

MADRID-BOSTON PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

Volume 1 Annex V1-7 Type A Water Licence Applications

Package P4-20

Hope Bay Project Boston Conceptual Closure and
Reclamation Plan, Detailed Cost Estimate



Memo

To: John Roberts, PEng, Vice President Environment
Oliver Curran, MSc, Director Environmental Affairs **Client:** TMAC Resources Inc.

From: Jozsef Miskolczi, MASc, PEng **Project No:** 1CT022.013

Reviewed By: Maritz Rykaart, PhD, PEng **Date:** November 30, 2017

Subject: Hope Bay Project Boston Conceptual Closure and Reclamation Plan, Detailed Cost Estimate

Change Log

The following table provides an overview of material changes to this report from the previous version issued as Volume 8 – Annex 27 as part of the DEIS for Phase 2 of the Hope Bay project dated December 2016.

Changes by Section

Information Request, Technical Comment, or Other Change	Section	Comments
Other	1, Attachment 1	Updated costs to consider additional infrastructure to accommodate gold production at Boston
Camp costs	2.4.4	Updated costs from vendor estimate
Personnel transport to/from camp	2.4.4	By-weekly crew charters were included as separate cost.

1 Introduction

The Hope Bay Project (the Project) is a gold mining and milling undertaking of TMAC Resources Inc. The Project is located 705 km northeast of Yellowknife and 153 km southwest of Cambridge Bay in Nunavut Territory, and is situated east of Bathurst Inlet. The Project comprises of three distinct areas of known mineralization plus extensive exploration potential and targets. The three areas that host mineral resources are Doris, Madrid, and Boston.

The Project consists of two phases: Phase 1 (Doris project), which is currently being carried out under an existing Water Licence, and Phase 2 (Madrid-Boston project) which is in the environmental assessment and regulatory stage. Phase 1 includes mining and infrastructure at Doris, while Phase 2 includes mining and infrastructure at Madrid and Boston located approximately 10 and 60 km due south from Doris, respectively.

This memo provides a detailed description of the costing assumptions and associated closure and reclamation cost for Boston. The memo should be read in conjunction with the Hope Bay Project: Boston Conceptual Closure and Reclamation Plan, November 2017 (CCRP) (SRK 2017).

The cost estimate was developed using an internal SRK spreadsheet model that is consistent with the principles of RECLAIM version 7.0 (Brodie 2014). A summary of the estimated costs (rounded to the nearest thousand) is provided in Table 1, while the detailed backup information is included in Attachment 1.

Table 1: Summary of Closure and Reclamation Costs

Facility Type	Cost (rounded to nearest thousand)
<i>Direct Cost Items</i>	
Stockpiles and Waste Rock Dumps	\$72,000
Fuel Storage Facilities	\$713,000
Buildings and Facilities	\$4,239,000
Water Management	\$20,000
Rock Fill Pads	\$122,000
Roads and Transportation	\$245,000
Underground Workings	\$62,000
Quarry	\$0
Tailings	\$15,267,000
Waste and Landfills	\$465,000
Pipelines	\$26,000
Closure Compliance	\$115,000
Interim Care and Maintenance (ICM)	\$2,278,000
TOTAL DIRECT COSTS	\$23,659,000

<i>Indirect Cost Items</i>	
Contingency	\$4,731,000
Mobilization and Demobilization	\$2,142,000
General and Administration costs	\$2,996,000
Field support	\$889,000
Hydrocarbon decontamination	\$100,000
Post-closure Monitoring	\$970,000
TOTAL INDIRECT COSTS	\$11,828,000
CLOSURE COST - TOTAL	\$35,487,000

2 Cost Estimate Basis

2.1 Third Party Contractor

The cost estimate assumes that all work is carried out by an independent qualified third-party contractor.

2.2 Quantities

Quantity estimates needed as input into the cost estimates were derived using standard engineering calculations, or direct material take-offs from topographic maps, design and as-built drawings, and aerial photographs. Itemized quantity estimates are provided in Attachment 1

2.3 Unit Costs

2.3.1 Equipment Rates

Equipment rates were provided in 2012 by the independent on-site construction contractor (NunaLogistics). These rates were updated to represent 2017 CAD dollars by applying an annual increment of 3%. The rates included ownership, overhead, and profit, but excludes maintenance labor and fuel, which is included separately.

2.3.2 Labour Rates

Labor rates were provided in 2015 by Nuna Logistics and include overhead and profit. The 2015 unit rates were updated to 2017 CAD by applying a 3% annual increment. The labour rates do not include the costs of camp accommodation or travel to and from site, which is included separately.

2.3.3 Material Costs

Estimates of material costs were obtained from the following sources:

- Vendor quotes;
- Costs from third party consultants;
- Cost Mine 2015 (InfoMine 2014), updated to 2017 by applying 3% annual escalation; and
- SRK experience on other projects.

Older material quotes were adjusted to 2017 dollars based on a 3% annual increment. Material costs were factored up by 15% to include freight and shipping to site.

2.3.4 Task Unit Costs

The Task Unit Rate was calculated as the cost per unit quantity based on the labour, equipment and materials required to complete the task. The productivity for each task was obtained from the following sources:

- Equipment specifications obtained from manufacturer's data, in this case the Caterpillar Handbook (CAT 2012);
- "Environmental Remediation Cost Data – Unit Price" 11th Annual Edition, (Martin et al. 2004); and
- SRK experience on other projects.

2.3.5 Relocation Unit Costs

The relocation unit costs consist of the transport of materials from the various reclamation areas to the Boston Landfill or to the Roberts Bay jetty over all-weather roads. Regular haul trucks or 20-foot cargo containers on a trailer were assumed to be used for hauling waste or equipment to Roberts Bay. Costs for loading and unloading the Seacans were calculated as separate line items.

