

Appendix G2

Logistics

Report to:

SEABRIDGE GOLD

SEABRIDGE GOLD INC.

KSM Project – Logistics Study 2012

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SEABRIDGE GOLD

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KSM PROJECT – LOGISTICS STUDY 2012

JULY 2012

Prepared by	<u><i>"Original document signed by Peter Udovicic, B.A. (Economics)"</i></u> Peter Udovicic, B.A. (Economics)	Date	<u>July 16, 2012</u>
Reviewed by	<u><i>"Original document signed by Mike Shamro"</i></u> Mike Shamro	Date	<u>July 16, 2012</u>
Authorized by	<u><i>"Original document signed by Johan Steenkamp, MBA, PMP"</i></u> Johan Steenkamp, MBA, PMP	Date	<u>July 16, 2012</u>

PU/aim



Suite 800, 555 West Hastings Street, Vancouver, British Columbia V6B 1M1, Canada
Phone: 604.408.3788 Fax: 604.408.3722

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GLOSSARY

annum/year	a
Baltic Handysize Index.....	BHSI
British Columbia.....	BC
Canadian dollars	Cdn\$
Canadian National Railways	CNR
Copper Fox Metals Inc.....	Copper Fox
day	d
deadweight tonnage	DWT
foot.....	ft
gross vehicle weight	GVW
Imperial Metals Corp.....	Imperial Metals
Kerr-Sulphurets-Mitchell	KSM
kilometres	km
kilotonnes.....	kt
Kinder Morgan Vancouver Wharves	KMVW
Land Reservation Agreement	“the Agreement”
million tonnes.....	Mt
million.....	M
pounds	lb
Prince Rupert Port Authority	PRPA
Ridley Terminals Inc.	RTI
Seabridge Gold Inc.	Seabridge
Stewart Bulk Terminals	SBT
Tetra Tech-Wardrop.....	Tetra Tech
tonnes per year	t/a
tonnes	t
twenty-foot equivalent units	TEUs
Wainwright Marine Services	WMS
West Fraser Timber Co. Ltd.....	West Fraser
Yukon Zinc Corp.	Yukon Zinc

1.0 INTRODUCTION

Tetra Tech-Wardrop (Tetra Tech) has been retained by Seabridge Gold Inc. (Seabridge) to conduct a Logistics Study for the Kerr-Sulphurets-Mitchell (KSM) Project located in northwestern British Columbia (BC). This Study identifies the options available for transporting the following:

- copper concentrates from the KSM site to a port facility
- molybdenum concentrates from the KSM site to a port facility
- mining and construction equipment and materials to the KSM site.

This Logistics Study provides an update to the Logistics Studies conducted in 2010 and 2011 (Wardrop; 2010, 2011), by incorporating current pricing and information related to the KSM Project. This Study has been prepared to a prefeasibility level and all viable modes of transportation were considered. Any potential environmental permits and related issues are not considered in this Study.

All costs are shown in Canadian dollars (Cdn\$) unless otherwise specified.

2.0 COPPER CONCENTRATE LOGISTICS

2.1 INTRODUCTION

This section outlines the shipping options for copper concentrates from the KSM Project site. For the purposes of this Study, it has been assumed that:

- the copper concentrates will be shipped in bulk
- the projected volume is approximately 330,000 t/a
- the customer base will be in Asia
- the concentrates will be delivered to Asian ports in Handysize ocean vessels.

