carrier is not responsible for damages incurred during ground transportation and cartage, beyond the high-water mark. This is why cargo must be verified, inspected and accepted, with any necessary annotations, before leaving the dock site or the landing beach area.

DELAYS

Manifests are distributed to consignees at the time of the ship's arrival at destination. Given the nature of sealift operations and unpredictable changes in weather conditions, and other factors surrounding these operations, customers must sign the manifest within reasonable delays at the end of the unloading operations, and prior to the ship's departure. Annotations, if necessary, must be added on the manifest before its signing for cargo receipt and acceptance.

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PACKAGING AND SHIPPING GUIDE

PART 6 — VEHICLES, TIRES AND HEAVY MACHINERY

NOTICE

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DELIVERY OF VEHICLES

All vehicles delivered to the maritime shipping terminal, whether heavy or light, new or used, must be accompanied by a shipping notice indicating the following information: model, serial number, weight and dimensions in metric measurements, destination, name of consignee and name of shipper. It is advisable to attach a list of accessories to the registration documents. However, the sealift carrier will not be held responsible for loss of items or accessories included in the vehicle without proper packaging. Used vehicles must be in working order & clean for inspection purposes, and accompanied by a list of mechanical and bodywork defects. Several factors must be considered a priority in relation to vehicles, such as safety during loading and unloading of vessels and the liability of the maritime carrier.. The maritime carrier will tolerate a maximum of one hundred fifty (150) kilograms of belongings within a standard vehicle or truck. Moreover, the Carrier may refuse receipt of a vehicle that appears overloaded, which can cause suspension damages and, more importantly, would represent an unsafe situation during loading & unloading operations. It is essential that the following safety measures are met: If the weight of the vehicle is not indicated on the registration form, and the weight declared is not consistent with the type of vehicle, we will need an official weighing certificate.

Specifications:

No parcel(s) allowed to be stowed on the front seats. No cargo will exceed the lower level of cabin windows. All merchandise in the trunk must respect the weight and trunk will be locked. Fuel tanks must not be filled to more than one quarter of their full capacity and enough to be moved during loading and unloading operations. If the vehicle is not in working condition, it can not be transported. If the battery of the vehicle needs to be charged, supplementary charges will apply. The vehicle must be clean in order to facilitate its inspection.

If it is a new vehicle, we recommend that the customer talk to his dealer to keep the protective plastic liner of the body.

Tires:

Tires must be piled on a palette or on a wooden base not higher than 5’ with 1” wide metal straps. They should be shrink wrapped in order to avoid water accumulation inside the tires.

DELIVERY OF HEAVY MACHINERY

In addition to the above mentioned documents, heavy machinery & equipment must also be accompanied by paperwork clearly indicating lifting points. All accessories and spare parts must be separately packaged or secured on skids, and clearly identified. (see part 7) In addition to the shipping notice, all heavy vehicles must also be accompanied by an official weight receipt, lifting points’ information as well as a list of both accessories and defects. It is also necessary to include directions for disengagement of anti-theft devices and any other special systems or devices that vehicles and/or machinery may be equipped with.

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PACKAGING AND SHIPPING GUIDE

PART 8 — STRUCTURAL STEEL

NOTICE

Information contained in this document will in no way render the maritime transportation company responsible nor liable.

PACKAGING

Steel structure parts of different lengths should be segregated and packaged separately for economical reasons relating to the cost of sealift carriage. For acceptance by the Carrier, steel structure must be packaged in a way to facilitate handling and stacking, and make safe the manipulation and handling of this type of Cargo throughout the sealift process. An acceptable standard package (Cargo Unit) of steel structure metal will include the illustrated features and the following components:

1) Wooden skids, made of 4'' x 4'' pieces in length corresponding to the depth of the bundle are used to facilitate forklift handling. Wooden pieces of adequate thickness and dimensions are placed in between each layer of stacked steel, in order to prevent sliding, which is a characteristic of metal; otherwise, sliding would ultimately render the metal strapping ineffective. The maximum weight of a bundle of steel is 14 tons and the width cannot exceed 8'.
2) At the two extremities at least, and depending on the length and weight of the bundle, strap down the bundle to skids in pairs, unreservedly using heavy-duty wide metal straps. 1" or 1 ¼" straps are strongly recommended. The first pair of straps will serve to secure the bundle onto the skids, and others to enforce the tying of the metal pieces in a bundle. Additional straps and more skids should be added depending on the length of the bundle (See illustrations 1 and 2).