2.4 Indirect Costs

Indirect costs were defined as any costs that cannot be directly associated with individual tasks.

Many of the indirect costs depend on the project duration. The Project duration was estimated as the summation of the durations for the individual tasks based on the calculated crew productivities. Start weeks for individual tasks were determined based on equipment availability and the requirement of capping the camp at a relatively small size (33 person for Doris-Madrid). End week for individual tasks is dependent on the duration of that task. The detailed schedule is provided in Attachment 1.

2.4.1 Contingency

A contingency of 20% of direct costs was added to the estimate.

2.4.2 Interim Care and Maintenance

While the closure activities are assumed to commence immediately after milling is completed, an interim care and maintenance period of 18 months was included for costing purposes. This cost covers maintenance of the water management systems and compliance monitoring. Presence on site is assumed for warm months only (182 days).

2.4.3 Mobilization and Demobilization

The mob-demob costs were included as a lump sum in the cost estimate and are based on the equipment needs and schedule to complete the works as detailed in Attachment 1.

Mobilized equipment was assumed to originate from Edmonton, AB. Equipment is hauled by truck to Hay River, NT, and shipped by barge to Roberts Bay. Marine barging costs were calculated based on the revenue ton for each piece of equipment from 2017 rates published by the Nunavut Government (NT 2017). Revenue tons for barging are calculated as the cubic meter volume or the net weight of the equipment, whichever is larger. Trucking cost of the equipment to Hay River was assumed to be equal to the barging cost.

2.4.4 Camp Costs

Camp costs were included in the cost estimate under the General and Administration Cost headings. Labour benefits were included in the labour unit costs. The maximum number of beds required in camp was determined to be 27 based on the crew sizes to complete the closure and the scheduling of the individual closure tasks (Attachment 1). This includes camp support personnel.

Camp costs for the 27-person camp were scaled up from an estimate for a 16-person winter camp (SRK 2017) and are included as follows:

- Camp mobilization/demobilization and one-time setup cost of \$170,000.
- Camp operations cost of \$668,000 per year, which included camp manager as well as cooking/first aid staff.
- The camp rental of \$405,000 per year.

The cost of groceries was calculated based on the total number of person-days for the closure at an assumed cost of \$110 per person per day. Personnel transportation to and from camp was included as by-weekly charter flights to Yellowknife at a cost of \$10,600 each.

Camp mobilization and demobilization will be done by air from the Boston all-weather airstrip.

2.4.5 Field Support

It was assumed that a supervisor would be on site throughout the Project duration. An allowance for equipment maintenance support was included, with a mechanic assumed to be on-site for 10% of the project duration.

All reclamation areas are assumed to be accessible on all-weather roads, thus no helicopter support was assumed to be required for the closure.

2.4.6 Hydrocarbon Decontamination

An allowance was made for hydrocarbon decontamination including planning and engineering as well as sampling and testing costs. Contaminated soils are disposed of locally in the underground workings.

2.4.7 Post-closure Monitoring

Lump sums were included for each of the various post-closure monitoring items, according to the schedule showing the required frequency and duration. The costs are in undiscounted 2017 CAD.

2.4.8 Cover Replacement Cost

A section addressing the cost of replacing the geosynthetic cover on the Boston dry-stack was included. This is a separate item from the actual cost estimate, as it will have to be assessed in terms of net present value (NPV) over a timeframe which falls well outside of the post-closure period. The total cost of geosynthetic cover replacement is \$19.2 millions in undiscounted 2017 Canadian Dollars. The cost includes the direct construction costs, as well as the full suite of associated indirect costs.

2.5 Compatibility with RECLAIM 7.0

The Canadian Government liability estimate is required by Indigenous and Northern Affairs Canada (INAC). INAC requires that a spreadsheet model (RECLAIM 7.0) be used to estimate closure costs.

The RECLAIM model is a spreadsheet model originally developed by SRK in 1992, and subsequently modified and updated by Brodie Consulting (Brodie 2014). The model has pre-set sheets that can be expanded to describe a specific project. The model template includes a default list of unit costs for most tasks and materials used in closure work. Typical low and high equipment and labor unit rates are suggested, but the user is encouraged to apply known unit rates instead of the default rates wherever possible. Some indirect costs are estimated as user-specified percentage of direct costs (Engineering and Project Management). Mobilization/Demobilization costs are calculated based on unit rates.

The cost estimate was structured in a similar fashion to the RECLAIM structure, with the facilities being grouped into functional categories, as follows:

- Stockpile Stockpiles and Waste Rock Dumps,
- Fuel Storage Facilities,
- Buildings and Facilities,
- Water Management,
- Rock Fill Pads,
- Transportation,
- Underground Workings,
- Quarry,
- Tailings,
- Waste and Landfills,
- Pipelines, and

- Interim Care and Maintenance.

The methods used by SRK and RECLAIM to estimate costs are similar. Both models are based on the same facilities, use the same quantities, unit rates and indirect costs. The methods differ by how this information is organized within the spreadsheets. The cost information is summarized similarly. Because of this, the SRK cost estimate is at minimum an adequate alternative to RECLAIM.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

3 References

Brodie Consulting Ltd. (2014). RECLAIM Version 7.0 User Manual. MS Excel Workbook and User Manual prepared for Aboriginal Affairs and Northern Development Canada – Water Resources Division. March 2014.