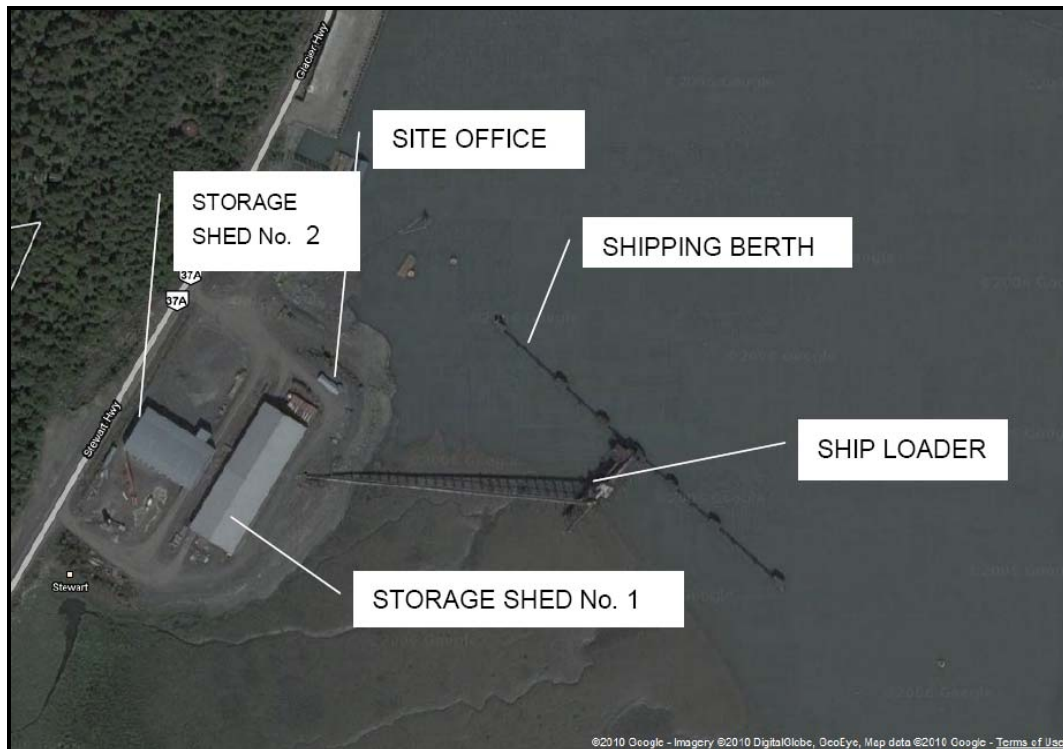
2.2 EXISTING PORT OPTIONS

2.2.1 STEWART BULK TERMINALS – STEWART, BC

Stewart Bulk Terminals (SBT) is located in Stewart, BC, at the head of the Portland Canal, which is a 150 km fjord that is ice-free throughout the year. The terminal is accessible via Highway 37A, but there is no direct rail service. The terminal was built in the early 1970s to service the Granduc Copper Mine. Although some components have been added and others refurbished, the material handling systems are largely unchanged.

An aerial photograph of the terminal and site is provided in Figure 2.1.

Figure 2.1 Stewart Bulk Terminals Site



SBT currently handles mineral concentrates from the Imperial Metals Corp. (Imperial Metals) Huckleberry Mine and recently acquired mineral concentrates from the Yukon Zinc Corp. (Yukon Zinc) Wolverine Mine.

Both of the terminals' on-site sheds are equipped with elevated truck dump platforms and approach ramps. The elevated platforms provide a physical separation between the trucks and the storage area. The platforms in both sheds are designed to handle side-dump trailers. Storage Shed No.1 is dedicated to Yukon Zinc and is under contract to 2015. Storage Shed No.2 is dedicated to Imperial Metals, who has extended their mine operation until 2021.

Trucking from Yukon Zinc's Wolverine Mine is based on the New Bulk Haul program that was instituted by the BC Ministry of Transportation and Infrastructure, which allows commercial trucks to haul larger mining loads, specifically along Highway 37A and a portion of Highway 37. Vehicles have a gross vehicle weight (GVW) of 72,300 kg (increased from 63,500 kg), resulting in a payload of approximately 50 t (an increase of approximately 19%).

SBT is planning a major expansion to the site, storage capacity, and ship loading system with the intention of increasing the throughput of the terminal due to the many active projects located in the vicinity of Stewart. SBT are currently in discussion with Imperial Metals for the Red Chris Project, and have signed an agreement with

Copper Fox Metals Inc. (Copper Fox) to potentially handle concentrates from their Schaft Creek Project.

