SEWPCC Upgrading/Expansion
Conceptual Design Report

SECTION 15 - Hauled Wastewater

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15.0 Hauled Wastewater Facility

15.1 PURPOSE OF UNIT PROCESS

Provincial regulations require that individual residential wastewater from holding tanks, septic tanks and privies be hauled to a wastewater treatment plant (WWTP) for treatment. Commercial and industrial wastewater is also hauled to a WWTP for treatment. Commercial waste can include fat, oil and grease from restaurant grease traps.

Hauled wastewater (HWW) is currently discharged at the SEWPCC by the 33 licenced haulers. The haulers discharge wastewater from their trucks into a receiving manhole connected to the SEWPCC interceptor.

15.2 EXISTING HAULED WASTWATER RECEIVING FACILITY

The existing South End Hauled Wastewater Facility (HWWF) is located north of the SEWPCC treatment facility adjacent to the site access road. Trucks have access to the site via the Perimeter Highway (PTH 101) south service road that connects St. Mary's Road and St. Anne's Road.

The HWWF approach road and exit road are paved with concrete. A barrier drop gate controls access to the discharge location. The hauler gains access by inserting a magnetic card into the card reader. Magnetic sensors imbedded in the concrete sense the location of the vehicle so the gate will close after entering the discharge area.

The discharge area consists of a heated concrete pad with a receiving manhole. The concrete heating system is a glycol/water hydronic system that uses electric boilers to heat the glycol/water solution.

The hauler discharges HWW into a receiving manhole through a 150 mm diameter discharge pipe that is connected to the bottom of the manhole. The discharge manhole is connected to the interceptor to the SEWPCC via a control manhole that has an air operated pinch control valve mounted on the pass through 300 mm diameter pipe.

The receiving manhole contains a volatile hydrocarbon sensor for detecting volatile substances such as gasoline, diesel fuel and solvents. When hydrocarbons are sensed in the receiving manhole, the sensor controller activates and opens a solenoid valve located on the air line to the pinch valve, sends a signal to the plant control panel and illuminates an emergency light at the discharge facility. The pinch valve closes and the flow is not allowed into the interceptor and the hauler is unable to completely discharge the contaminated load. Any discharged

wastewater in the manhole would have to be removed by the hauler and disposed of at an appropriate facility.

Plant flushing water is available at the HWWF and is piped directly to the pipe between the receiving manhole and the control manhole, and to the receiving manhole for flushing and cleaning purposes.

A control panel contains a compressor for the pinch valve control, breaker panel, electric boilers for heating the glycol/water solution and circulation pumps. Bollards protect the different devices from vehicle damage and the area is illuminated with yard lighting.

15.3 PRELIMINARY DESIGN REPORT RECOMMENDATION

The SEWPCC Upgrading/Expansion PDR was prepared with minimal available hauled wastewater data. In order to proceed, assumptions were made based on the limited data to arrive at an estimated average day and maximum day flow. Three options for the co-treatment of HWW with wastewater at the SEWPCC were identified. PDR Option #1 comprising of an automated septage receiving station (ASRS) with fine screens, grit removal and two chamber underground flow equalization was recommended. A process schematic of the option recommended through the PDR is shown in Figure 15.1

A list of clarifications requiring the City's input was also presented and the need for a City-wide HWW study was identified. Subsequently, the City initiated the "Winnipeg Regional Hauled Wastewater Plan (WRHWWP)" (Stantec, 2007) to develop long term strategies for city wide HWW management.

15.4 WINNIPEG REGIONAL HAULED WASTEWATER PLAN RECOMMENDATION

The WRHWWP was developed to determine appropriate long-term HWW handling strategies for the City. The WRHWWP study included extensive HWW characterization work and looked at the North End (NE), South End (SE) and West End (WE) Water Pollution Control Center HWWFs and operations. Completion of the WRHWWP involved short-listing of 6 viable options from a preliminary list of 33 options identified. The preferred option was selected by the WRHWWP steering committee at a technical workshop and consisted of adding minimum upgrades to NEWPCC and SEWPCC HWWF.

The WRHWWP option involves closing the WE HWWF and diverting all HWW to the NE and SE HWWFs. The existing NE and SE HWWFs would be upgraded to meet the minimum improvements identified below. Extensive testing to characterize the hauled wastewater identified that equalization storage to protect the Biological Nutrient Removal (BNR) process was not required.