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Attachment 1 – Cost Estimate Sheets

Work Area Code	Item	Task	Sub-task	Facility Name	Task	Quantity	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
DIRECT COSTS													
Stockpiles and Waste Rock Dumps													
BM_001	9	1	1 Boston Ore Stockpile		no closure activities are required, regrading addressed under BM_036							\$ 71,969.35	
BM_024	9	24	1 Boston Waste Rock Pile		grade for positive drainage	40778.0	40778.0 m ²		C.5.05	\$ 1.23	\$ 50,048.88		
BM_026	9	26	1 Boston Overburden Pile		grade for positive drainage	17860.0	17860.0 m ²		C.5.05	\$ 1.23	\$ 21,920.47		
BM_040	9	40	1 Boston Old Camp Ore Stockpile		grade for positive drainage	0.0	0.0 m ²		C.5.05	\$ 1.23	\$ -		facility reclaimed as part of Phase 2 construction
Fuel Storage Facilities													
BM_010	9	10	1 Boston Fuel Facility		drain residual fuel	75000.0	75000.0 L		C.2.03	\$ 0.02	\$ 1,703.80		
	9	10	2		consolidate fuel in barge at Robert Bay	75000.0	75000.0 L		C.4.73	\$ 0.02	\$ 1,731.66		
	9	10	3		decommission fuel transfer facilities	6.0	6.0 each		C.1.02	\$ 476.06	\$ 2,856.37		
	9	10	4		wash tanks	6.0	6.0 each		C.2.04	\$ 1,186.71	\$ 7,120.26		
	9	10	5		operate oil/water separator	3.9	3.9 m ³		C.2.08	\$ 32.80	\$ 129.09		
	9	10	6		disconnect piping and controls	6.0	6.0 each		C.1.02	\$ 476.06	\$ 2,856.37		
	9	10	7		dismantle tanks and cut into manageable pieces	6.0	6.0 each		X.22	\$ 74,211.74	\$ 445,270.46		
	9	10	8		prepare pieces for transportation - load into container	23.7	23.7 m ³		C.4.01	\$ 10.23	\$ 242.75		
	9	10	9		haul cut metal Boston landfill laydown	23.7	23.7 m ³		C.4.48	\$ 4.73	\$ 112.37		
	9	10	10		excavate and stockpile liner protection cover	5287.2	5287.2 m ³		C.5.04	\$ 2.75	\$ 14,532.90		
	9	10	11		load contained contaminated soils into megabags for hauling	2643.6	2643.6 m ³		C.4.12	\$ 72.73	\$ 192,271.60		assume 50% of liner protection cover is contaminated
	9	10	12		haul megabags to Boston underground	2643.6	2643.6 m ³		C.5.22	\$ 15.37	\$ 40,624.20		
	9	10	13		clean liner	4406.0	4406.0 m ²		C.2.10	\$ 0.41	\$ 1,815.50		
	9	10	14		remove and cut liner into manageable pieces	4406.0	4406.0 m ²		C.3.02	\$ 0.17	\$ 750.69		
	9	10	15		load waste into containers	63.4	63.4 m ³		C.4.01	\$ 10.23	\$ 648.33		
	9	10	16		haul containers to Boston landfill	63.4	63.4 m ³		C.4.44	\$ 3.26	\$ 206.64		
Buildings and Facilities													
BM_002	9	2	1 Boston Process Plant		decommission crusher, milling, and process plants	1.0	1.0 each		X.09	\$ 100,000.00	\$ 100,000.00		
	9	2	2		Drain chemicals and reagents into containers for shipping off site	4.2	4.2 m ³		C.2.01	\$ 2,699.56	\$ 11,230.16		
	9	2	3		disassemble equipment	1.0	1.0 each		X.10	\$ 200,000.00	\$ 200,000.00		
	9	2	4		prepare equipment for shipping off-site	1.0	1.0 each		X.11	\$ 50,000.00	\$ 50,000.00		
	9	2	5		demolish / dismantle mill building	198800.0	198800.0 m ³		C.3.05a	\$ 13.32	\$ 2,647,993.55		
	9	2	6		Collect Debris	14000.0	14000.0 m ²		C.3.10	\$ 0.37	\$ 5,249.14		
	9	2	7		load waste for transport to Landfill	8344.8	8344.8 m ³		C.4.01	\$ 10.23	\$ 85,349.92		
	9	2	8		Haul debris to landfill	8344.8	8344.8 m ³		C.4.14	\$ 4.70	\$ 39,218.03		
	9	2	9		transport drums to Roberts Bay	4.2	4.2 m ³		C.4.04	\$ 2.30	\$ 9.56		
BM_003	9	3	1 Boston Power Plant		decommission (electrical)	4.0	4.0 each		C.1.06	\$ 784.27	\$ 3,137.10		
	9	3	2		demolish building	3125.0	3125.0 m ³		C.3.05a	\$ 13.32	\$ 41,624.65		
	9	3	3		dismantle stacks	40.0	40.0 m		C.3.13	\$ 136.30	\$ 5,452.16		
	9	3	4		prep stacks for shipping	40.0	40.0 m		C.3.12	\$ 627.24	\$ 25,089.76		
	9	3	5		haul stack sections to Boston landfill	166.0	166.0 m ³		C.4.44	\$ 3.26	\$ 541.14		
	9	3	6		collect all debris	1250.0	1250.0 m ²		C.3.10	\$ 0.37	\$ 468.67		
	9	3	7		load waste into containers	3150.8	3150.8 m ³		C.4.01	\$ 10.23	\$ 32,225.61		
	9	3	8		haul containers to Boston landfill	3150.8	3150.8 m ³		C.4.44	\$ 3.26	\$ 10,271.12		
BM_004	9	4	1 Boston Warehouse		demolish tent structure	300.0	300.0 m ³		C.3.05	\$ 13.12	\$ 3,936.20		
	9	4	2		dismantle wood flooring, shelving, and lofts	9.0	9.0 m ³		C.3.05	\$ 13.12	\$ 118.09		
	9	4	3		collect debris	60.0	60.0 m ²		C.3.10	\$ 0.37	\$ 22.50		
	9	4	4		load debris into containers for transport	18.1	18.1 m ³		C.4.01	\$ 10.23	\$ 185.53		
	9	4	5		haul debris to Boston landfill	18.1	18.1 m ³		C.4.44	\$ 3.26	\$ 59.13		
BM_005	9	5	1 Boston Mill Office		decommission (electrical, mechanical, plumbing)	2.0	2.0 each		C.1.05	\$ 679.52	\$ 1,359.03		
	9	5	2		demolish trailers	90.0	90.0 m ³		C.3.05	\$ 13.12	\$ 1,180.86		
	9	5	3		collect all debris	36.0	36.0 m ²		C.3.10	\$ 0.37	\$ 13.50		
	9	5	4		load waste into containers	59.7	59.7 m ³		C.4.01	\$ 10.23	\$ 610.48		
	9	5	5		haul containers to Boston landfill	59.7	59.7 m ³		C.4.44	\$ 3.26	\$ 194.58		
BM_006	9	6	1 Boston Mine Office		decommission (electrical, mechanical, plumbing)	2.0	2.0 each		C.1.05	\$ 679.52	\$ 1,359.03		
	9	6	2		demolish trailer	90.0	90.0 m ³		C.3.05	\$ 13.12	\$ 1,180.86		
	9	6	3		demolish cribbing, stairs, entryways, etc.	18.0	18.0 m ³		C.3.05	\$ 13.12	\$ 236.17		
	9	6	4		collect all debris	36.0	36.0 m ²		C.3.10	\$ 0.37	\$ 13.50		
	9	6	5		load waste into containers	59.7	59.7 m ³		C.4.01	\$ 10.23	\$ 610.48		
	9	6	6		haul containers to Boston landfill	59.7	59.7 m ³		C.4.44	\$ 3.26	\$ 194.58		
BM_007	9	7	1 Boston Exploration Office		decommission (electrical, mechanical, plumbing)	2.0	2.0 each		C.1.05	\$ 679.52	\$ 1,359.03		
	9	7	2		demolish trailer	90.0	90.0 m ³		C.3.05	\$ 13.12	\$ 1,180.86		
	9	7	3		demolish cribbing, stairs, entryways, etc.	18.0	18.0 m ³		C.3.05	\$ 13.12	\$ 236.17		
	9	7	4		collect all debris	36.0	36.0 m ²		C.3.10	\$ 0.37	\$ 13.50		
	9	7	5		load waste into containers	59.7	59.7 m ³		C.4.01	\$ 10.23	\$ 610.48		
	9	7	6		haul containers to Boston landfill	59.7	59.7 m ³		C.4.44	\$ 3.26	\$ 194.58		
BM_008													