On October 13, 2011, Copper Fox announced the completion of a Land Reservation Agreement (“the Agreement”) between Copper Fox and SBT which secures the shipping requirements for storage and loading of concentrate received from the proposed Schaft Creek Mine through the Port of Stewart.

The Agreement reserves space for Copper Fox at the SBT facilities for:

- the construction of a concentrate storage warehouse to store up to 50,000 t of concentrate
- the use of the loading facilities at SBT to meet the anticipated monthly loading requirements of the Schaft Creek Project.

Pursuant to the terms and conditions of the Agreement, Copper Fox and SBT are required to negotiate a “Terminal Services Agreement” that covers the terms and conditions for the storage and loading of bulk concentrate onto ocean-going vessels for shipment of bulk concentrate. The Agreement is assignable to another party and covers a term from October 12, 2011, through April 1, 2019. Pursuant to the terms of the Agreement, SBT will construct the concentrate storage warehouse on land that was previously permitted for their current concentrate storage and loading operations.

A photograph of the ship loader and berth are shown in Figure 2.2.

Figure 2.2 Stewart Bulk Terminals Ship Loader and Berth



SHIPPING COSTS

For this Study, SBT provided a terminal handling rate of Cdn\$20.00/t, which covers the receiving and unloading of trucks, storage, and loading to ocean vessels. Any capital costs for storage and handling systems would be in addition to the handling rate and would need to be negotiated directly with SBT. Trucking costs are estimated at Cdn\$34.64/t and are based on the hauling of larger loads. Seabridge would be responsible for application to the BC Provincial Government for the hauling of larger loads. Trucking costs for standard GVWs are estimated at Cdn\$38.58/t.

2.2.2 *KINDER MORGAN VANCOUVER WHARVES – NORTH VANCOUVER, BC*

Kinder Morgan Canada Terminals LP owns and operates the Kinder Morgan Vancouver Wharves (KMVW) facility in North Vancouver. KMVW is a bulk marine terminal, strategically located on the north shore of Burrard Inlet in Port Metro Vancouver. In operation since 1959, the 129-acre terminal handles approximately 3 Mt of inbound and outbound cargo annually. The facility consists of five vessel berths capable of handling Panamax-size vessels, with significant rail infrastructure, dry bulk storage, and liquid bulk storage. KMVW handles wood pellets, mineral concentrates, sulphur, and distillates; it is accessible by both truck and rail via Canadian National Railways (CNR).

The terminal has the largest unloading crane in Port Metro Vancouver, and has enclosed facilities for both ship loading and unloading railcars, as well as facilities for receiving product by truck. KMVW's loading equipment includes a traveling gantry shiploader; unloading is performed by a grab bucket unloading crane. Seven warehouses (several of which have multiple separations) provide storage for over 500 kt of concentrates.

KMVW offers mineral concentrate transloading with both ship loading and unloading capabilities. The terminal currently handles cargo from major mines such as Highland Valley Copper, Gibraltar, Mount Polley, Kemess, Red Dog, and Copper Mountain. KMVW may acquire new volume from projects such as New Afton and Mount Milligan. An aerial photograph of the facility is shown in Figure 2.3.

Figure 2.3 Kinder Morgan Vancouver Wharves Facility



SHIPPING COSTS

For this Study, KMVW provided a terminal handling rate of Cdn\$25/t. This rate covers the receiving and unloading of trucks or railcars, storage, and loading to ocean vessels. Any capital costs that are required for storage and/or receiving systems would be in addition to the handling rate and would need to be negotiated directly with KMVW. In addition to the handling rate, KMVW requires a “New Mine Environmental Project” surcharge of Cdn\$12.00/t. This surcharge is applicable to any new mining projects that wish to use KMVW and is applicable until September 30, 2018.