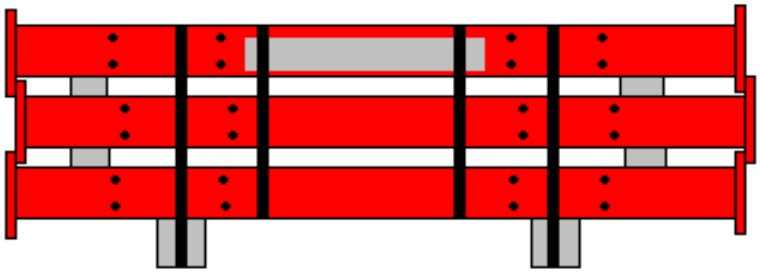

ILLUSTRATION 2

LABELLING & SHIPPING

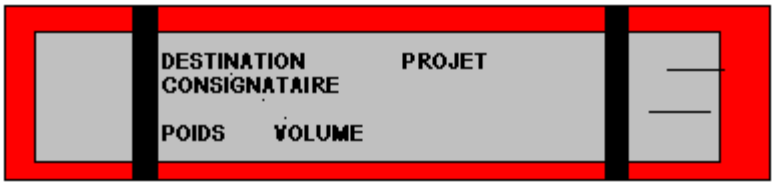

ILLUSTRATION 3

1) Each bundle must display a label with the following information: destination, weight in kilograms, volume in cubic meters, name of consignee and name of project.
2) Because structural steel is amongst the first types of cargo to be loaded aboard the vessel, the date of delivery to the docks is of the utmost importance for operations planning. The sealift Carrier cut-off dates must be respected at all times by shippers.
3) All shipments to designated maritime shipping terminals must include a shipping notice, per destination and per consignee. A 24-hour advanced notice is required for the delivery of shipments to the Carrier's terminal facilities. Shipping notice forms are available on our Web site: www.arcticsealift.com

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PACKAGING AND SHIPPING GUIDE

PART 8B REBAR

NOTICE

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PACKAGING

A rebar (short for reinforcing bar), also known as reinforcing steel, reinforcement steel, rerod, a deformed bar, reo, or reo bar, is a common steel bar, and is commonly used as a tensioning device in reinforced concrete and reinforced masonry structures holding the concrete in compression. It is usually in the form of carbon steel bars or wires, and the surfaces may be deformed for a better bond with the concrete.

Wooden skids, made out of 4'' x 4'' pieces in lengths corresponding to the depth of the bundle are used to facilitate forklift handling. Maximum weight 14 T, and maximum 8 feet large and 2 feet high.

The two extremities at least, and depending on the length and weight of the bundle, strap down the bundle to skids in pairs, unreservedly using heavy-duty wide metal straps. 1" or 1 ¼" straps are strongly recommended. The first pair of straps will serve to secure the bundle onto the skids, and others to enforce the tying of the metal pieces in a bundle. Additional straps and more skids should be added depending on the length of the bundle.

LABELLING & SHIPPING

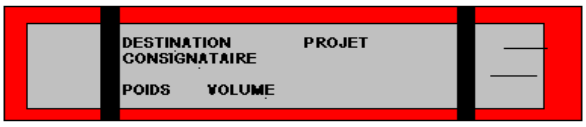

ILLUSTRATION 3

1) Note: The rebar bundle should be placed on a wooden base and secured with straps. For rebars of different lengths, they must all be packaged in a close crate. Each bundle must display a label with the following information: destination, weight in kilograms, name of consignee and name of project.

2) Because rebar is amongst the first types of cargo to be loaded aboard the vessel, the date of delivery to the docks is of the utmost importance for operations planning. The sealift Carrier cut-off dates must be respected at all times by shippers.

3) All shipments to designated maritime shipping terminals must include a shipping notice, per destination and per consignee. A 24-hour advanced notice is required for the delivery of shipments tot the Carrier's terminal facilities.

Shipping notice forms are available on our Web site: www.arcticsealift.com

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PACKAGING AND SHIPPING GUIDE

PART 10 — CEMENT BAGS

NOTICE

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PACKAGING

The cost of transportation of cement bags, due to the nature and weight of this material, is relatively high compared to its purchasing cost. Damages and losses resulting from poor packaging, and the replacement cost can be significant. It is therefore proven that adequate packaging of this material is essential, and turns out to be a good investment in this particular case. The same packaging process and criteria can be used for similar bagged materials.