Work Area Code	Item	Task	Sub-task	Facility Name	Task	Quantity	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
	9	16	5		haul debris to Boston landfill	7.6	7.6 m3		C.4.44	\$ 3.26	\$ 24.66		
BM_017	9	17	1	1 Boston Fire Water Tank	decommission and disconnect electrical and plumbing	2.0	2.0 each		C.1.03	\$ 1,327.71	\$ 2,655.41		
	9	17	2		demolish structure	74.4	74.4 m3		C.3.05	\$ 13.12	\$ 976.44		
	9	17	3		remove tank insulation	1.0	1.0 each		C.3.15	\$ 746.46	\$ 746.46		
	9	17	4		dismantle tanks and cut into manageable pieces	1.0	1.0 each		X.22	\$ 74,211.74	\$ 74,211.74		
	9	17	5		prepare pieces for transportation	2.2	2.2 m3		C.4.01	\$ 10.23	\$ 22.55		
	9	17	6		haul cut metal to Boston landfill	2.2	2.2 m3		C.4.44	\$ 3.26	\$ 7.19		
	9	17	7		collect debris	73.1	73.1 m2		C.3.10	\$ 0.37	\$ 27.42		
	9	17	8		load debris into containers for transport	37.1	37.1 m3		C.4.01	\$ 10.23	\$ 378.98		
	9	17	9		haul debris to Boston landfill	37.1	37.1 m3		C.4.44	\$ 3.26	\$ 120.79		
BM_018	9	18	1	1 Boston Accommodation Camp Buildings	decommission (electrical, mechanical, plumbing)	300.0	300.0 each		C.1.05	\$ 679.52	\$ 203,854.80		
	9	18	2		demolish accommodation trailers	13640.0	13640.0 m3		C.3.05	\$ 13.12	\$ 178,966.11		
	9	18	3		demolish cribbing, stairs, entryways, etc.	202.5	202.5 m3		C.3.05	\$ 13.12	\$ 2,656.94		
	9	18	4		demolish arctic corridor	1000.0	1000.0 m3		C.3.05	\$ 13.12	\$ 13,120.68		
	9	18	5		collect all debris	4140.0	4140.0 m2		C.3.10	\$ 0.37	\$ 1,552.25		
	9	18	6		load waste into containers	2329.7	2329.7 m3		C.4.01	\$ 10.23	\$ 238,614.64		
	9	18	7		haul containers to Boston landfill	2329.7	2329.7 m3		C.4.44	\$ 3.26	\$ 76,052.51		
BM_020	9	20	1	1 Boston Core Shack	decommission (electrical, heating)	2.0	2.0 each		C.1.05	\$ 679.52	\$ 1,359.03		
	9	20	2		demolish tent structure	781.3	781.3 m3		C.3.05	\$ 13.12	\$ 10,250.53		
	9	20	3		dismantle wood flooring, shelving, and lofts	390.6	390.6 m3		C.3.05	\$ 13.12	\$ 5,125.27		
	9	20	4		collect debris	312.5	312.5 m2		C.3.10	\$ 0.37	\$ 117.17		
	9	20	5		load debris into containers for transport	113.6	113.6 m3		C.4.01	\$ 10.23	\$ 1,161.51		
	9	20	6		haul debris to Boston landfill	113.6	113.6 m3		C.4.44	\$ 3.26	\$ 370.20		
BM_035	9	35	1	1 Boston Airstrip Lighting	remove ground lighting fixtures (airstrip lighting, approach lights)	70.0	70.0 each		C.1.10	\$ 42.47	\$ 2,972.88		
	9	35	2		remove floating lighting fixtures (airstrip lighting, approach lights)	10.0	10.0 each		C.1.12	\$ 68.15	\$ 681.52		
Water Management												\$ 19,567.82	
CM_001	17	1	1	1 Closure - Drain Reclaim Pond									
	17	1	2										
	17	1	3										
	17	1	4										
	17	1	5										
BM_021	9	21	1	1 Boston Contact Water Pond #2	disconnect piping and electrical wiring, remove sump pumps	4.0	4.0 each		C.1.05	\$ 679.52	\$ 2,718.06		
	9	21	2		load waste into containers	1.6	1.6 m3		C.4.01	\$ 10.23	\$ 16.57		
	9	21	3		haul containers to Boston landfill	1.6	1.6 m3		C.4.44	\$ 3.26	\$ 5.28		
	9	21	4		breach contact water containment berm	648.0	648.0 m3		C.5.05	\$ 1.23	\$ 795.32		
	9	21	5		remove and cut liner from breach into manageable pieces	90.0	90.0 m2		C.3.02	\$ 0.17	\$ 15.33		
