



**KERR WOOD LEIDAL ASSOCIATES LTD.**  
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January 28, 1998

Mr. Jerry Stokes, A.Sc.T.  
Coordinator Customer Service and Projects  
Engineering Services  
The Corporation of the District of North Vancouver  
P.O. Box 86218  
North Vancouver, B.C.  
V7L 4K1

Dear Sir:

**Re: Premier Street Landfill Annual Report**  
**Our File No. 031-178**

The District of North Vancouver has retained Kerr Wood Leidal Associates to compile the Premier Street Landfill Annual Report to be submitted to the Ministry of Environment, Lands and Parks (MOELP). This report includes presentation and interpretation of monitoring data collected, recommended amendments to the monitoring program, and a discussion of ongoing landfill closure activities.

## **DATA ANALYSIS**

### **a) Surface Water and Interstitial Water Sampling in Lynn Creek**

Nine (9) surface water samples and three (3) interstitial water samples were collected in November, 1996 in various parts of Lynn Creek. The same number of samples were also collected in March, 1997, May, 1997, and September, 1997 respectively. In-situ dissolved oxygen, pH and temperature measurements were made by Integrated Resource Consultants Inc. Other qualities of the samples, such as metal concentration, COD and TOC levels, were analyzed by Cantest. The results have been submitted to MOELP. After reviewing of the data, the MOELP has determined that there is no immediate concern for pollution of the environment.

Of particular relevance, the dissolved oxygen levels in surface water and interstitial water upstream and downstream of the landfill are consistently close to saturation. This is one of the best indicators of stream health and it shows that the landfill have little or no negative

impact on the health of Lynn Creek.

Results of the metal analysis during the four sampling periods show that concentrations of various metals were consistently below the maximum levels indicated in the "Working Criteria for Water Quality". Occasionally, the total iron levels in the interstitial water samples were higher than the criteria. However, the dissolved iron concentrations in the same samples were consistently less than 0.3 mg/L indicating that most of the total iron concentration are contributed by iron content of suspended sediment, and thus not important.

**b) Leachate Samples**

Five (5) leachate samples were collected during each of the above mentioned sampling periods. Leachates generated in the landfill are discharged into the GVRD sewer system. Results of the analysis show that the leachate quality and volume generally meet the GVRD discharge permit requirements. The iron concentrations in a few leachate samples exceeded the limit. Steps have been taken to minimize leachate generation. These activities will be discussed in the following sections in more detail.

**c) Settlement**

A number of surveys have been conducted on top of the landfill. By comparing the most recent 1997 survey to the survey done in 1995, it is observed that settlement up to 0.44 m has occurred in locations where significant depths of inorganic fill material has been placed. In areas where no additional inorganic fill has been placed, settlements range from 0.05 m to 0.17 m. The new inorganic fill materials are being placed in the landfill to create plateaus for future development as sports fields.

**d) Landfill Gas**

Methane gas generated in the landfill is flamed continuously on site for odour control and greenhouse gas control. In the future, when the development of the new field house is completed, the methane gas may be used to heat the building.

## **RECOMMENDED AMENDMENT TO MONITORING PROGRAMS**

In 1996, a number of recommendations regarding the monitoring programs were made to the District of North Vancouver. The recommendations have not been fully adopted. The following summarizes the 1996 recommendations and the detailed program is attached.

**a) Surface Water Sampling in Lynn Creek**

There are nine surface water sampling sites. The data collected shows that identical

information are being provided at several of the sampling sites. It was therefore recommended that the number of surface water sampling be reduced to five.

**b) Interstitial Water Sampling in Lynn Creek**

There are three interstitial water sampling sites. It was recommended that the two intermediate sites should be eliminated and a new up-stream site near 1-10 be added to the sampling program, resulting in one downstream site and one new upstream reference.

**c) Leachate Monitoring Sites**

Currently, leachate samples are collected from the south pump station (2-26), the north pump station (2-25), the downstream manhole (2-27) which receives discharge from both pump stations, and two "groundwater" monitoring wells inside the landfill. Data collected showed that leachate quality was similar in both pump stations and the manhole. Therefore, it was recommended that sampling continue at the downstream manhole (2-27) only, and discontinue sampling at the two pump station.

It was also recommended that sampling be conducted at the new south end purge well (PW95-1) and the at the new north end monitoring well (PW95-2) for a period of one year provided that the leachate sampling results are consistent with those at 2-27.

**LANDFILL CLOSURE ACTIVITIES IN 1995, 1996 AND 1997**

The District of North Vancouver is actively implementing the landfill closure recommendations presented in the 1995 Premier Street Landfill Closure Plan. The following summarizes the landfill closure activities completed over the past 3 years.

