IQALUIT SEWAGE LAGOON INVESTIGATION
FINAL REPORT

Prepared For:
Municipality of Iqaluit
P. O. Box 460
Iqaluit, NWT
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FSC PROJECT NO. 97-1970
February 5, 1998

FERGUSON SIMEK CLARK
ENGINEERS AND ARCHITECTS
GROUP

Our File: 97-1970
February 5, 1998

Municipality of Iqaluit
P. O. Box 460
Iqaluit, NWT
X0A 0H0

Attention: Ian Mosher, P. Eng.
Director, Engineering & Planning

Dear Mr. Mosher,

RE: - Iqaluit Sewage Lagoon Investigation
Final Report

We are pleased to present you with this final report discussing our assignment to investigate the Iqaluit sewage lagoon.

We trust that you will find this report both helpful and informative.

We appreciate having been selected for this assignment and look forward to serving you again in the near future.

Yours very truly,
FERGUSON SIMEK CLARK

Kevin Hodgins, P. Eng.
Principal

Ron Kent, P. Eng.
Head, Environmental Services

encl.

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1. BACKGROUND

In our proposal we outlined two potential problem areas. The first, and most serious, was the potential problem with the structural integrity of the west dyke as a result of apparent seepage.

Ice and snow cover on the dyke has made it difficult to determine if the showing of liquid is seeping, piping, or perhaps up-welling as a result of tidal action and ice formation. If the liquid is piping, the dyke may breach, thus, potentially prompting the resulting spill to be investigated under the *Fisheries Act*.

Therefore, the first priority of this project was to determine if the structural integrity of the dyke has been compromised, and recommend alternatives to deal with the situation to the satisfaction of the Town and the regulatory agencies.

The purpose of this report is to address the aspects of this first priority

The second potential problem is for the view a regulatory agency may take of the seep. It may be seen as an uncontrolled discharge of untreated wastewater and, therefore, potentially be subject to enforcement. In the previous court case, the uncontrolled discharge that occurred following the spill was a significant concern for the court.

The second priority of this project was to provide a discussion of the fundamental function of this lagoon design that would satisfy the needs of the Town and the regulatory agencies. The discussion should include a definition of primary treatment, historical effluent quality, reasonable seepage rates through an earthen fill structure, and the potential beneficial effects of a seepage in this situation.

This second priority has been addressed in a separate report entitled, " Draft Discussion Paper. Seepage from a Sewage Lagoon - What is a reasonable rate?"

2. SITE SURVEY

On January 8, 1998 FSC was able to complete a chain survey of the west dyke to determine the approximate location of the seep. Shown on Figure 1, the seep is located on the downstream face, between 7 and 17 metres in a southerly direction from the outfall pipe, near the edge of the section that was repaired in September - October of 1991.

As may also be seen by Figure 1, the seep location is apparently located above the un-repaired portion of the dyke, i.e. not in UMA's repair area.

During the survey it was noted that the ice associated with the seepage was clear with a green colour. Neither the rock toe drain, nor the french drain, could be observed because of the accumulation of significant quantities of ice and snow. It is unknown if the seep continues to grow or if it has stopped as a result of lowering the level of the lagoon. It appears now that the level of the ice associated with the seep is above the current level of the lagoon.

3. HISTORICAL INFORMATION

On January 10, 1992 there was a similar seep. Town Staff noted a seep 5 metres north of the overflow structure, 2/3 way down face of dyke. Noted as outside the area of reconstruction.[1] The seepage was likely from the lagoon rather than a result of restricted flow through the control structure or effluent backwashed against the exterior of the dyke.[2] To follow up, the site was apparently monitored twice daily by Town Staff. DIAND did not consider the event a spill, and no further investigation took place.

There are no other reported seeps in the Town records or in DIAND's records.