BM_025	9	25	1	1 Boston Contact Water Pond #1	disconnect piping and electrical wiring, remove sump pumps	4.0	4.0 each		C.1.05	\$ 679.52	\$ 2,718.06		
	9	25	2		load waste into containers	1.2	1.2 m3		C.4.01	\$ 10.23	\$ 12.27		
	9	25	3		haul containers to Boston landfill	1.2	1.2 m3		C.4.44	\$ 3.26	\$ 3.91		
	9	25	4		breach contact water containment berm	648.0	648.0 m3		C.5.05	\$ 1.23	\$ 795.32		
	9	25	5		remove and cut liner from breach into manageable pieces	66.6	66.6 m2		C.3.02	\$ 0.17	\$ 11.35		
BM_027	9	27	1	1 Boston Overburden Pile Sedimentation Pond	disconnect piping and electrical wiring, remove sump pumps	4.0	4.0 each		C.1.05	\$ 679.52	\$ 2,718.06		
	9	27	2		load waste into containers off-site	1.2	1.2 m3		C.4.01	\$ 10.23	\$ 12.27		
	9	27	3		haul containers to Boston landfill	1.2	1.2 m3		C.4.44	\$ 3.26	\$ 3.91		
	9	27	4		breach contact water containment berm	648.0	648.0 m3		C.5.05	\$ 1.23	\$ 795.32		
	9	27	5		remove and cut liner from breach into manageable pieces	66.6	66.6 m2		C.3.02	\$ 0.17	\$ 11.35		
BM_032	9	32	1	1 Boston TMA Contact Water Pond Berms	disconnect piping and electrical wiring, remove sump pumps	6.0	6.0 each		C.1.05	\$ 679.52	\$ 4,077.10		
	9	32	3		remove and cut liner from breach into manageable pieces	270.0	270.0 m2		C.3.02	\$ 0.17	\$ 46.00		
	9	32	4		load waste into containers for hauling to landfill	179.9	179.9 m3		C.4.01	\$ 10.23	\$ 1,839.92		
	9	32	5		haul containers to Boston landfill	179.9	179.9 m3		C.4.44	\$ 3.26	\$ 586.43		
	9	32	2		breach contact water containment berm	1944.0	1944.0 m3		C.5.05	\$ 1.23	\$ 2,385.97		
Rock Fill Pads												\$ 121,930.78	
BM_014	18	3	2		haul containers to Madrid North Underground	243.6	243.6 m3		C.4.14	\$ 4.70	\$ 1,144.85		
	9	14	1	1 Boston Laydown Area	decommission vehicle plug system	10.0	10.0 each		C.1.05	\$ 679.52	\$ 6,795.16		
	9	14	2		remove cables and posts	10.0	10.0 each		C.3.14	\$ 411.17	\$ 4,111.74		
	9	14	3		collect all debris	9300.0	9300.0 m2		C.3.10	\$ 0.37	\$ 3,486.93		
	9	14	4		load waste into containers	5.6	5.6 m3		C.4.01	\$ 10.23	\$ 57.07		
	9	14	5		haul debris to Boston landfill	5.6	5.6 m3		C.4.44	\$ 3.26	\$ 18.19		
BM_013	9	13	1	1 Boston Land Farm	excavate and stockpile liner protection cover	2280.0	2280.0 m3		C.5.04	\$ 2.75	\$ 6,267.02		
	9	13	2		load contained contaminated soils into megabags for shipping off-site	1140.0	1140.0 m3		C.4.12	\$ 72.73	\$ 82,913.31		
	9	13	3		haul megabags to Boston underground	1140.0	1140.0 m3		C.4.44	\$ 3.26	\$ 3,716.28		
	9	13	4		clean liner	3800.0	3800.0 m2		C.2.10	\$ 0.41	\$ 1,565.80		
	9	13	5		remove and cut liner into manageable pieces	3800.0	3800.0 m2		C.3.02	\$ 0.17	\$ 647.44		
	9	13	6		load waste into containers	36.5	36.5 m3		C.4.01	\$ 10.23	\$ 373.11		
	9	13	7		haul containers to Boston landfill	36.5	36.5 m3		C.4.44	\$ 3.26	\$ 118.92		
BM_019	9	19	1	1 Boston Core Storage Pad	band together corr boxes	500.0	500.0 each		C.6.02	\$ 11.36	\$ 5,679.34		
	9	19	2		collect all debris	10000.0	10000.0 m2		C.3.10	\$ 0.37	\$ 3,749.38		
	9	19	3		load waste into containers	6.0	6.0 m3		C.4.01	\$ 10.23</			