Shipments to KMVW can be delivered by either truck or rail. The cost for direct trucking is estimated at Cdn\$186.80/t and is the highest cost option. Rail deliveries would require a rail load-out facility and operation that could perform the following:

- unload trucks
- provide ample storage
- load rail cars.

Rail Load-out Facilities

There is an existing rail load-out in Kitwanga, BC, that was once used to transload concentrates from the Eskay Creek Mine. A lease on the building held by Barrick Gold Corp. has expired, and ownership has been returned to the local First Nations.

The facility is approximately 120 ft by 60 ft and can store approximately 4,000 t of concentrates. There is a loading capacity of two railcars in the shed, with the capacity to store seven railcars outside. To accommodate the anticipated volumes from the KSM Project, both the rail system and facility would require upgrading. Further studies would be required to determine the upgrading requirements, rail service levels, and associated costs. Photographs of the Kitwanga facility are provided in Figure 2.4 to Figure 2.8.

Figure 2.4 Kitwanga Facility Exterior – Truck Bay and Ramp



Figure 2.5 Kitwanga Facility Exterior – Rail Access



Figure 2.6 Kitwanga Facility Interior – Overhead Crane



Figure 2.7 Kitwanga Facility Interior – Storage Bays and Rail Access



Figure 2.8 Kitwanga Facility Interior – Truck Dump Area



Trucking costs to Kitwanga are estimated at Cdn\$50.98/t, transloading at Cdn\$5.83/t and rail delivery at Cdn\$39.96/t. The transit time for railcar delivery is approximately five days. Any capital costs for expansion or upgrading would be in addition to the operating costs.

Other alternatives and potential locations for rail load-outs are in Smithers, BC, or Terrace, BC. Currently, there are no such facilities in either of the locations; therefore, these would need to be developed including land acquisition. Order of magnitude costs are estimated at Cdn\$3 M and would take at least 12 months to develop. Further investigation would be required and costs would be additional to the operating costs. Trucking costs to Smithers are estimated at Cdn\$64.85/t, transloading at Cdn\$5.83/t, and rail delivery at Cdn\$39.20/t. Trucking costs to Terrace are estimated at Cdn\$64.19/t, transloading at Cdn\$5.83/t, and rail delivery at Cdn\$46.46/t.

2.3 OCEAN FREIGHT

Ocean transport is a key component in delivering mineral concentrates to smelters in Asia. The most commonly used vessel type is a Handysize vessel with a deadweight tonnage (DWT) capacity ranging from 32,000 t to 36,000 t per vessel. These types of vessels are used mainly because of draft restrictions at many Asian ports.

Ocean vessels in the mineral concentrates trade generally call on more than one port in order to fill the vessel with cargo from a variety of shippers. Ships calling at Stewart also load cargo at Skagway and Hawk Inlet, which helps to keep rates as competitive as possible without the need to extend the voyage to southern ports.

Transit times from west coast ports to Asian ports average about 25 days due to the time required for loading at more than one port.

Vessel delays at the loading ports result in demurrage costs, which are currently US\$10,000/d. These costs are would be the responsibility of the shippers. Average delays at the ports of consideration are as follows:

- SBT: no delays
- KMWV: 3 days.

Ocean freight rates are volatile and are driven by market forces such as supply and demand, and are also influenced by the price of bunker fuel. Daily rates are published in the Baltic Handysize Index (BHSI).

For the purposes of this Study, the following ocean freight costs are being used, which are long-term rates that have been estimated by an ocean freight carrier for shipments of 10,000 t parcels:

- SBT: US\$63/t
- KMWV: US\$55/t.

Based on preliminary estimates for KSM copper concentrates, an estimated 33 ocean vessel shipments would be required per year.

2.4 OPERATING COST COMPARISON

Table 2.1 summarizes the estimated operating costs for all existing port options. An exchange rate of 0.96 was used for any rates that were provided in US funds.