**a) 1995 Closure Activities**

In 1995, the first of a series landfill closure activities was carried out. Modifications were made to the north drainage to divert leachate to the leachate collection system directly in order to keep the north end ditch as a clean water ditch. The total cost of this upgrade was around \$61,000.

**b) 1996 Closure Activities**

In 1996, a series of landfill closure activities were performed. The southern portion of the western perimeter ditch was upgraded and the southern sedimentation pond was constructed. The purpose of this upgrade was to collect clean surface runoff and prevent it from seeping down to the perforated leachate collector and thereby reducing the volume of leachate and water to be handled by the leachate pump stations. Water quality in the sedimentation pond is being monitored to confirm that it is safe to discharge the water into Lynn Creek.

Drainage was rerouted from under the Hydro line right-of-way and leachate/condensate drain seepage controls were constructed along this portion of the ditch to protect the quality of the water collected. Odour control systems were also installed along the southwest side of the landfill. The total cost of these upgrades was approximately \$420,000.

**c) 1997 Closure Activities**

In the past year, a third purge well was installed in the south end of the landfill to improve the current groundwater leachate interception system.

The north end drainage ditch, and the northern portion of the western perimeter ditch upgrade was completed. These ditches intercept the clean surface runoff from the northern end of the landfill. In addition a new perforated leachate collector was installed at the north end of the landfill to protect the salmonoid enhancement area. The northern sedimentation pond which was designed to clarify water collected from these two ditches was constructed. Water quality in the northern sedimentation pond will be monitored to confirm that the collected surface water can be discharge into Lynn Creek.

Also, disturbed rip-rap in Lynn Creek near the south end was repaired. Lastly, designs for repairing the northern bentonite wall was completed and the construction phase of the project is pending. The total cost of these upgrade activities was over \$530,000.

**PROPOSED FUTURE CLOSURE ACTIVITIES IN 1998**

It is proposed that in 1998, the northeast perimeter ditch should be constructed. The water collected in this ditch will initially be diverted to the north end ditch and the water quality will be monitored regularly. If the water quality is consistently good, then the water can be discharged into the salmonoid enhancement area.

A significant amount of ponding of surface run-off was observed on the various terraces at the site. The ponded water can seep into the landfill and add to the leachate generation. It is therefore proposed that terrace ditches and sloped terrace channels be constructed. A crown will be added to each terrace to divert the surface run-off to the terrace ditches. The surface run-off collected in these terrace ditches will be discharged into the sloped drainage channels and then directed to the western perimeter ditches.

Other proposed activities include extending the landfill gas system to the north end of the site and relocating the gas flare stack to the north end, and the grout curtain construction for the northern bentonite wall repairs.

Lastly, it is proposed that odour control system be extended along the west side of the site, north of the north pump station.

Mr. Jerry Stokes, A.Sc.T.  
January 28, 1998  
Page 5

The total cost of the proposed upgrade is in the vicinity of \$1,000,000.

#### **SUMMARY**

Water quality in Lynn Creek and leachate quality in the landfill have been monitored regularly over the last year. Review of the data show that the landfill has no significant impact on the quality of the water in Lynn Creek. Extensive upgrades have been implemented in the landfill since 1995 to reduce the leachate generation and better protect the environment. More upgrading to the Premier Street Landfill has been proposed for 1998.

Yours Truly

**KERR WOOD LEIDAL ASSOCIATES LTD.**

A handwritten signature in cursive script that reads "Tom O'Connell". The signature is written in dark ink and is positioned above the printed name.

Tom O'Connell, P. Eng.

Enclosure: Premier Street Landfill Closure Plan Updated Environmental Monitoring Program

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139 WEST 16th STREET, NORTH VANCOUVER, B.C. V7M 1T3 PHONE (604) 985-5361

FAX NO. (604) 985-3705

March 26, 1996

Mr. David Bryans  
Risk Management Coordinator  
District of North Vancouver  
North Vancouver, B.C.

Dear David;

Re: PREMIER STREET LANDFILL CLOSURE PLAN  
Updated Environmental Monitoring Program  
Our File No. 31. ~~31~~ 1-31

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### Introduction

In the **Premier Street Landfill Closure Plan** we reviewed the existing environmental monitoring program at the landfill. Our assessment indicated duplication in surface water and interstitial water sampling, as well as in groundwater monitoring. It was therefore suggested that the monitoring program be updated.