Work Area Code	Item	Task	Sub-task	Facility Name	Task	Quantity	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
	9	34	6		collect all debris	6000.0	6000.0	m2	C.3.10	\$ 0.37	\$ 2,249.63		
	9	34	7		load waste into containers	26.0	26.0	m3	C.4.01	\$ 10.23	\$ 265.76		
	9	34	8		haul containers to Boston landfill	26.0	26.0	m3	C.4.43	\$ 3.26	\$ 84.71		
BM_037	9	37	1	1 Boston Airstrip Access Road	crown road for positive drainage	1.0	1.0	km	C.5.17	\$ 866.22	\$ 887.01		
BM_039	9	39	1	1 Boston Landfill Access Road	crown road for positive drainage	1.3	1.3	km	C.5.17	\$ 866.22	\$ 1,092.30		
BM_045	9	45	1	1 Boston Water Intake Access Road	crown road for positive drainage	0.2	0.2	km	C.5.17	\$ 866.22	\$ 213.09		
Underground Workings												\$ 62,427.49	
BM_028	9	28	1	1 Boston Vent Raise	remove ducts, pipes, and cables	100.0	100.0	lm	C.3.16	\$ 119.02	\$ 11,901.55		
	9	28	2		construct a concrete cap (0.5 m thick reinforced concrete) to seal the top	1.0	1.0	each	C.6.03	\$ 14,292.68	\$ 14,292.68		
	9	28	3		decommission and dismantle all ventilation and heating facilities	4.0	4.0	each	C.1.05	\$ 679.52	\$ 2,718.06		
	9	28	4		prepare units for shipping	1.0	1.0	each	C.1.08	\$ 1,368.94	\$ 1,368.94		
	9	28	5		haul units to Boston landfill	37.2	37.2	m3	C.4.44	\$ 3.26	\$ 121.30		
	9	28	6		regrade pads for positive drainage	2270.0	2270.0	m2	C.5.05	\$ 1.23	\$ 2,786.08		
BM_033	9	33	1	1 Boston Portal and Underground Works	remove ducts, pipes, electrical cables	100.0	100.0	lm	C.3.16	\$ 119.02	\$ 11,901.55		
	9	33	2		construct portal plug	706.8	706.8	m3	C.5.03	\$ 24.53	\$ 17,337.32		
Tailings												\$ 15,266,954.47	
BM_031	9	31	1	1 Boston TMA Tailings	regrade top surface for positive drainage	72900.0	72900.0	m2	C.5.05	\$ 1.23	\$ 89,473.82		
	9	31	2		cover entire dump with hdpe liner,	202826.0	202826.0	m2	C.5.01	\$ 33.85	\$ 6,864,661.28		
	9	31	3		Produce ROQ (quarry drill&blast)	202826.0	202826.0	m3	C.5.24	\$ 23.16	\$ 4,697,501.00		
	9	31	4		Produce Crush	60847.8	60847.8	m3	C.5.27	\$ 4.91	\$ 298,529.54		
	9	31	5		place 1 m thick liner protection layer of crushed rock & ROQ	202826.0	202826.0	m2	C.5.02	\$ 16.35	\$ 3,316,788.83		
Waste and Landfills												\$ 464,672.36	
BM_038	9	38	1	1 Boston Landfill	empty seacan of debris, place and track pack (all site waste to Boston landfill)	1129.5	1129.5	each	C.4.02	\$ 86.72	\$ 97,954.15		
	9	38	2		regrade top surface for positive drainage	27040.0	27040.0	m2	C.5.05	\$ 1.23	\$ 33,187.54		
	9	38	3		Produce ROQ (quarry drill&blast)	8112.0	8112.0	m3	C.5.09	\$ 24.76	\$ 200,876.11		
	9	38	4		place 0.3 m crushed gravel + 0.7 m ROQ liner protection layer	8112.0	8112.0	m3	C.5.02	\$ 16.35	\$ 132,654.55		
Pipelines												\$ 25,529.77	
BM_043	9	43	1	1 Boston Water Discharge Line	flush pipeline prior to decommissioning	1.0	1.0	Each	C.2.06	\$ 677.68	\$ 677.68		
	9	43	2		cut pipelines into manageable pieces and place in containers for hauling to landfill	2000.0	2000.0	m	C.3.03	\$ 11.08	\$ 22,168.89		
	9	43	3		remove electrical cables and controllers	2.0	2.0	each	C.1.05	\$ 679.52	\$ 1,359.03		
	9	43	4		load debris into containers for hauling to landfill	98.2	98.2	m3	C.4.01	\$ 10.23	\$ 1,004.12		
	9	43	5		haul containers to Boston landfill	98.2	98.2	m3	C.4.44	\$ 3.26	\$ 320.04		
DO NOT MODIFY THIS ROW													
Closure Monitoring												\$ 149,500.00	
CM_002	24	1	1	1 Closure Compliance	Annual Geotechnical Inspection	1	1	each	LS	\$ 35,000.00	\$ 45,500.00		
	24	1	2		Water Sampling and Testing	1	1	each	LS	\$ 60,000.00	\$ 78,000.00		
	24	1	3		Regulatory Costs	1	1	each	LS	\$ 20,000.00	\$ 26,000.00		
Interim Care and Maintenance												\$ 2,277,527.38	
ICM_001	23	1	1	1 Interim Care and Maintenance - Annual ICM	water management and camp care and maintenance	1.5	1.5	year	LS	\$ 1,439,927.58	\$ 2,159,891.38		
	23	1	2		compliance monitoring	1.5	1.5	year	LS	\$ -	\$ -		
	23	1	3		mob/demob ICM fleet	1.0	1.0	-	LS	\$ 117,636.00	\$ 117,636.00		
Total Direct Costs												\$ 23,656,808.62	
Contingency												\$ 4,731,361.72	
Contingency					20% of direct costs				x	\$ 23,656,808.62	\$ 4,731,361.72		
Mobilization & Demobilization												\$ 2,142,246.33	
-					Mobilization - all work areas	1	1	each	LS	\$ 1,071,123.17	\$ 1,071,123.17		
					Demobilization - all work areas	1	1	each	LS	\$ 1,071,123.17	\$ 1,071,123.17		equipment on site for 2 years while all closure completed
General and Administration costs												\$ 2,995,863.42	
-					Camp Management & Operations	1.3	1.3	yr	OC.11	\$ 668,250.00	\$ 868,725.00		
-					Camp Mobilization/Demobilization	1	1	LS	OC.12	\$ 170,437.50	\$ 170,437.50		includes cook, first aid, housekeeping, manager
					Crew charters (by-weekly)	34	34	each	OC.05	\$ 10,617.57	\$ 360,997.40		includes mob/demob + one-time setup cost
					Groceries	9,720	9,720	person-day	OC.13	\$ 110.00	\$ 1,068,203.52		
					Camp Rental	1.3	1.3	yr	OC.10	\$ 405,000.00	\$ 526,500.00		
Field support												\$ 888,858.83	
-					Supervision	476.00	476.00	days	x	\$ 1,750.63	\$ 833,297.51		
					Equipment maintenance support - Mechanic	48.00	48.00	days	x	\$ 1,157.53	\$ 55,561.32		
					Helicopter Support	0	0	hours	E.08	\$ 2,367.39	\$ -		
Hydrocarbon decontamination												\$ 100,000.00	
-					Confirmatory Sampling and Analysis	1	1	LS		\$ 100,000.00	\$ 100,000.00		Minimum cost \$25,000 maximum cost \$100,000, each work area = \$20,000
Post-closure Monitoring												\$ 970,000.00	
					Annual geotechnical inspection	5	5	LS		\$ 35,000.00	\$ 175,000.00		
					Cover monitoring	5	5	LS		\$ 35,000.00	\$ 175,000.00		
					Regulatory costs	10	10	LS		\$ 20,000.00	\$ 200,000.00		
					Water sampling and testing	7	7	LS		\$ 60,000.00	\$ 420,000.00		
Total Indirect Costs												\$ 11,828,330.30	
Total Closure and Reclamation Cost												\$ 35,485,138.92	