The recommended SEWPCC HWWF upgrades are as follows:

1. **Adding an automated swipe card manifest tracking system –** The punch code entry system should be replaced with a magnetic swipe card system that would automatically and electronically track all discharges to the HWWFs. This would help to reduce the amount of "paper" tracking that haulers have objected to and improve the tracking and billing functions for the City.

2. **Adding flow measurement –** The current manifest system does not allow for discharge measurement and therefore an accurate means for billing based on volume or load. Adding flow measurement will greatly increase the tracked accuracy of discharges reported in the manifest system.

3. **Adding sampling capabilities –** Enforcement of discharge quality will be greatly improved with the addition of sampling capabilities. The addition of HWW sampling, whether random or continuous, has proven to be an effective means of ensuring compliance of discharge quality and reducing the risks for BNR upsets in other municipalities and therefore is recommended here as well.

4. **Adding discharge containment –** A tank with minimum 35 m^3 volume should be included to allow containment of HWW that may include constituents of concern such as VOC's or other materials. This would allow an opportunity to contain "off-spec" loads prior to release into the main liquid process, and removal if necessary.

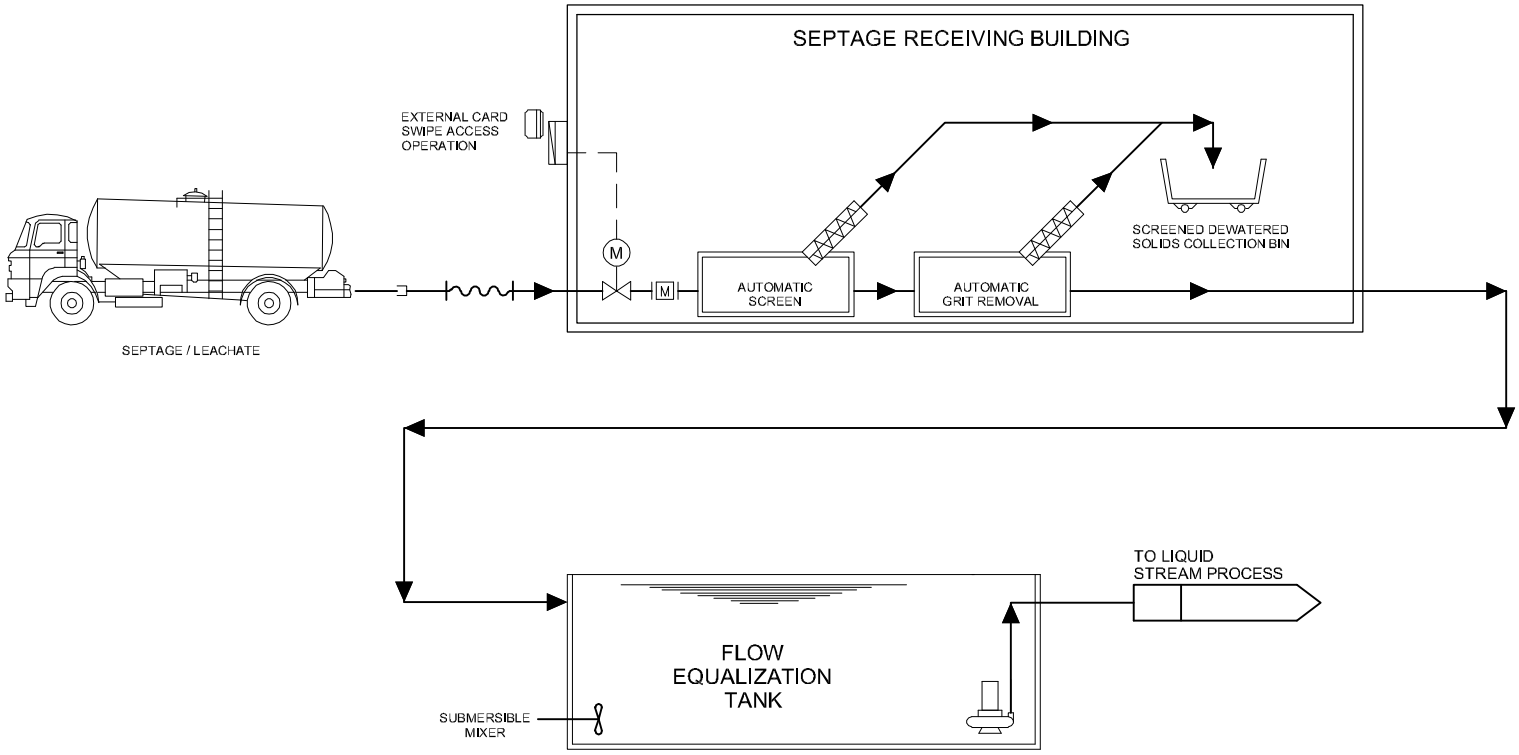
5. **Improving security/access issues –** Improvements with respect to security and access are recommended to reduce the risks for illegal discharges from haulers who can now circumvent current access controls and/or discharge HWW containing high VOC concentrations. Improvements to traffic controls, video, VOC detection, HWW containment are recommended as a result.

