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BABSON COLLEGE

COST BREAKDOWN AND CONSTRUCTION PROFILE: YELLOWKNIFE JOINT VENTURE ICE ROAD

PREPARED BY THE GOLDSTEIN GROUP

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NORTHWEST TERRITORY, CANADA
DIAMOND MINING MAP

Source: Diavik Diamond Mine, Inc. Fact Book[1]

[1] http://www.diavik.ca/documents/DiavikFactBook.pdf

COST BREAKDOWN OVERVIEW

WHAT ARE SOME EXPENSES ON THE ICE ROAD?

As reported on the Nuna Logistics website, there area variety of itemized costs that go into the construction, maintenance, and support functions necessary to operate the Joint Venture Ice Road. The costs broken-out on the company's web site include:

Planning

1. an ongoing process to ensure route efficiency and safety, and cost control

Ice Profiling (Pioneers)

1. number of ice profiling teams two - one team north end and one team south end
2. equipment includes ice profiler, amphibious Hagglund, snow cats, plows, and helicopter support
3. ice profiling crews, working with helicopter, map, test and clear the initial winter road route
4. south crew and north crew work toward meeting in mid-route

Construction and Maintenance

1. variety of specialized equipment: plows, graders, water trucks, dozers, snow blowers, specialized low ground pressure equipment

Camp Catering

1. full camp catering is provided to trucking and mining/explorations companies

Summer Maintenance

1. Managers
2. Profilers
3. Dispatchers
4. Maintenance crews
5. Camp catering
6. Administration and payroll

The above information was obtained from Nuna Logistics,
http://nunalogistics.com/projects/winter_road/index.html

COST BREAKDOWN

The first step in constructing a financial estimate of the costs associated with the construction, maintenance, and support of the ice road was designing a conceptual processes based on research (both regarding the Tibbitt to Contwoyto Joint Venture Ice Road, as well as similar ice roads constructed in Alaska).

This allowed for the completion of the *Initial Clearing Costs* table:

Initial Route Clearing		**Per mile cost**	
Plowing, Drilling, Flooding	353	$ 18,000.00	$ 6,354,000.00
		Per machine cost	
Fixed Costs Machinery	10	$ 40,000.00	$ 400,000.00

In addition to the *Team Costs* table:

Team Costs			
Ice Profiling	180	$ 6,000.00	$ 1,080,000.00
Amphibious Haggulund	180	$ 6,000.00	$ 1,080,000.00
Snow Cats	180	$ 6,000.00	$ 1,080,000.00
Plows	180	$ 6,000.00	$ 1,080,000.00
Helicopter Support	180	$ 650.00	$ 117,000.00

From this point, it was necessary to construct a best-estimate organizational design for each of the two teams that support the above functions. The team structure emerged as follows, with average salary rates derived from industry databases (IBISWorld and Salary.com Industry Reports):

Administrative Support	# of Units		
General Manager	1	$ 150,000.00	$ 150,000.00
Cost Controller	2	$ 80,000.00	$ 160,000.00
Safety Officer	4	$ 100,000.00	$ 400,000.00
Machine Operator	12	$ 70,000.00	$ 840,000.00
Maintenance Crews	8	$ 70,000.00	$ 560,000.00
Camp Catering	20736	$ 10.00	$ 207,360.00

ARCTIC PREMIUM

As a result of the region's remoteness and the difficulty involved in transporting materials and equipment to the area, there is a substantial premium on goods and services consumed and rendered in the Northwest Territories. The arctic premium is equivalent to 35%.

EXCHANGE RATE

This financial model takes into account the assumption that all costs are paid in Canadian dollars with an exchange rate of 1 U.S. dollar = 1.05139978 Canadian dollars.

ECONOMIC MULTIPLIERS

When an individual, firm, or government injects money into an economy, the realized impact/value is not necessarily equal to the original value injected into the system. Let's say that a government injects $100 into the economy through a tax refund. A recipient of that money might save 20% of that (meaning their marginal propensity to save is 20%) and spend 80% (marginal propensity to consume). The customer might then purchase an item from a retailer for $80, who will then save 20% and spend the remaining 80% -- this cycle would continue on as each consumer expenditure becomes income for the next person down the line.

An economic multiplier becomes the expected measure of the real value of that initial cash injection in the economy. In the example above, the economic multiplier can be calculated by dividing 1/Marginal Propensity to Save or 1/.2 = 5. Therefore the economic multiplier is 5 and the net impact on the economy of that initial $100 is actually $500.

The economic multiplier varies from industry to industry. The majority of functions served in the construction, maintenance, and support of the Ice Roads falls into either a) Construction, or b) Support Activities for Mining and Oil and Gas Extraction.

AT A GLANCE: ANALYSIS

Rather than calculate the economic impact using a weighted average or tiered calculation of the above, the total impact of the model was run separately for each industry to provide a more conservative estimate of the impact in the form of a range.

Support Activities for Mining and Oil and Gas Extraction Calculations

GDP at Basic Prices ($): [GDP intensity ratio for Support Activities for Mining and Oil and Gas Extraction] x [Gross output]

Economic Multiplier for Support Activities for Mining and Oil and Gas Extraction	0.66
GDP at Basic Prices ($) =	$ 12,279,875.00

This means that the impact of the money injected into the economy as a result of building the Joint Venture road is $12,279,875.00 **above and beyond** the initial injection of $18,605,871.21, equaling a total impact of **$30,225,746.21**.

Support Activities for Construction Calculations

GDP at Basic Prices ($): [GDP intensity ratio for Construction] x [Gross output]

Economic Multiplier for Support Activities for Mining and Oil and Gas Extraction	0.44
GDP at Basic Prices ($) =	$ 8,186,583.33

This means that the impact of the money injected into the economy as a result of building the Joint Venture road is $8,186,583.33 **above and beyond** the initial injection of $18,605,871.21, equaling a total impact of **$26,792,454.54**.

Therefore, based on our assumptions and on the above calculations, we estimate the overall impact of the ice road on the economy of Yellowknife, Northwest Territories to be between **$26,792,454.54** and **$30,225,746.21**.

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