Mobilization

No. of units (from schedule)	Manual Override	Equipment already on site from ICM	Final No. Units	Description	Units	Quantity	Unit cost	Task cost	Notes
All Project Areas				Construction equipment					
0			0	Helicopter	ea	1.0	\$ 10,000.00	\$	Flight from Yellowknife
3			3	Dozer - CAT D8	m ²	38.9	\$ 470.00	\$ 54,905.40	From Hay River to Roberts Bay; NT Marine Rates 2017
5		1	4	Excavator - Cat 330	m ³	36.7	\$ 470.00	\$ 68,948.17	From Hay River to Roberts Bay; NT Marine Rates 2017
2		1	1	Loader - CAT 980	m ³	46.4	\$ 470.00	\$ 21,813.86	From Hay River to Roberts Bay; NT Marine Rates 2017
2			2	Motor grader CAT 14H	m ³	28.5	\$ 470.00	\$ 26,798.00	From Hay River to Roberts Bay; NT Marine Rates 2017
1			1	Skidder CAT 242	m ³	5.6	\$ 470.00	\$ 2,735.22	From Hay River to Roberts Bay; NT Marine Rates 2017
4	4	1	3	Truck - CAT 740	m ³	69.3	\$ 470.00	\$ 97,713.00	From Hay River to Roberts Bay; NT Marine Rates 2017
4	4		4	Tractor Trailer	m ³	1.0	\$ 14,216.00	\$ 56,864.00	From Hay River to Roberts Bay; NT Marine Rates 2017
4	4		4	Flatbed truck (5 tonne)	ea	1.0	\$ 5,358.00	\$ 21,432.00	From Hay River to Roberts Bay; NT Marine Rates 2017
6			6	Drill	m ³	25.9	\$ 470.00	\$ 73,094.40	From Hay River to Roberts Bay; NT Marine Rates 2017
1	1		1	Drum crusher	kg	0.2	\$ 470.00	\$ 70.50	From Hay River to Roberts Bay; NT Marine Rates 2017
2			2	Power washer	kg	0.1	\$ 470.00	\$ 94.00	From Hay River to Roberts Bay; NT Marine Rates 2017
2			2	Welding Equipment	kg	0.3	\$ 470.00	\$ 235.00	From Hay River to Roberts Bay; NT Marine Rates 2017
1			1	Crane	m ³	28.4	\$ 470.00	\$ 13,360.03	From Hay River to Roberts Bay; NT Marine Rates 2017
5		1	4	Pickup trucks - F150	ea	1.0	\$ 3,925.00	\$ 15,700.00	From Hay River to Roberts Bay; NT Marine Rates 2017
28		2	26	20 ft containers	ea	1.0	\$ 6,896.00	\$ 179,296.00	tires, spare parts, and lubricants; from Hay River to Roberts Bay; NT Marine Rates 2017
37			37	Highway Trailers Hauling	LS	1.0	\$ 438,063.58	\$ 438,063.58	double up the barging cost, as per INAC& TMAC agreed upon cost
Subtotal Mobilisation								\$ 1,071,123	
Subtotal Demobilisation								\$ 1,071,123	Assumes same cost as mobilisation
Total								\$ 2,142,246	