The proposed scope of work to upgrade SE HWWF as described is shown in Figure 15.2

15.5 INDEPENDENT REVIEW TEAM RECOMMENDATION

The Independent Review Team (IRT) conducted an independent review of the SEWPCC Upgrading/Expansion PDR. The IRT review of HWW management resulted in a recommendation for the design team to address the potential to capture and separately dispose of FOG (fat, oil and grease) through the HWW management process versus the proposed method of screening and equalizing the hauled wastewater.

The IRT proposed option involves an ASRS, flow equalization and physical pre-treatment. Pre-treatment consists of directing the equalized flow to a small Primary Settling Tanks (PST) for solids and FOG removal. The treated effluent would be discharged back to the main liquid



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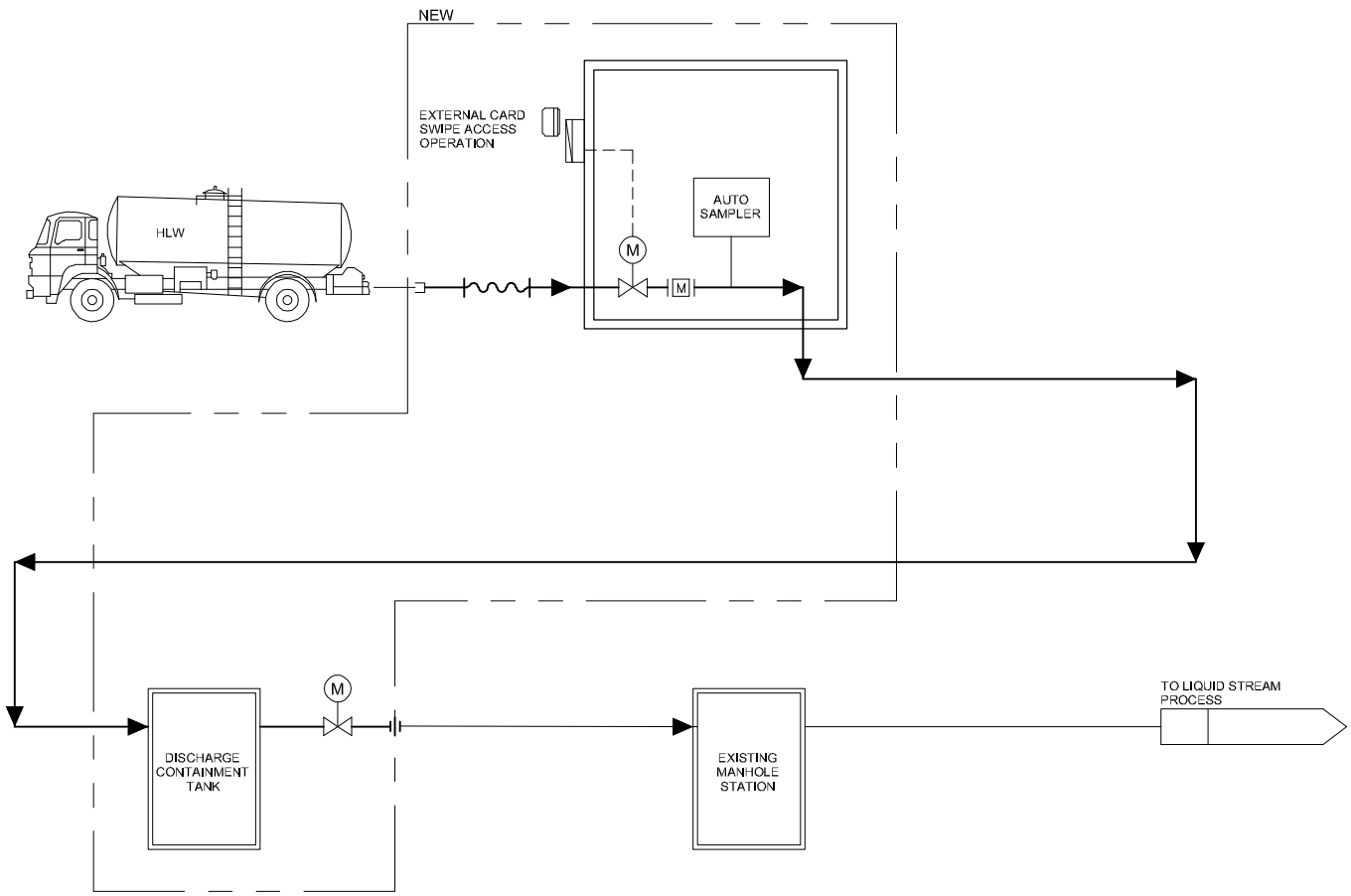