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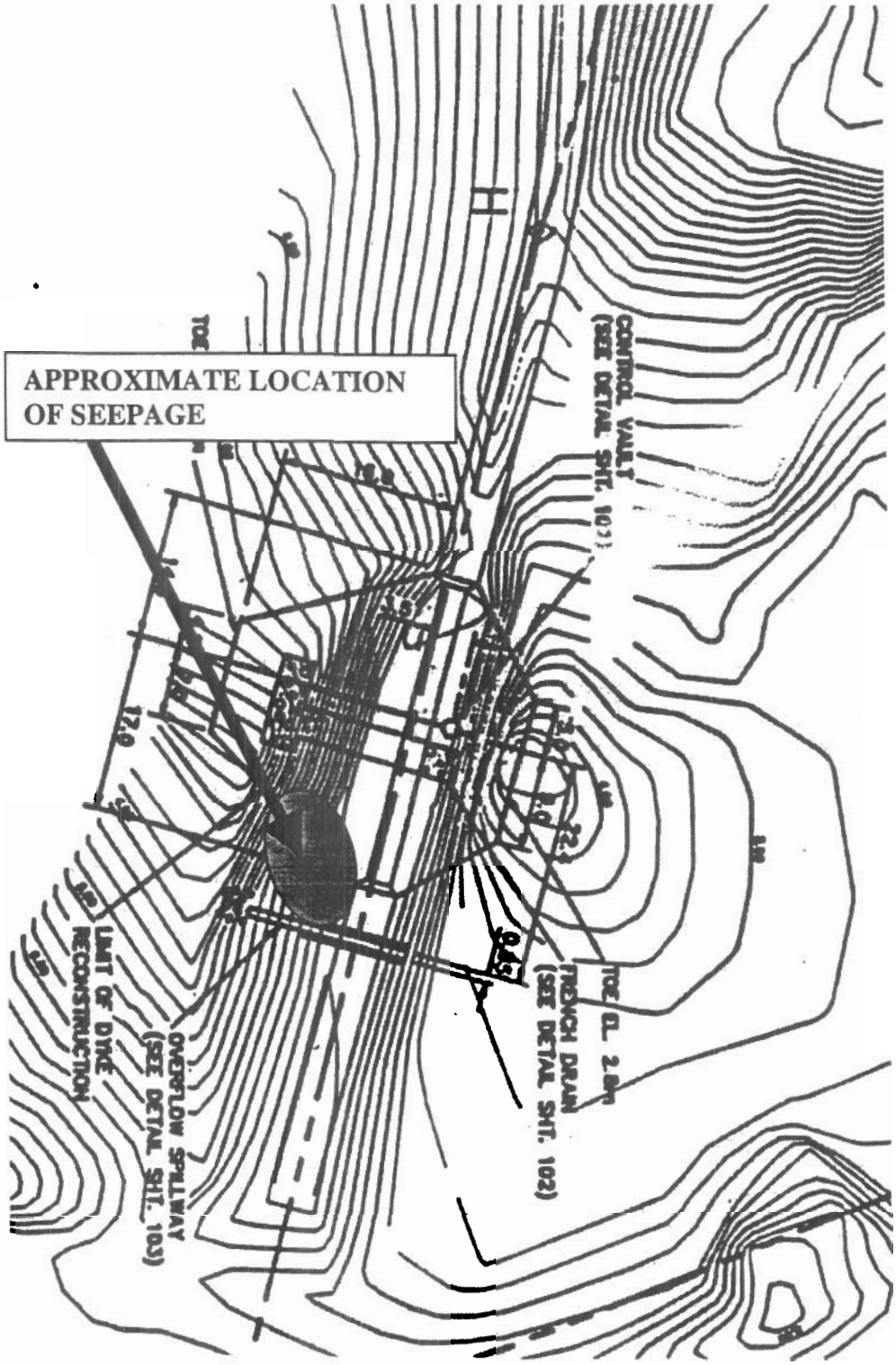
[1] Gray, Fred. January 10, 1992. Status Report. Iqaluit Sewage Lagoon. Town of Iqaluit Records.
[2] McDonnell, Kevin. DIAND Water Resources. Memo to JMA Theriault DIAND Iqaluit. January 15, 1992. File B5555-1-91-221



NOT TO SCALE

FSC GROUP
FERGUSON SIMEK CLARK
ENGINEERS AND ARCHITECTS

JOB TITLE
IQALUIT LAGOON
INVESTIGATION

IQALUIT, NWT

DRAWING TITLE
APPROXIMATE
LOCATION
OF SEEPAGE

DESIGNED BY	SCALE NTS
DRAWN BY WM	DATE JAN. 8, 1998
CHECKED BY	CLIENT JOB NO.
FSC FILE NO. OUTFALL.DWG	FSC PROJECT NO. 97-1970
SHEET OF	DRAWING NO FIG. 1

4. OPTIONS

In consultation with our sub-consultant, AGRA Earth and Environmental, we had discussed a number of options including:

1. If the seep was located close enough to the french drain, and the french drain was operational, then it may have been possible to drill the dyke and attach the seep to the french drain;

2. Drilling the dyke to sample the soil in the area of the seep and, if inconclusive, or if needed following regulatory consultation, install piesometers to locate the phreatic surface, and either thermisters and/or frost gauges to determine if and where the dyke is freezing; and

3. Maintaining the lagoon at its lowest possible level, implementing an on-going monitoring program, and developing a spill preparedness plan.

5. DISCUSSION OF OPTIONS

There are many remaining unknowns including:

- Is the ice associated with the seep growing?

- Given the significant amount of ice and snow at the base of the West Dyke, and as the seep is between 7 and 17 metres from the outfall pipe, is there up-welling of the effluent contributing to the ice apparently associated with the seep?