Table 2.1 Operating Cost Matrix – Copper Concentrates for Asian Markets

Activity	Port of Stewart (Cdn\$/t)	KMWV (Cdn\$/t)			
		Rail via Kitwanga	Rail via Smithers	Rail via Terrace	Via Direct Truck
Trucking	34.64	50.98	64.85	64.19	186.8
Transloading to Rail	n/a	5.83	5.83	5.83	n/a
Rail Transport	n/a	39.96	39.2	46.46	n/a
Terminal Handling	20	25	25	25	25
Other Ports Costs	0	12	12	12	12
Ocean Freight	65.63	57.29	57.29	57.29	57.29
Total	\$120.27	\$191.06	\$204.17	\$210.77	\$281.09

2.5 POTENTIAL PORT OPTIONS

In addition to the existing ports, there are additional port options that are located within reasonable geographic proximity to the KSM Project. These ports currently do not have the facilities necessary to handle mineral concentrates and would require either brownfield or greenfield investment.

2.5.1 PRINCE RUPERT

There are two potential sites in Prince Rupert. The first is a brownfield opportunity at Ridley Terminals Inc. (RTI), and the second is a greenfield bulk terminal development on Ridley Island, working in conjunction with the Prince Rupert Port Authority (PRPA).

RIDLEY TERMINALS INC.

RTI is a Federal Crown Corporation that owns and operates an export coal terminal with an annual throughput capacity of 12 Mt/a, which can be expanded to 24 Mt/a. RTI also handles wood pellets and is capable of handling other bulk commodities.

RTI may no longer be available due to the increasing demand from coal producers both in Canada and the US. In 2011, RTI concluded a variety of agreements for terminal handling services with producers such as Arch Coal Inc., Teck Resources Ltd., Anglo American, Hillsborough Resources Ltd., and Coalspur Mines Ltd. These agreements range from 5 years to 14 years in duration.

In order to handle the additional volume of coal, RTI are in the process of expanding terminal throughput with their Cdn\$200 M “Capacity Realization Project”, which is scheduled for completion by the end of 2014. The plan is to double the current capacity by:

- upgrading existing stackers/reclaimers
- adding dumpers, conveyance, and a new stacker/reclaimer
- installing and upgrading of rail infrastructure
- integrating new lands.

An aerial photograph of the RTI facility is shown in Figure 2.9

Figure 2.9 RTI Facilities – Aerial Photograph



PRINCE RUPERT PORT AUTHORITY BULK TERMINAL

The PRPA is a local port authority that operates under the Canada Marine Act. It is an autonomous and commercial agency that is responsible for the overall planning, development, marketing, and management of the commercial port facilities within the Prince Rupert Harbour.

PRPA is planning a 100-acre dry bulk terminal facility to handle concentrate as well as potash, sulphur, wood pellets, iron ore, and cement. Usage could be for a specific commodity or shared within a multi-purpose facility.

On February 23, 2012, it was announced that the Government of Canada will be contributing Cdn\$15 M to the Port of Prince Rupert's "Road Rail Utility Corridor" initiative on Ridley Island. As the closest North American port to Asian markets, the Cdn\$90 M "Road Rail Utility Corridor" project is designed to expand the Port of Prince Rupert's capacity to meet Asia's demand for western Canada's natural resources. The PRPA and CNR have each contributed Cdn\$30 M to the project. The Government of BC made a commitment of Cdn\$15 M in September 2011.

The "Road Rail Utility Corridor" will consist of three inbound tracks and two outbound tracks for coal, potash, and other bulk terminal developments. Two additional tracks will form a loop around the main part of Ridley Island and one new track will extend off the rail loop toward RTI. The project also includes 69 kV electric and water utility extensions into the middle of the island to support bulk terminal development as well

as road improvements along the new rail corridor. Construction is anticipated to begin in mid-to-late 2012, with a completion date of 2014.

