MEMO

TO:	City of Iqaluit, CO Erik Marko, Colliers Project Leaders
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DATE:	August 30, 2019
SUBJECT:	Leachate Treatment System Evaluation
OUR FILE:	19-9543

Dillon Consulting (Dillon) is currently engaged to provide detailed design services to the City of Iqaluit (the City) for a new landfill facility as well as a waste transfer station and leachate treatment system. This evaluation was conducted as a change of scope to the original leachate treatment system design.

In the spring of 2019 the City informed Dillon that they were in possession of an existing leachate treatment system purchased in 2016 to treat heavy leachate flows resulting from extinguishing a fire at the existing landfill site. The City asked Dillon to perform and evaluation of the system to assess its potential for re-use at the new landfill facility as a capital cost saving measure.

Dillon provided a scope of work for this evaluation and in August 2019 visited Iqaluit to assess the treatment system components. Upon arrival to Iqaluit the treatment system was not in operation however Dillon's team was able to perform a visual condition assessment of the components and gain a better understanding of the overall function and capacity of the system through discussions with the previous operators, Qikiqtaaluk Environmental (QE) also based in Iqaluit.

Scope of the Evaluation

The current evaluation consisted of three main tasks:

1. A desktop evaluation of available background data including operation and maintenance manuals, product data sheets, and the existing system schematics.
2. A site visit to visually assess the current condition of the treatment system, and inventory the components. From this visit a spreadsheet format inventory was created for the major system elements along with pertinent design information, conditions, connections, power requirements etc.
3. Summarization of the evaluation in memo format for review by Colliers and the City, leading to a decision by the City on whether or not the existing system or parts thereof will be re-used.

Existing System Process and Capacity

A process schematic of the existing system from the operation and maintenance manual can be found attached in Appendix A.

The system consists of three basic stages: chemical pre-treatment, biological treatment and tertiary filtration. The following sections outline the treatment process and equipment/infrastructure required for each stage.

Pre-Treatment

Currently, leachate from the existing landfill is collected in a horseshoe shaped pond around the perimeter (leachate collection pond (LCP)). There is an open topped plastic tote bin (approx. 1 m^3) submerged in the LCP which serves as a mixing basin for the pre-treatment process. Lime is dosed into the pre-treatment basin to elevate the pH as high as 11 according to discussions with the operator and polymer is dosed to assist with coagulation of the precipitate. A pump in the pre-treatment basin moves the lime dosed leachate from the LCP into a second holding pond called the retention pond (RP). Reportedly a significant portion of the metals precipitate and settle out in the RP.

The pre-treatment system has a reported capacity of 1000 L/minute and requires two operators full-time on site to operate.

Biological Treatment

Once settling has occurred in the retention pond, the leachate is transferred to the bioreactor. Prior to the bioreactor the leachate is filtered in both sand and bag filters and heated through a system of four boilers to achieve a minimum liquid temperature of 10 ^oC to permit biological degradation of organic material.

The bioreactor is a large pond with three floating baffle curtains to create four distinct sections. First is an aerated portion for BOD removal, then an un-aerated settling zone, sludge is pumped from this zone back into the first to keep biomass active in the aeration zone. Following this, the third zone is an aerated zone for removal of ammonia, lastly the fourth zone is unaerated and allows for further settling prior to discharge.

The reported capacity of the biological treatment process is 200 m^3/day.

Filtration

The effluent from the bioreactor is them pumped through a set of sand filters, followed by bag filters, then through a proprietary “Ultrasorption” adsorption filter and a granular activated carbon (GAC) filter. It is reported that the bag filters need to be changed daily, it is unknown how often backwashing of the sand filters or replacement of the adsorption media is required.

Available Options

Based on our review of the City’s existing West 40 leachate treatment system Dillon has compiled the following three options for the City to consider for re-use as the new landfill’s leachate treatment. These options are potential alternatives to the original design included in the 30% design package previously submitted. The City needs to consider how removal of the West 40 leachate treatment system may impact potential legacy issues related to leachate management following closure of the West 40 site:

Option 1 – Abandon Existing West 40 Leachate System, Construct New Process

This option would involve abandoning the system at the West 40 site and constructing all new leachate treatment infrastructure at the new landfill site. This options presents the lowest risk of the three as all

equipment would be new and a performance guarantee could be required from the manufacturer, however it would also be the highest capital cost and would not make use of any existing equipment.

Option 2 – Relocate Existing West 40 System to New Site, Re-Use All Components

This involves packing up the existing system as is, and relocating it to the new landfill site. It would require that a new pond and baffle system be constructed. If this option were to be selected the City should be aware that not all equipment will be available for re-use. It is known from discussion with the operator that two of the four boilers are not functioning, the aeration system header was prone to overheating and needs to be replaced, and the aeration blower needs an enclosure which can protect it from the elements including rain, dust, ice etc.

Also the City would still need to construct a new pond to serve at the retention pond as well as the bioreactor. The new pond would require a liner system and four floating baffles to create the necessary zones. Based on visual inspection the existing baffles are not suitable for re-use.

Option 3 – Selective Re-use of Existing System Components

This option would involve selecting certain pieces of equipment from the existing treatment system which are most suitable for re-use and present the most cost savings compared to purchasing all brand new equipment. Under this option, modest improvements could be made such as new equipment containers, fixed elements of process piping for easy setup/decommissioning each year and reliability.

As the equipment was not in operation at the time of the evaluation it should be operated to confirm function prior to moving ahead with relocation. Some of the equipment that may benefit from salvaging are:

- Aeration system tubing;
- Blower (new enclosure required);
- Chemical feed pump;
- Water heating system (two boilers require repairs);
- Multiple 1 hp submersible pumps;
- Two 3 hp centrifugal pumps;
- Filter vessels (bag and sand);
- Adsorption media and GAC vessel; and
- Storage containers (seacans).

TABLE 1 OPTIONS COMPARISON

Available Options	Pros	Cons
Option 1	· Less risk, all new infrastructure	· Largest capital expenditure
Option 2	· Lower cost by re-using components	· Higher risk, using all existing equipment
Option 3	· Less capital cost than full replacement, repair/replace some components as required, make use of serviceable existing equipment	· Some risk associated with the re-use of existing components, coordination required up front to ensure serviceability of equipment

Conclusion

Dillon has presented the above three options to Colliers and the City for review. Which option is selected depends ultimately on the appetite of the City to construct either a more robust permanent system, or to make use of the existing equipment and construct a more rudimentary treatment process. Regardless of the option selected, a new lined pond will need to be constructed at the new landfill and some equipment components will need to be setup and taken down each summer/winter to protect from freezing.

The Authorities Having Jurisdiction (e.g. NWB, NIRB) should be contacted to obtain their opinion on the desired treatment process and discharge location, as there appear to be no suitable nearby receiving waters.

A significant factor which should be considered when selecting and option will be who will ultimately operate the system. If the City intends to operate the system using their own forces, it may be beneficial to build in additional automation to the process to reduce operator involvement. However if the operation of the system will be contracted out as has been done in the past, re-use of the more basic equipment will save the City on capital investment and relieve the city of the workload of staffing the treatment system full time during operation. Tolerance to risk is also critical, as the system has not been operated in several years and some elements have remained outside unprotected. Dillon cannot guarantee the performance of said system based on this.