- Is there salt water in the seep ice?

- Is ice at base of the West Dyke sufficient to block the toe drain and french drain?

- Is the toe drain completely blocked or just in this location?

- The plans issued for re-construction in 1984 by Reinders were not followed. There are no as-built drawings or resident engineer's reports. There are no soil tests. For

example, the membrane liner was replaced with geotextile. Were the toe drains built properly? Were the toe drains wrapped with geotextile and now potentially blinded with fines?

5.1 Option 1

Option 1 has now been ruled out because of distance, angle, and concern that the french drain itself is blocked with ice.

5.2 Option 2

Option 2 has been ruled out for the present because it does nothing to correct the potential problem or produce any tangible results. The data collected would be largely of academic interest only because, given the location of the lagoon, it is virtually impossible to manage the toe drain and french drain.

The fact that there was clear ice associated with the seepage on January 8th may mean that there was, or is, little transport of fine materials from within the dyke. This is potentially a good sign that the structure integrity may be still intact.

There are significant logistical problems with undertaking this work in winter as well.

5.3 Option 3

Option 3 remains.

5.4 A Spill Preparedness Plan

A spill preparedness plan is fundamental to the due diligence expected by Regulatory Agencies for this facility. Due diligence is one of the primary defences in environmental litigation. Although the Town of Iqaluit may have an over-all emergency preparedness plan it may not incorporate the sewage lagoon per se.

A spill preparedness plan focused on the lagoon should be modelled following the Spill Contingency Planning and Reporting Regulations (1993) under the *Environmental*

Protection Act, and the Nunavut Water Board's, Guidelines for Contingency Planning, January 1987.

The basic information required by such a plan includes:

A. The name of the person in charge;

B. The persons responsible for activating the plan;

C. A description of the facility;

D. A description of the contaminant(s);

E. A site map;

F. Steps to be taken to report, contain, clean up, and dispose of spilled contaminants;

G. Means to active the spill plan;

H. Description of training provided to people who respond to a spill;

I. Inventory and location of clean-up equipment; and

J. The date the plan was prepared.

With respect to point I, an inventory of appropriate granular resources should be developed and perhaps stockpiled.

6. CONCLUSIONS

6.1 A drilling program at this time would not produce useable results as the likely potential cause, ice cover on the toe drain and french drain, cannot be managed.

6.2 The dyke at this time appears to be stable.

6.3 At least one similar seep has occurred in the past without further incident or concern.

6.4 Without the ability to manage the ice cover at the toe drain and french drain, seeps could regularly occur. The frequency of such seeps will depend primarily on the weather, snow and ice conditions, and tide conditions.

6.5 Attempts to remove the ice and snow from the dyke may cause the disturbance, if not removal, of significant quantities of granular material. Further, riprap could be removed from the face of the downstream dyke, thus, opening it to erosion from the sea. The result may be a failure where one may not have occurred.

6.6 The spring will see additional runoff from the immediate watershed enter the lagoon. This water could become problematic.

6.7 The current liquid level monitoring system seems to be inadequate as there is no record of the relationship between the green line on the concrete pier and the level of lagoon or the associated freeboard.

7. RECOMMENDATIONS

7.1 Option 3 should be implemented. The following monitoring should be undertaken:

7.1.1 The site should continue to be monitored frequently. The frequency of monitoring should increase if problems develop. Some estimation of the amount of ice should be made routinely to determine if the seep continues; and

7.1.2 The level of liquid in the lagoon should be monitored frequently to ensure proper operation of the outfall pipe.

7.2 A spill preparedness plan should be developed that sees granular material, mobile equipment, and spill response personnel identified for an immediate response. Routine monitoring of the seep area and liquid level in the lagoon will determine the extent of preparedness necessary for the spill response team.

7.3 Efforts should be made to ensure that water from outside the immediate watershed does not enter the lagoon. This includes ensuring water entering the drainage ditch from the airport and FOL site stays within the ditch. This may mean cleaning the ditch of ice and snow and ensuring the culverts in the West Dyke access road remain clear.

7.4 Increased monitoring in the spring should be undertaken and the spill response team prepared to respond if there appears to be materials transport from the dyke.

7.5 We strongly recommend against using equipment to remove ice and snow from the seep area.

7.6 Liquid level and lagoon freeboard monitoring should be improved. The solution that would provide a simple yet effective system would be to survey the existing concrete pier into the existing as-built design. A large visual scale could be installed on the pier which would correlate, for example, to the invert of the outfall pipe and a one metre freeboard level.

However, there is a significant life-safety concern with working from lagoon ice during the winter. We strongly recommend against attempting a survey until both the lagoon and the dykes are free of ice.

Until the lagoon is ice-free, it is recommended that visual monitoring continue using the experience gained to date.