Task	Unit	Quantity	Tonnage	Unit Cost	Activity Total	Subtotals	Notes
INTERIM CARE & MAINTENANCE						\$ 1,202,507	
on-site caretaker person-months	person-months	6		\$35,674	\$214,043		on-site caretaker in the summer months only
extra personnel	person-months						extra personnel
-electrician	person-months	3		\$36,622	\$109,865		half the time, for opening and closing the camp + maintenance
-mechanic	person-months	3		\$34,726	\$104,177		half the time, for opening and closing the camp + maintenance
annual fuel	litre	22500		\$1.05	\$23,625		annual fuel
misc. supplies	allow	6		\$1,500	\$9,000		misc. supplies
pick-up truck	month	12	2	\$3,999	\$95,986.72		one pickup for each crew - Doris and Madrid
small dozer	month	12		\$36,215	\$217,287.39		yearly stand-by rate at 50% of active rate
small excavator	month	12		\$10,000	\$120,000		small excavator
snow machine	month	0		\$7,103	\$0		summer caretaker only
articulated dump truck	month	12		\$10,000	\$120,000		articulated dump truck
communications	month	6		\$2,500	\$15,000		communications
mobile camp rental	allow	0		\$80,000	\$0		existing Doris camp will be used as it transitions to C&M
camp operations (up to 10 persons)	month	6		\$5,260	\$31,563		includes manager and cook/first aid
groceries	person/month	182	6	\$130	\$141,960.00		based on 6 person average occupancy
flights (Yellowknife - cambridge bay - Dc	each	26		\$11,209	\$291,445		two person-crews shift change monthly commercial flight to Cambridge Bay + 1 hr helicopter charter
COMPLIANCE MONITORING AND REPORTING						\$ 95,000	
SNP/AEMP water sampling & reporting	each	1		\$60,000	\$60,000		SNP/AEMP water sampling & reporting
geotechnical assessment	each	1		\$35,000	\$35,000		geotechnical assessment
WATER MANAGEMENT						\$ 237,421	
Operate / maintain pumping system							
technician (camp support incl under							
Mob)	days	182		\$1,189	\$216,421		manage contact water ponds
site support, consumables	month	6		\$3,500	\$21,000		site support, consumables
Annual Interim C&M Cost						\$ 1,534,927.58	
EQUIPMENT MOBILIZATION						\$ 117,636.00	
Number of ICM crews required:		1					Based on number of areas requiring reclamation, linked to schedule
Excavators							
mobilize	1	20	\$	470.00	\$ 9,400.00		Edmonton to Hay River (1 x 36.1 tonnes)
demobilize	1	20	\$	470.00	\$ 9,400.00		Hay River to Roberts Bay (1 x 36.1 tonnes)
Dump trucks							
mobilize	1	34.4	\$	470.00	\$ 16,168.00		Edmonton to Hay River (1 x 34.4 tonnes)
demobilize	1	34.4	\$	470.00	\$ 16,168.00		Hay River to Roberts Bay (1 x 34.4 tonnes)
Loaders							
mobilize	1	30	\$	470.00	\$ 14,100.00		Edmonton to Hay River (1 x 30 tonnes)
demobilize	1	30	\$	470.00	\$ 14,100.00		Hay River to Roberts Bay (1 x 30 tonnes)
Light duty vehicles							
mobilize	1	-	\$	5,358.00	\$ 5,358.00		Edmonton to Hay River
demobilize	1	-	\$	5,358.00	\$ 5,358.00		Hay River to Roberts Bay
Standard 20' containers							
mobilize	2	-	\$	6,896.00	\$ 13,792.00		Edmonton to Hay River
demobilize	2	-	\$	6,896.00	\$ 13,792.00		Hay River to Roberts Bay
Mob/Demob cost for ICM						\$ 117,636.00	

Item_Task	Duration (weeks)	Crew Size	Start Week	End Week
Boston TMA Produce ROQ	26	10.0	1.0	26.0
Boston TMA Produce crush	25	2.0	3.0	27.0
Boston TMA Construct Cover	33	3.0	6.0	38.0
Boston Landfill Produce ROQ	4	4.0	28.0	31.0
Boston camp and mill facilities Decommission	26	4.0	1.0	26.0
Boston camp and mill facilities Decontamination	1	4.0	27.0	27.0
Boston camp and mill facilities Demolition	29	10.0	27.0	55.0
Boston camp and mill facilities Earthworks	6	3.0	56.0	61.0
Boston camp and mill facilities Misc.	9	6.0	56.0	64.0
Boston camp and mill facilities Vent Raise Seal	1	4.5	62.0	62.0
Boston Fuel Storage Decommission	1	3.0	56.0	56.0
Boston Fuel Storage Decontamination	2	3.0	57.0	58.0
Boston Fuel Storage Demolition	1	3.0	59.0	59.0
Boston Fuel Storage Earthworks	3	2.0	54.0	56.0
Boston Fuel Storage Misc.	12	3.0	57.0	68.0
Boston Pads Collect Debris	1	4.0	52.0	52.0
Boston Pads Earthworks	5	1.0	54.0	58.0
Boston Water Management Structures Demolition	1	3.0	54.0	54.0
Boston Water Management Structures Earthworks	1	1.0	55.0	55.0
Construct Boston Landfill Cover Construct Cover	3	3.0	56.0	58.0
Construct Boston Landfill Cover Produce ROQ	4	4.0	59.0	62.0