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File: 3BM-CAP0207

Briefing Note – 070126 Stand Alone Final Engineered Design for Water Licence Application of the Hamlet of Cape Dorset
Author – Zhong Liu
Date – Mar. 19, 2007

Documents Reviewed

Date	DCL/AMEC	NWB/BGC/AE
Dec. 21, 2006	Water Licence Design Report (DCL061221)	
Nov. 1, 2006	Geotechnical Investigation (Drilling Program) (AMEC061101)	
Oct. 5,2006		Technical Meeting Notes (BGC061005, internal)
Sept. 12,2006	Examination of Drawings (AMEC 060912)	
Sept. 7, 2006	Design Drawings (Drawing #111 – berm section views dated Sept. 7, 2006, others dated Oct. 28,2005) (DCL 060907) The above are the new sub mission by GN/CGS in 2007	
Aug. 9, 2006		Response to DCL060714 (BGC060809, internal)
Aug. 4, 2006		Update and First Notice of Technical Meeting (NWB060804)
Jul. 14, 2006	Response to NWB060621 (DCL060714)	
Jun. 21, 2006		Meeting Discussion and NWB Technical Concerns (NWB060621)
Jun. 2, 2006	Response to Interveners' Comments (DCL060602)	
Oct. 13, 2005	Geotechnical Investigation (Geotechnical Analysis) (AMEC051013)	

July 05

Feb 06 – Revised App.
July 05

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Technical Summary

GN/CGS submitted the revised water licence application for P Lake Sewage Lagoon, Cape Dorset on Jan. 26, 2007. DCL changed the liner configuration inside the berm from vertical liner option to upstream slope option (DCL060907). AMEC conducted a field drilling program in Sept. 2006, and claimed that *"the soil and permafrost conditions at the lagoon site are in a close agreement with the assumed subsurface conditions described in the AMEC geotechnical report. Based on this, AMEC considers that the results of the geothermal modeling provide reliable data on the temperature regime of the berm and the berm subgrade. The recommended depth of the cut-off trench, based on the berm subgrade temperature, both in the AMEC geotechnical report and DCL design specifications also can be considered sufficient to eliminate unlikely seepage under the berm."* (AMEC061101)

Points of Interest

The design report (DCL061221) scaled the body text down from 44 pages to 25 pages. The description about the treatment performance of P Lake and the wetland was removed from the report. DCL stepped back from the potential CWS/MWWE criteria (50/50 for the far north) to current water licence discharge criteria (100/120 of Northwest Territories 1992 municipal guidelines), although the annual lagoon kinetics still indicates the sewage lagoon effluent can meet the CWS/MWWE criteria. DCL seemed not conduct proofreading for the report. The design report is still "draft" (in cover page), and the typos occurred in the previous submission are still there.

The field drilling program was conducted on Sept. 8 and 9, 2006 by AMEC. 22 shallow borehole (up to 3.1 m depth) and 2 test pits (2 m depth) were drilled/excavated at the proposed lagoon site. The findings were summarized in a 4-page report (AMEC061101). The report extrapolated the mean annual permafrost temperature at a depth of about 15 m to be in a range of -4 °C to -5 °C, based on one set of reliable temperature data obtained in one shallow borehole. The thickness of the active layer was expected in the report to be about 1.8 to 2.0 m in the lagoon impoundment area. The inferred above parameters in AMEC 051013 (geotechnical analysis) report are -5 °C to -7 °C at a depth of 10 to 12 m for permafrost temperature and 1.5 m for active layer. I am not sure where the values are in close agreement.

Mr. Holger Hartmaier of BGC pointed out in the Sept. 19, 2006 technical meeting that *"this method of exploration (using the air track drill available from the road construction contractor) would not yield the information to determine the extent of the frost affected bedrock required for the design of the cut-off trench as it would be difficult to identify zones of ground ice contents and to distinguish bedrock from large boulders"* (BGC061005).

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The focus on the design is the berm. Drawing #111 dated Sept 7, 2006 indicates the upstream slope liner configuration. The liner slope is 1:1, and the berm slope is 1:2.5,which is different from the geotechnical analysis (AMEC051013, the assumed berm and liner were both 1:2). Two terms about liner are shown in Drawing #111, Bentonite Liner and Bebtomat St Liner. They might be the same.

No specifications were provided in this 2007 submission.

AMEC commented in its Examination of Drawings (AMEC060912, for Drawing #111 dated Sept. 7, 2006) that the berm slope revision (from 1:2 to 1:2.5) represented conservative conditions from a slope stability perspective. However, no slope stability analysis seemed to be done. In the report AMEC asked for details about Type II granular material, Section #4, and potential manhole settlement, and provided recommendations. AMEC also offered to provide additional instructions to a field engineer/technologist. I am not sure how these comments would have been incorporated into the final design because no new drawings are dated after AMEC had reviewed Drawing #111 and no specifications are available in the 2007 submission.

Deficiencies and Line of Action

DCL and AMEC, in the Jul. 14, 2006 response letter, appeared to answer all the questions of the NWB Jun. 21, 2006 comment letter. However, the two letters addressed to the previous design, then many comments and responses do not apply anymore.

The internal comment report (BGC060809) by Mr. Holger Hartmaier of BGC responded to the DCL060714 letter, and provided insightful points about responsibility for geotecnical design, requirements for submission of technical documents for water licence approval, design recommendations regarding water retention, and construction supervision and execution.

Mr. Holger Hartmaier submitted an internal comment report (BGC061005) after the Sept. 19, 2006 technical meeting. The report pointed the deficiencies of the technical presentation made by DCL and AMEC. These comment also apply to the 2007 submission, which has not significant variation with the Sept. 19, 2006 technical presentation.

- The air track holes will not provide the appropriate information to determine the depth of the cut-off trench;
- AMEC does not believe seepage analysis and slope stability analysis necessary;
- No additional thermal modeling have been done after the field drilling program because AMEC claimed the investigation is in close agreement with the assumption of the Oct. 13, 2006 geotechnical analysis. No additional thermal modeling for the assessment of global warming, either;

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- The revised liner configuration (upstream slope liner) would expose the sewage discharge pipe going through the embarkment to freezing upstream of the manhole where the shutoff valve is located;
- No flooding handling details are included in the 2007 submission;
- No QA/QC plan for construction inspection is provided.

From the current submission, DCL did not fully give AMEC the opportunity to review the specifications, and then AMEC could not make sure its design recommendations had been incorporated. The NWB could not make a full review, either.

The specifications are to be provided and the above concerns to be clarified.

Interconnectivity (for multi-report application)

The consistency among the design report, drawing and geotechnical analysis was improved. However, there is a "hole" in the 2007 submission because no specifications are provided.

Conclusion

Based on the review of the correspondence documents, I believe DCL and AMEC are reluctant to take significant efforts to satisfy the NWB's information request.

AMEC and DCL signed their names and sealed their stamps on the reports and design, even if the NWB had different opinions on the long-term water retention capability. They are confident with their design, and NWB has to let them go. However, strict terms and conditions must be put into the licence of 3BM-CAP.

After they submit design specifications and provide further clarification for the NWB concerns, the draft licence can be prepared. Some considerations for the lincence terms and conditions include, but not limited to:

1. Construction
   - QA/QC plan for construction inspection (e.g., inspection to confirm that the cutoff trench is located in good quality frozen rock and the liner connection is properly done);
   - As-built drawings.
2. Operation
   - Operations and Maintenance manual;
   - Spill emergency plan (with backup storage – modification of the existing system, DCL060602);
   - Sampling program (amended as EC proposed);
   - Abandonment and Restoration Plan for the existing 3-cell lagoon.