### Surface Water and Interstitial Water Sampling in Lynn Creek

At present there are nine surface water sampling sites and three interstitial water sampling sites. The water quality testing results indicate that the same information is being provided at several of the sampling sites. It is therefore recommended that the sampling program include only the sites that are providing useful and unique information.

Table 1 lists all the sampling sites and there locations, which are also indicated on the attached plan. The suggested surface water sampling sites for ongoing monitoring include the following:

- |   |             |
|---|-------------|
| • Upstream Lynn Creek reference site    | 1-10        |
| • Hastings Creek, opposite the landfill | 1-06        |
| • Two downstream sample sites           | 1-01 & 1-02 |
| • Salmonoid Enhancement ditch           | 1-11        |

Of the three existing interstitial water sampling sites, it is suggested that the downstream site (1-03) be retained, the two intermediate sites discontinued, and a new upstream reference site near 1-10 be added.

### **Leachate Monitoring Sites**

Leachate characteristics are presently monitored at three locations including the south pump station (2-26), the north pump station (2-25) and at a manhole at the southern boundary of the landfill (2-27). The discharge from the two pump stations is combined in a single pipe which passes through the downstream manhole. Monitoring results indicate that the leachate characteristics are very similar at all three locations. It is therefore suggested that sampling continue at the downstream manhole only (2-27).

It is also suggested that sampling be conducted at the new south end purge well (PW95-1) and at the new north end monitoring well (PW95-2). If the leachate sampling results are consistent with those at the southern manhole (2-27) then sampling could possibly be discontinued after one year. Table 2 summarizes the leachate monitoring information.

### **Groundwater Monitoring Sites**

At present there are 25 groundwater monitoring sites. Many of these are no longer functional because they are dry, silted up, or damaged. Table 3 lists all the monitoring sites, of which many have two or three monitors at different elevations in a single well.

In the past few years, results have only been obtained from the well containing monitors 2-22, 2-23, and 2-24, and from the well containing monitors 2-39, 2-40, and 2-41. These are ideal wells for ongoing groundwater monitoring, as one is located upstream of the southern purge wells, and the other is located downstream of the purge wells. The new south end monitoring well MW95-1 and the new north end well MW95-2 should be added to the sampling program.

It is also recommended that a new monitoring well be installed upstream of the landfill to provide a reference for background groundwater quality.

If you require any further assistance regarding the implementation of these recommended tasks, we would be pleased to assist the District as required.

Yours truly,

**KERR WOOD LEIDAL LTD.**

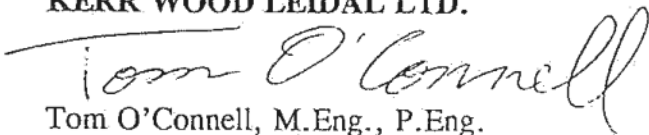
  
Tom O'Connell, M.Eng., P.Eng.

TABLE 1

**ENVIRONMENTAL SAMPLING SITES AT PREMIER STREET LANDFILL**  
**Summary of Sampling Location Identification Numbers**  
**Creek or Surface Water Sampling Locations**

| I.D. No.    | Sample Type        | Location  | Comment                        |
|-------------|--------------------|---|--------------------------------|
| 1-01        | Surface Water      | Lynn Creek, near highway bridge.                              | Good downstream sampling site. |
| 1-02        | Surface Water      | Lynn Creek, near south pump station.                          | Good site at end of landfill.  |
| 1-03        | Interstitial Water | <del>Lynn Creek, same location as 1-02.</del>                 | Good site at end of landfill.  |
| 1-04        | Surface Water      | Lynn Creek, south of BG Hydro-power line.                     | Similar results as site 1-10.  |
| 1-05        | Interstitial Water | Lynn Creek, same location as 1-04.                            |                                |
| 1-06        | Surface Water      | Hastings Creek, opposite north pump station.                  | Important reference site.      |
| 1-07        | Surface Water      | Lynn Creek, south of north pump station.                      | Similar results as site 1-10.  |
| 1-08        | Interstitial Water | Lynn Creek, same location as 1-07.                            |                                |
| 1-09        | Surface Water      | Lynn Creek, north of north-south pump station.                | Similar results as site 1-10.  |
| 1-10        | Surface Water      | Lynn Creek, north of landfill site.                           | Good upstream reference site.  |
| 1-10A (New) | Interstitial Water | <del>Lynn Creek, north of landfill site.</del>                | New upstream reference site.   |
| 1-11        | Surface Water      | Perimeter ditch, north end of site (Salmon Enhancement area). | Important fisheries area.      |
| 1-12        | Surface Water      | Lynn Creek, east of location 1-09.                            | Similar results as site 1-10.  |

|                |                  |  |
|----------------|------------------|--|
| <b>LEGEND:</b> | 1-02             | Surface water sampling site to be maintained.      |
|                | <del>1-03</del>  | Interstitial water sampling site to be maintained. |
|                | <del>1-05</del>  | Duplicate site to be deleted.                      |
|                | <del>1-10A</del> | New interstitial water sampling site to be added.  |