Stantec Consulting Ltd. 905 Waverley Street, Winnipeg, Manitoba Tel 204-489-5900 Fax 204-453-9012		ENGINEER'S SEAL	**THE CITY OF WINNIPEG** **WATER AND WASTE DEPARTMENT**
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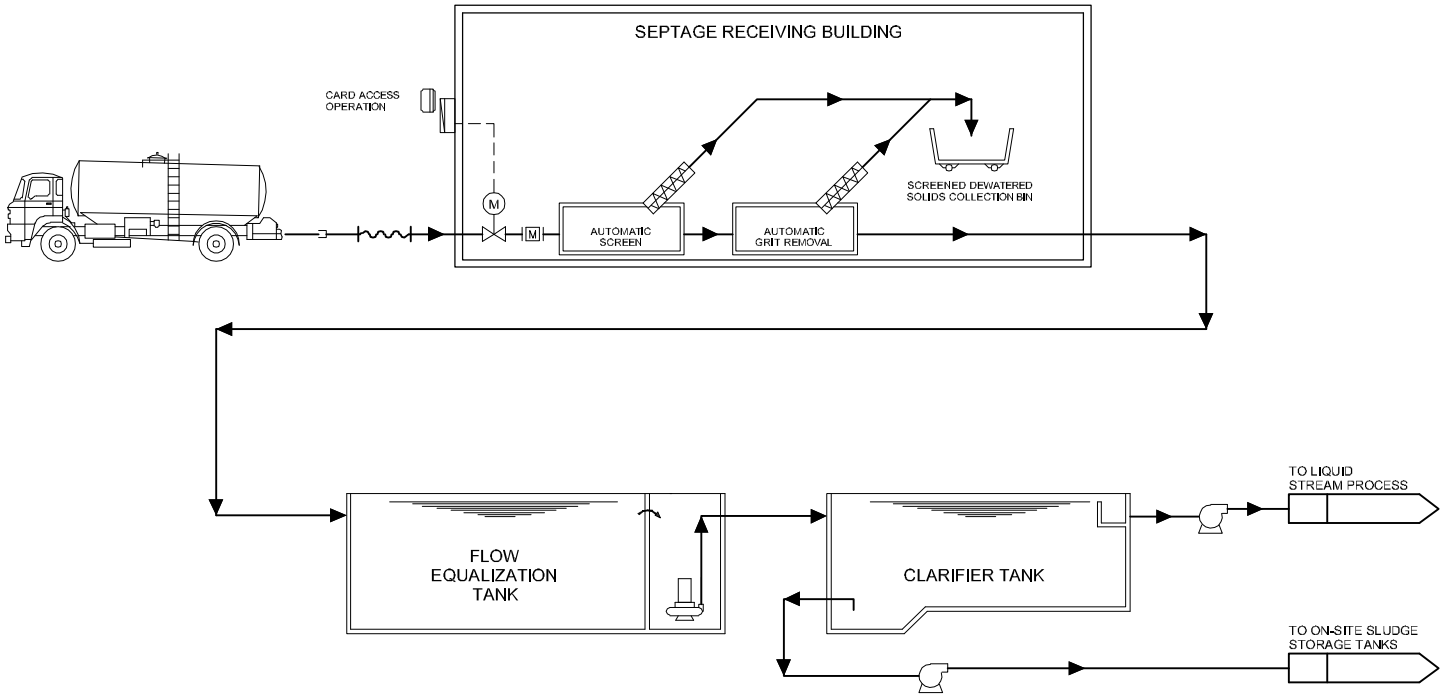