2.5.2 *KITIMAT*

The Eurocan Terminal in Kitimat was a wholly-owned division of West Fraser Timber Co. Ltd. (West Fraser), an integrated forest products company with sawmill and pulp and paper operations in both Canada and the US. On May 14, 2011, West Fraser announced that it has entered into an agreement to sell its deep sea wharf and related assets to Rio Tinto Alcan, subject to government approval for the transfer of related permits and licences. The wharf formed part of West Fraser's Eurocan linerboard and kraft paper mill located in Kitimat, BC, which was closed in January of 2010.

On August 16, 2011, West Fraser announced that it had completed the sale of the Eurocan deep sea wharf and related assets to Rio Tinto Alcan. With this transaction, Kitimat is no longer a potential option for handling mineral concentrates for export.

3.0 MOLYBDENUM CONCENTRATE LOGISTICS

3.1 INTRODUCTION

This section outlines the shipping options for molybdenum concentrates from the KSM Project site. For this Study, it is assumed that:

- the processed molybdenum output is approximately 1,800 t/a
- the processed molybdenum will be loaded in 1 t bags for transport purposes
- the molybdenum will be delivered in standard ocean containers
- the customer base will be in Asia.

Ocean freight and other related costs would be in addition to the costs identified in this Study and will be contingent on the final destination and sales arrangements.

Currently, there are five terminal facilities in BC that are equipped to handle containers for export via ocean vessels. The terminal facility that is closest to the KSM Project is the Fairview Terminal in Prince Rupert, BC. The other terminal facilities are in Port Metro Vancouver and are not considered economically viable due to the distance from the project site.

3.2 FAIRVIEW TERMINAL – PRINCE RUPERT

The Fairview Terminal in Prince Rupert is the closest North American port to Asia. The terminal is accessible via rail (CNR) and via truck on Highway 16. The annual throughput capacity is 500,000 TEUs (twenty-foot equivalent units) with plans for a Phase 2 expansion, which will increase the annual throughput capacity by 1.5 million TEUs for a grand total of 2 million TEUs. A TEU is a measure often used to describe the capacity of both container ships and container terminals.

The Fairview Terminal is shown in Figure 3.1.

Figure 3.1 Fairview Terminal, Prince Rupert



3.3 SHIPPING COSTS

Shipments of molybdenum concentrates will require the use of a variety of modes of transportation. The bags will be transported via truck to Prince Rupert, transferred from truck to container, and then delivered to the Fairview Terminal for ultimate loading onto ocean vessels. The following is a description and summary of the estimated costs for each mode of transportation:

- **Trucking:** trucking is based on a GVW of 63,500 lb with a payload of approximately 42 t per truck. Bags will be trucked directly from the site using B-train flat-deck trucks at a cost of Cdn\$77.53/t.
- **Container Stuffing:** trucks will be delivered to a warehouse where the bags will be unloaded from the trucks and stuffed into standard 40 ft ocean containers, which have a capacity of 24 t. The cost for this is Cdn\$150 per container, or Cdn\$6.25/t.
- **Drayage:** the cost for delivering the loaded containers from the warehouse to the Fairview Terminal is Cdn\$225 per container, or Cdn\$9.38/t.

Table 3.1 Estimated Molybdenum Concentrate Shipping Cost Summary

Transport Mode	Cost (Cdn\$/t)
Trucking	77.53
Container Stuffing	6.25
Drayage	9.38
Total	93.16

4.0 MINING AND CONSTRUCTION EQUIPMENT LOGISTICS

A major logistical initiative will be required during the construction phase of the Project due to the significant amount of mining and construction equipment that will need to be transported to the KSM site. The costs and preferred modes of transportation will be determined when the sizes, weights, and origins of the equipment are finalized. This section discusses the modes of transport that would be available for the Project.

4.1 TRUCK

There are regional, long-haul, and heavy haul trucking companies that are capable of providing services for the Project from all points in North America. Other related services that are within close proximity to the Project include warehouse and cargo consolidation facilities.