TABLE 2

**ENVIRONMENTAL SAMPLING SITES AT PREMIER STREET LANDFILL**  
**Summary of Sampling Location Identification Numbers**  
**Leachate Sampling Locations**

| <u>I.D. No.</u> | <u>Sample Type</u> | <u>Description</u>                      | <u>Comment</u>   |
|-----------------|--------------------|---|--|
| 2-25            | Leachate-Sample    | North Pump Station.                     | Very similar results to 2-27.                                |
| 2-26            | Leachate-Sample    | South Pump Station.                     | Very similar results to 2-27.                                |
| 2-27            | Leachate Sample    | Manhole 17-A, below South Pump Station. | Long term monitoring site.                                   |
| PW95-1 (New)    | Leachate Sample    | New well near north pump station.       | Sample quarterly for 1 year.<br>Discontinue if same as 2-27. |
| PW95-2 (New)    | Leachate Sample    | New south end purge well.               | Sample quarterly for 1 year.<br>Discontinue if same as 2-27. |

|                |        |   |
|----------------|--------|---|
| <u>LEGEND:</u> | 2-27   | Leachate sampling site to be maintained.          |
|                | 2-25   | Duplicate site to be deleted.                     |
|                | PW95-1 | New temporary leachate sampling site to be added. |

TABLE 3

**ENVIRONMENTAL SAMPLING SITES AT PREMIER STREET LANDFILL**  
**Summary of Sampling Location Identification Numbers**  
**Groundwater Sampling Locations**

| I.D. No.     | Sample Type        | Description   | Comment                           |
|--------------|--------------------|---|-----------------------------------|
| 2-13         | Groundwater Sample | Well site with three piezometer tubes for sampling from different elevations within the well. | Dry and plugged since 1990.       |
| 2-14         |                    |   | Dry and plugged since 1990.       |
| 2-15         |                    |   | Dry and plugged since 1990.       |
| 2-16         | Groundwater Sample | Well site with three piezometer tubes for sampling from different elevations within the well. | Dry since 1992.                   |
| 2-17         |                    |   | Dry since 1992.                   |
| 2-18         |                    |   | Dry since 1992.                   |
| 2-19         | Groundwater Sample | Well site with three piezometer tubes for sampling from different elevations within the well. | Dry since 1992.                   |
| 2-20         |                    |   | Dry since 1992.                   |
| 2-21         |                    |   | Dry since 1992.                   |
| 2-22         | Groundwater Sample | Well site with three piezometer tubes for sampling from different elevations within the well. | Dry since 1990.                   |
| 2-23         |                    |   | Dry since 1990.                   |
| 2-24         |                    |   | Good samples throughout the 90's. |
| 2-28         | Groundwater Sample | Well site abandoned because tubes blocked and cannot obtain samples.                          | Blocked since 1990.               |
| 2-29         |                    |   | Blocked since 1990.               |
| 2-30         | Groundwater Sample | Well site with three piezometer tubes for sampling from different elevations within the well. | Damaged by 1994.                  |
| 2-31         |                    |   | Damaged by 1994.                  |
| 2-32         |                    |   | Damaged by 1994.                  |
| 2-33         | Groundwater Sample | Well site with two piezometer tubes for sampling from different elevations within the well.   | Dry since 1990.                   |
| 2-34         |                    |   | Dry since 1990.                   |
| 2-35         | Groundwater Sample | Well site with two piezometer tubes for sampling from different elevations within the well.   | Silted up since 1990.             |
| 2-36         |                    |   | Silted up since 1990.             |
| 2-37         | Groundwater Sample | Well site with two piezometer tubes for sampling from different elevations within the well.   | Dry since 1991.                   |
| 2-38         |                    |   | Dry since 1991.                   |
| 2-39         | Groundwater Sample | Well site with two piezometer tubes for sampling from different elevations within the well.   | Some good samples in the 90's.    |
| 2-40         |                    |   | Some good samples in the 90's.    |
| 2-41         |                    |   | Some good samples in the 90's.    |
| MW95-1 (New) | Groundwater Sample | New well near south pump station.   |                                   |
| MW95-2 (New) | Groundwater Sample | New well near north pump station.   |                                   |
| 2-42 (New)   | Groundwater Sample | New background upstream reference well.   |                                   |