Stantec Consulting Ltd. 905 Waverley Street, Winnipeg, Manitoba Tel 204-489-5900 Fax 204-453-9012	ENGINEER'S SEAL	**THE CITY OF WINNIPEG** **WATER AND WASTE DEPARTMENT** SOUTH END WATER POLLUTION CONTROL CENTRE IRT RECOMMENDED HLWF PROCESS FLOW DIAGRAM
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stream process while the settled solids and FOG would be conveyed to the plant's solids handling process. The IRT proposed scope of work to upgrade the SE HWWFs as described above is shown in Figure 15.3.

If pre-treatment of hauled wastewater prior to introduction into the main wastewater treatment process was implemented at the SEWPCC, it would be desirable to locate the HWW discharge facility and pre-treatment in the area of the new solids handling facility. Relocating the facility greatly simplify both the odor control challenges associated with pre-treatment of hauled wastewater, and handling of the resulting solids and FOG.

The City's operations staff have confirmed that the handling of the solids and FOG associated with hauled wastewater does not present any major challenges of a separate pre-treatment process would be more complex than dealing with the solids and FOG through the main process. Therefore, they are opposed to this option. Having observed the operation of the existing SEWPCC HWW system, Stantec agrees that pre-treatment of hauled wastewater is not justified at the SEWPCC

15.6 OPINION OF PROBABLE CAPITAL AND O&M COSTS

The opinion of probable costs identified in Table 15.1 were prepared to assist in the evaluation / comparison of the treatment options to determine which options are the most appropriate to carry forward in the Detailed Design.

Table 15.1 – Opinion of Probable Cost for SEWPCC HWWF Upgrading Options

SEWPCC HWWF Upgrade		
OPTION	CAPITAL COSTS	ANNUAL O & M COSTS
WRHWWP Option	$1,100,000	$18,000
PDR Option	$4,800,000	$40,000
IRT Option	$5,200,000	$65,000

The above opinion of probable cost does not include the NEWPCC HWWF upgrade work as identified in the WRHWWP.

15.7 PROPOSED SEWPCC HWWF

Stantec supports the recommendations of the WRHWWP and has confirmed that the proposed HWWF upgrades are compatible with the upgrading the SEWPCC to BNR.

The WRHWWP option involves closing the WE HWWF and diverting all HWW to the NE and SE HLWFs. The existing NE and SE HWWFs would be upgraded to meet minimum improvements identified from HWW inspections. The proposed upgrade work would take placed adjacent the current location of the hauled wastewater station as shown Figure 15.4.

Figure 15.4 – Aerial Site Plan of SEWPCC HLWF

It must be recognized that the BNR process is susceptible to upsets from over strength wastewater. The WRHWWP projects a future HWW volume and characteristic for the SEWPCC. In order to protect the SEWPCC BNR process, the City should continue to monitor the volumes and characteristics of the hauled wastewater received at the SEWPCC. If either significant volume or wastewater strength increases are identified, steps may have to be taken to protect the BNR process. The facility will be designed to facilitate upgrading to add increased equalization along with mixing and pumping capabilities. The proposed facility upgrades will improve the City's ability to monitor the incoming hauled wastewater and implement any future protective measures.

15.8 SEWPCC HWWF IMPLEMENTATION

The City is intending to implement the upgrades to the SEWPCC and NEWPCC HWWF independently of the SEWPCC Upgrading and Expansion project. The upgrades are scheduled for 2009.

15.9 LEACHATE

The PDR concluded that the SEWPCC could receive leachate from the Brady Road Landfill without significantly impacting the final effluent quality, and concluded that the HWWF was potentially a good location for leachate discharge. Since the City has not advanced this concept with Manitoba Conservation, it was agreed with the City that no further evaluation of this concept would be undertaken as part of the Conceptual Design and the SEWPCC HWWF will not be designed to accommodate leachate. Should the City decide to treat Brady Road Landfill leachate at the SEWPCC at some time in the future, alternatives for leachate transfer, equalization and discharge into the treatment process train would have to be evaluated.

