Notice of Alteration Form

Manitoba
Sustainable Development

Client File No. : 5037.00	Environment Act Licence No. : 778R

Legal name of the Licencee: Diageo Canada Inc.

Name of the development: Daigeo Gimli Plant

Category and Type of development per Classes of Development Regulation:

Manufacturing — Manufacturing and industrial plants

Licencee Contact Person: Antony Jose
Mailing address of the Licencee: P.O Box 2000, 19107 Seagram Road
City: Gimli Province: Manitoba Postal Code: R0C1B0
Phone Number:(204) 651-1456 Fax: Email: antony.jose@diageo.com

Name of proponent contact person for purposes of the environmental assessment (e.g. consultant):
Amanda Conway P.Eng., Stantec Consulting Ltd.

Phone: (306) 667-2554 Fax:	Mailing address: 500-311 Portage Aveue Winnipeg, MB R3B 2B9

Email address: amanda.conway@stantec.ca

Short Description of Alteration *(max 90 characters):*
Addition of heat recovery equipment and a second Equalization Tank. See attachment.

Alteration fee attached: Yes: ☐ No: ☑

If No, please explain: Alteration to works that do not change environmental effects

Date: 12/14/2022	Signature: [redacted] Printed name: Antoine L. Smith Jr

A complete Notice of Alteration **(NoA)** consists of the following components:

- ☑ **Cover letter**
- ☑ **Notice of Alteration Form**
- ☑ **4 hard copies and 1 electronic copy of the NOA detailed report** (see "Information Bulletin - Alteration to Developments with Environment Act Licences")
- ☐ **$500 Application fee, if applicable** (Cheque, payable to the Minister of Finance)

Submit the complete NOA to:

Director
Environmental Approvals Branch
Manitoba Sustainable Development
Suite 160, 123 Main Street
Winnipeg, Manitoba R3C 1A5

For more information:

Phone: (204) 945-8321
Fax: (204) 945-5229
http://www.gov.mb.ca/conservation/eal

DIAGEO

GLOBAL SUPPLY

Diageo Canada Inc.,
PO Box 2000
19107 Seagram Road
Gimli, Manitoba, Canada
R0C 1B0

Tel: 1-833-642-3123

Manitoba Sustainable Development
Suite 160, 123 Main Street
Winnipeg MB R3C 1A5

December 13, 2022

Attention: Director, Environmental Approvals Branch

Reference: Notice of Alteration – Diageo Canada Inc., 19107 Seagram Rd, Gimli, MB R0C 1B0

Please find attached a completed Notice of Alteration (NOA) form and supporting detailed report for the planned upgrades at the Diageo Canada Inc. (Diageo) distillery located in Gimli, MB to comply with terms and conditions stipulated in the current Industrial Service agreement (ISA) between Diageo and the Rural Municipality of Gimli (RM) for wastewater treatment services.

Diageo is undertaking two projects to address specific wastewater discharge modifications to satisfy in the current ISA, which was signed by both Diageo and the RM in January 2022. The two project objectives are to: 1) reduce wastewater discharge temperature; and 2) better homogenize the wastewater quality and attenuate flow variations before being discharged into the RM's forcemain.

The improvements that are currently being planned include the installation of heat recovery systems to reduce effluent temperature and capture energy from the wastewater to be reused within Diageo's facility, and the addition of a second equalization (EQ) tank.

The heat reduction project is aimed at reducing the possible production of Hydrogen Sulfide (H2S) in the RM's forcemain servicing Diageo. This project is intended to reduce the atmospheric environmental impact at the RM's wastewater treatment plant (GWWTP). With implementation, there is a resulting energy efficiency for Diageo due to the reduction of natural gas demand. This in turn will also reduce the carbon footprint of the Diageo distillery. There is no change to the terrestrial and aquatic environmental effects.