Transport along Highway 37 from Kitwanga may be limited due to some bridges along the route. One bridge in particular that could be a limiting factor is the Nass River Bridge, located approximately 141 km north of the junction between Highway 16 and Highway 37, which is a single-lane bridge that has yield signs at either end. Built in 1972, it is constructed with wooden glue-laminated beams, has a capacity of 90 imperial tons (or 180,000 lb) GVW, is 323 ft in length, and has a horizontal restriction of 14'10". Further evaluation is required to ensure that the bridges on the route are capable of handling the weights and dimensions of both the cargo and transport vehicles.

4.2 RAIL

Rail transport could be viable, particularly for equipment or construction material that would be sourced from locations in the eastern parts of North America or Mexico. As an alternative to directing cargo to Vancouver, it could be more practical and/or cost effective to ship cargo north through Prince George to either Terrace or Smithers. Cargo would then be unloaded and transferred to trucks for subsequent delivery to the Project site.

Both Terrace and Smithers are served by the CNR, which crosses the continent east-west and north-south, serving ports on the Atlantic, Pacific and Gulf coasts with links to all three NAFTA nations. CNR operates in 8 Canadian provinces and 16 American states with connections to all points in North America.

4.3 BARGE

There are opportunities to ship cargo via barge from Port Metro Vancouver to either Prince Rupert or Stewart and then for furtherance by truck to site. The advantages of this mode include the consolidation and movement of large quantities of goods as well as the potential of moving oversized or heavy pieces of equipment in order to minimize highway travel and the need to obtain transport related permits.

In Prince Rupert, service is available by Wainwright Marine Services (WMS), an established tug and barge company that provides service to areas on the north coast of BC. WMS has tugs and barges of various sizes and capacities as well as industrial equipment, cranes, and freight trucks. WMS has a 10-acre marshalling yard located in the Prince Rupert Industrial Park as well as a variety of freight handling equipment. WMS have their own crane lifting capability of up to 35 t and have access to supplementary crane service to 100 t. Freight is mainly received via road; however, three barge ramps are available for receiving cargo via water carriers. WMS is strictly a charter-based company with no routine or scheduled service.

In Stewart, BC, there are no barge ramps; however, SBT has the capability of handling equipment via barge on a roll-on/roll-off basis. Barge unloading would take place at the north-eastern area of the terminal where the ground is sloped from the road level to the water's edge. Inbound movements would require mobile equipment such as a bulldozer to assist in pulling the equipment.

Current and previously handled cargo that has been either received or loaded on barges includes pipes, paving equipment, camp trailers, and gravel. SBT have the ability to mobilize cranes up to 200 t capacity and can handle barges up to 5,000 t capacity. Barges must have ramps or portable ramps available. Currently, barge service is provided by WMS and charter service would be available by Seaspan International Ltd.

4.4 PORT FACILITIES

Equipment arriving from Asia could be directed to terminals in either Port Metro Vancouver or Prince Rupert. Consideration will be given to whether the cargo is shipped in containers or in break-bulk form.

5.0 SUMMARY AND CONCLUSIONS

There are many active projects in northwestern BC that are competing for terminal handling services in Stewart. If space is not available, then brownfield or greenfield investment in Prince Rupert may be required for the shipment of copper concentrates.

For molybdenum concentrates, the most practical and cost effective method is to ship bags in containers via Prince Rupert. There is ample terminal handling capacity at Fairview Terminals.

For mining and construction equipment, there are a number of modes of transport available for the Project. The coordination of procurement activities, shipment, and load planning will be critical in determining the most efficient and cost effective options.

6.0 RECOMMENDATIONS

Tetra Tech recommends the following with regard to logistics for the KSM Project:

- engage in discussions with the owners/operators of SBT to determine the current and long-term status of terminal capacity and expansion plans in order to secure handling services for the Project
- investigate the viability and costs for port options in Prince Rupert as an alternative to the use of SBT.

7.0 REFERENCES

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Wardrop, a Tetra Tech Company, 2011. TJS Mining – Kerr Sulphurets Mitchell Project Pre-Feasibility Study Logistics Study (Update), Document No. 0952880200-REP-R0005-00, dated March 31, 2011.