15.10 IMPACT OF WASTEWATER CHARACTERIZATION AND NITRIFICATION KINETICS

Stantec retained EnviroSim Associates Ltd. / University of Manitoba in July 2008 to undertake a bench-scale investigation to determine the nitrifier maximum specific growth rate of the SEWPCC influent wastewater. A secondary objective was to confirm the influent wastewater constituent fractions and sub-fractions. The key conclusions from this study that identified a major impact of Hauled Liquid Waste (HLW) on the process design are as follows:

- Nitrification rate testing indicated that the growth rates for both Ammonia Oxidizing Bacteria (AOB) and Nitrite Oxidizing Bacteria (NOB) were 0.9 d^{-1} and 0.7 d^{-1}, respectively when HLW was not present in the effluent. The tests indicated that the values were 0.7 d^{-1} (for AOB) and 0.6 d^{-1} (for NOB) when HLW was present.

  The nitrification rate testing confirms the SEWPCC influent reflects typical values for AOB and NOB when HLW is not present. These values match the typical wastewater values used in modeling and sizing the SEWPCC BNR process for the Conceptual Design. The implication of low nitrifier growth rates when HLW is present is that the system must be operated at a longer SRT to maintain the nitrifier population. This in turn translates into an increased sludge mass in the system, resulting in increased bioreactor tank size or reduced treatment capacity.

- The fraction of influent TKN that is soluble unbiodegradable (f_{NUS}) was determined to be 0.07 and is higher than typical values that range from 0.02 ~ 0.04 mg N/mg N. The f_{NUS} component is biologically untreatable and a high value makes meeting low effluent TN difficult. As an example, at an influent TKN value of 46 mg/L (average value in design year dry weather period), 7% of the influent TKN (i.e. 3.2 mg/L) will be present in the effluent irrespective of the treatment process. Modeling confirms that the higher f_{NUS} value does not impact the design at the TKN limits in the existing Environmental Act Licence. However, if more stringent TKN limits are imposed in the future, the high f_{NUS} values could have a significant implication on future upgrading costs.

Based on these findings, the following options were developed to address the potential impact of HLW on the proposed SEWPCC upgrade / expansion:

- **Option 1:** Close SEWPCC HLW facility and consolidate all HLW receiving at the NEWPCC. This approach was identified as Option 6 in Section 8.4.6. of the Winnipeg Regional Hauled Wastewater Plan (WRHWP) report. The construction cost of the option was noted in the WRHWP report as $2,490,000.

- **Option 2:** Implement pre-treatment of HLW at the SEWPCC as per Option 2 described in Section 13.4.2 of the PDR and also the WRHWP report. This option includes an automatic septage receiving station (ASRS) followed by flow equalization and chemically enhanced primary treatment prior to discharge of the treated HLW to the trunk sewer entering the SEWPCC facility. This approach also allows the City to capture fats, oils and grease (FOG) effectively prior to the sewage entering the treatment plant. The opinion of probable construction cost as indicated in the WRHWP report, Appendix E, Table E-4 is $5,185,000.

- **Option 3:** Increase the aerobic volumes of the 4-train IFAS BNR by approximately 20% (based on preliminary modeling using BioWin™). This will increase the total aerobic volume form 13.7 ML to 16.4 ML. No net increase in clarifier area is anticipated. The opinion of probable costs for this additional expansion is estimated at $4,650,000.

- **Option 4:** Conduct additional sampling and toxicity testing to identify the compounds (e.g. heavy metals such as copper) that may be causing inhibition of the AOB and NOB. Based on these tests and input from the haulers, the potential source/sources could be eliminated. This approach allows the City to study the problem for the first few years without implementing larger aerobic tanks as a part of the BNR upgrade. Should the problem of identifying the sources remain unresolved, they would then have the choice of implementing either Option 1 or Option 2 to meet the long-term effluent requirements for Total Nitrogen (TN). An estimated budget is $250,000.

It is recommended that the City proceed with design/construction of the SEWPC based on growth rates of 0.9 d^{-1} and 0.7 d^{-1} for AOB and NOB, respectively. The City also needs to undertake additional sampling and toxicity testing in an effort to identify the potential HLW source(s) of inhibition. If these source(s) can be identified and diverted to the NEWPCC, no other action will be required. If the source(s) cannot be identified, the City will have to implement either Option 1 or 2 at some point in the future, when required by increased loading to the plant.