An acceptable standard package (Cargo Unit) of cement bags will include the illustrated features and the following components:

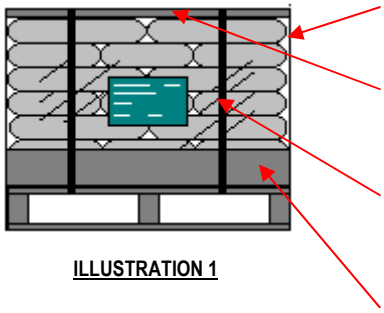

ILLUSTRATION 1

1) Cement bags are stacked on standard-sized wooden pallet (skid), as it may be originally received from the supplier; wooden pallet must resist to a capacity of 2270kg.
2) Polyethylene shrink-wrapping is necessary to offer protection against bad weather conditions during the various sealift stages and process;
3) A sheet of plywood is placed on the top to the full extent of the surface, or rigid wooden right angles made out of 1"X 6" wooden pieces could be used across the full length of the front and the back sides, to reduce the risk of damages that may result from stacking during warehousing and transportation stages;
4) Due to the heavy weight of this type of Cargo, heavy duty ¾ to 1 inch metal straps are used to tightly fasten the bundle onto the pallet. A two-way strapping is recommended, depending on the height of the bundle;
5) For additional protection to cement bag rows at the base, specifically during forklift handlings of the bundle, it is recommended to place a strip of plywood or a piece of spruce (1" X 6") at the base, nailed to the pallet sides over the fork insert;
6) A packing slip, with the type and quantity of content, is enclosed in a plastic envelope, and adhered on the front surface of the bundle.

LABELLING & SHIPPING

DESTINATION: _____
CONSIGNEE: _____
WEIGHT: _____ Kg
VOLUME: _____ M^3
PROJECT: _____

ILLUSTRATION 2

1) Self-adhesive shipping labels, or stencilling in dark ink on the plywood board described in (#5) here above, must be applied on the front and back sides of each pallet, listing the following information: destination, name of consignee, weight in kilograms, volume in cubic meters and name of project. (See ILLUSTRATION 2).
2) Due to its nature and heavy weight, cement is amongst the first types of cargo to be loaded aboard the vessel. Therefore, the date of delivery to the docks is of the utmost importance for operations planning and the ship-loading process. Hence, the Carrier's cut-off dates must be respected at all times by shippers.
3) A 24-hour advanced notice is required for the delivery of shipments to the Carrier's terminal facilities.

All shipments to designated maritime shipping terminals must include a shipping notice, per destination and per consignee. Shipping notice forms are available on our Web site: www.arcticsealift.com

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PACKAGING AND SHIPPING GUIDE

PART 11 — CLOSED CRATES

NOTICE

The information contained in this document will in no way render the maritime transportation company responsible nor liable.

GENERAL APPLICATIONS

Closed crates are used for a variety of packaging applications, including personal household effects, office supplies, certain types of furniture, building supplies and others.

The construction and specifications of a crate may vary, mainly depending on the type and weight of the cargo included. Thus, heavier crates should normally be built with heavier material for the floor, structure, walls and the choice of heavier metal strap and size.

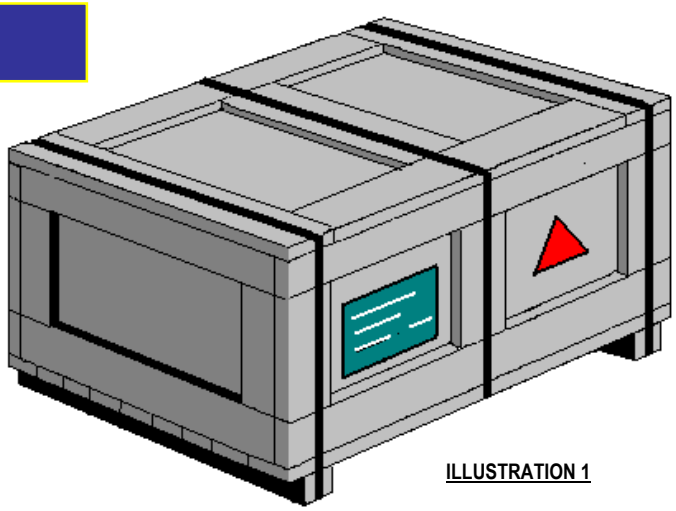

ILLUSTRATION 1

COMPONENTS & SPECIFICATIONS

An acceptable standard closed crate (Cargo Unit) will include the illustrated features and the following components:

A - STANDARD CLOSED CRATE:

1) Floor: Made of 2"X 4" or 2"x 6" hardwood, and ½" Plywood surface, and secured on 4" X 4" wooden skids;
2) Structure & Walls: Made with 1"X 4" or 2"X 3" spruce, and 3/8" plywood. The cover (lid) surface is enforced with wooden pieces of the same type, to sustain the pressure of stacking and 3 times its weight.
3) Fastening: ¾''metal straps are required. The nails used to assemble the crate must be of proper size and type.
4) The minimum size of a crate represents ½ of pallets.
5) Ensure that cargo is evenly distributed in the crate,, so to maintain the center of gravity in the middle.
6) A Polyethylene liner or wrapping is deployed to protect content inside the crate, from water infiltration and humidity;
7) A packing slip, including the listing of contents, should be enclosed in a plastic envelope and adheredk on the front wall of the crate.

LABELLING & SHIPPING

DESTINATION: _____
CONSIGNEE: _____
WEIGHT: _____ Kg
VOLUME: _____ M³
PROJECT: _____

ILLUSTRATION 2

1) Self-adhesive shipping labels, or stencilling in dark ink on the plywood wall surfaces, must be applied on the front and back walls, listing the following information: destination, name of consignee, weight in kilograms, volume in cubic meters and name of project. (See ILLUSTRATION 2).
2) A label with the « Hazardous Materials » symbol must appear on the crate, identifying the type of Hazardous Material (dangerous goods) included therein, if such is the case. Shippers are to make sure that paperwork for dangerous goods is duly completed and delivered to the Carrier; otherwise the shipment will be refused by the Carrier.
3) A 24-hour advanced notice is required for the delivery of shipments tot the Carrier's terminal facilities. The Carrier's cut-off dates must be respected at all times by shippers. All shipments to designated maritime shipping terminals must include a Shipping Notice, per destination and per consignee. Shipping Notice forms are available on our Web site: www.arcticsealift.com

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PACKAGING AND SHIPPING GUIDE

PART 17 —WOOD, PLYWOOD & LUMBER

NOTICE

Information contained in this document will in no way render the maritime transportation company responsible nor liable.

PACKAGING

In general, the basic bundling of lumber provided by suppliers is only suitable for local deliveries by trucks, and usually is insufficient for sealift delivery purposes. Throughout the sealift process, a bundle of lumber is handled an average of 8-10 times before it reaches its final destination. Precautions should therefore be taken to enforce the strapping and to further protect bundles of certain types of finishing wood products, including plywood, as explained hereafter.

A bundle of lumber should ideally include wood products of the same length, which eliminates void volumes within the bundle, and therefore results in optimizing the cost of shipping.

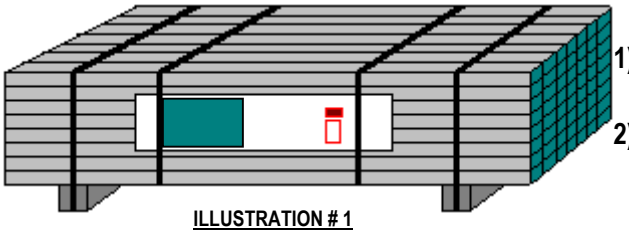

ILLUSTRATION # 1

An acceptable bundle of lumber or plywood (Cargo Unit) will include the illustrated features and the following components:

1) It is strongly recommended that the lumber and plywood be wrapped with a plastic sheet or a vapour barrier before applying the straps.
2) A pair of skids measuring 4"X 4", or a pallet of a minimum elevation of 4 inches are deployed to provide ground clearance for forklift handlings. The addition of skids is required for longer bundles, and should be kept proportional to the size and weight of the bundle.
3) For a bundle of up to a 10-foot long, two pairs of ¾" metal straps are recommended:
   One pair is used to hold the bundled wood onto the skids, and the other is to firmly hold the bundle together.
4) For large and heavy bundles, in addition to extra skids, additional pairs of 3/4" or 1" straps are added as needed and proportionally to the size and weight of the bundle.
5) Mouldings, door stoppers and kickboards, as well as all types of wooden products used as finishing material, floor covering and similar products must be better packaged. Closed crates and in some cases, open crate-types of packaging, are strongly recommended for these products. Information on the two types of crates is provided under Parts 11 and 13 of this Guide.

LABELLING AND SHIPPING

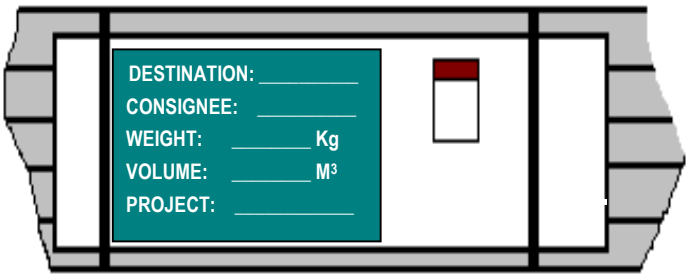

ILLUSTRATION #2

1) Self-adhesive shipping labels, or stencilling in dark ink on sized plywood surfaces, are applied on the front and back sides of each bundle, listing the following information: destination, name of consignee, weight in kilograms, volume in cubic meters and name of project.
2) The timely delivery to the docks is important for operations planning and the ship-loading processes. Therefore, the Carrier's cut-off dates must be respected at all times by shippers.
3) A 24-hour advanced notice is required for the delivery of shipments at the Carrier's terminal facilities. All shipments to designated maritime shipping terminals must include a shipping notice, per destination and per consignee.

   Shipping Notice forms are available on our Web site: www.arcticsealift.com

Revised March 2015

APPENDIX E
SCHEDULE

Airport Community Road Washout Rehabilitation - Coral Harbour Project Schedule (11/17/2015 Update)

	Start Date	End Date
Project Schedule	8/17/2015	4/14/2016
Proposal Closing Date	8/17/2015	
Client Proposal Review & Contract Development	8/18/2015	9/11/2015
Preliminary Design	9/2/2015	3/16/2016
Task 1: Project Initiation and Kickoff Meeting	9/8/2015	
Task 2: Review of Available Information	9/2/2015	10/6/2015
Task 3: Initial Site Visit and Survey	9/25/2015	9/28/2015
Task 4: Internal Conceptual Design Review Meeting	10/6/2015	
Task 5: Hydrology Update and Stormwater Model	10/7/2015	10/14/2015
Task 6: Development of Alternative Design Option & Report	10/8/2015	11/17/2015
Task 6a: Class 'C' Cost Estimate	11/10/2015	11/17/2015
Task 7: Internal Review	11/17/2015	11/20/2015
Task 8: Submission of Alternative Design Option & Report	11/20/2015	
Client Review Period	11/20/2015	11/27/2015
Client Conference Call	11/27/2015	
Task 9: Refinement of Preliminary Plans of Preferred Option	11/27/2015	12/4/2015
Task 9a: Class 'B' Cost Estimate	12/1/2015	12/4/2015
Task 10: Internal Review	12/4/2015	12/8/2015
Task 11: Submission of Preliminary Plans of Preferred Option	12/8/2015	
Client Review Period	12/8/2015	12/15/2015
Task 12: Environmental Application (NIRB, AANDC, NWB, DFO)	9/2/2015	3/16/2016
Detailed Design	12/8/2015	2/3/2016
Task 1: Internal Detailed Design Review Meeting	12/8/2015	
Task 2: Development of Detailed Design Drawings	12/8/2015	1/5/2016
Task 3: Internal Review	12/31/2015	1/5/2016
Task 4: Submission of Detailed Design Drawings (75%)	1/5/2016	
Client Review Period	1/5/2016	1/12/2016
Client Conference Call	1/12/2016	
Task 5: Revision of Detailed Design Drawings	1/13/2016	1/20/2016
Task 6: Revision of Class 'B' Cost Estimate	1/15/2016	1/20/2016
Task 6a: Internal Review	1/18/2016	1/20/2016
Task 7: Submission of Detailed Design Drawings (99%)	1/20/2016	
Client Review Period	1/20/2016	2/3/2016
Client Conference Call	2/3/2016	
Tender Document Preparation & Tendering	2/3/2016	4/14/2016
Task 1: Tender Package Preparation	2/3/2016	2/17/2016
Task 2: Class 'A' Cost Estimate	2/10/2016	2/17/2016
Task 3: Tender Drawings Submittal (100%)	2/17/2016	
Client Review Period	2/17/2016	2/24/2016
Task 4: Revision of Tender Package	2/24/2016	3/2/2016
Task 5: Revision of Class 'A' Cost Estimate	3/1/2016	3/2/2016
Task 6: Construction Tender Documents Issued	3/2/2016	
Task 7: Tender Administration and Recommendation	3/2/2016	4/6/2016
Task 8: Project Award	4/6/2016	
Task 9: Contract Documents Preparation	4/7/2016	4/14/2016