Currently, Diageo has an EQ tank onsite that is used to buffer pH and attenuate flows and loads to the GWWTP. Based on wastewater production rates and strength, the volume required to achieve full homogenization is insufficient. An additional EQ tank of similar size to the existing, will provide the volume and residence time required for pH control (ISA stipulation) and wastewater homogenization prior to discharge into the forcemain. More detail is provided in the report regarding the proposed control method to be used by Diageo for equalization. The addition of a second EQ tank does not alter any environmental effects, nor provides for production expansion. That is, the daily flows and loads will remain the same but will be discharged at a more even pace and concentration over a 24-hour period.

DIAGEO

GLOBAL SUPPLY

Diageo Canada Inc.,
PO Box 2000
19107 Seagram Road
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Increased buffer volume, along with lower wastewater temperatures will allow the discharge of cooled and homogenized wastewater from Diageo into RM's forcemain. This project will have positive atmospheric environmental impacts at the GWWTP Headworks and provide a more stable flow and load to the GWWTP to help mitigate treatment operating challenges.

Diageo strives to be a good steward to the Gimli community and seeks continual improvement by working collaboratively in partnership with the RM of Gimli. Diageo has no plans to increase production at the Gimli facility and therefore there is no change to wastewater flows and loads over a 24-hour period. We hope the NOA report is satisfactory and contains sufficient information to demonstrate that the improvements at Diageo's distillery are positive from an environmental standpoint and are considered a minor alteration. Please do not hesitate to contact me for further clarification.

Sincerely,

[redacted]

Antoine Smith
Diageo Canada Inc.

DIAGEO CANADA, GIMLI, MB - WASTEWATER DISCHARGE IMPROVEMENTS - CONCEPTUAL DESIGN REPORT FOR ADDITIONAL EQUALIZATION STORAGE

Conceptual Design Report for Additional Equalization Storage

January 4, 2023

Prepared for:
Diageo Canada, Gimli MB

Prepared by:
Stantec Consulting Ltd.

Project Number:
111220588

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	Draft Report	A. Munoz	July 21, 2022	N. Szoke	July 15, 2022	T. Wu	July 22, 2022
1	Final Report	A. Munoz	July 21, 2022	N.Szoke	July 28, 2022	T. Wu	July 21, 2022
2	Final Report	A. Munoz	July 21, 2022	N.Szoke	January 3, 2023	Julian Xheko	Dec 30, 2022

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ACRONYMS / ABBREVIATIONS

BOD_5	Biochemical Oxygen Demand 5-day
BWW	Backwash Waste
COD	Chemical Oxygen Demand
d	Days
DO	Dissolved Oxygen
EQ	Equalization Tank
GWWTP	Gimli Wastewater Treatment Plant
H_2S	Hydrogen Sulfide
HP	Horsepower
HRT	Hydraulic Retention Time
HVAC	Heating, Ventilation and Air Conditioning
I&C	Instruments and Controls
IG	Imperial Gallon
kW	Kilowatt
MCC	Motor Control Center
mg/L	Milligrams per Liter
NPV	Net Present Value
O&M	Operation and Maintenance
OPC	Opinion of Probable Cost
OPCC	Opinion of Probable Capital Cost
OPOC	Opinion of Probable Operating Cost
PDC	Power Distribution Center
P&ID	Process and Instrumentation Diagram
RO	Reverse Osmosis
SCADA	Supervisory Control and Data Acquisition
SCFM	Standard Cubic Feet per Minute
SWD	Side Water Depth
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids

1 Introduction

The Diageo Gimli Distillery (DGD) has agreed to improve their wastewater discharged via forcemain to the Rural Municipality of Gimli (Gimli) Wastewater Treatment Plant (GWWTP). The wastewater improvement requirements are contained in the current industrial service agreement (ISA) and memorandum of understanding (MOU) between DGD and Gimli. The improvements agreed to include reduced variations in flow rate, reduction in liquid temperature, reduced variability in pH swings, and reduction in the sulfur mass.

The project scope includes establishing the design criteria to size the wastewater cooling equipment, equalization tank, and auxiliary systems based on historical wastewater data and plant operations. An updated and redefined Class 4 Opinion of Probable Cost (OPC) for the proposed modifications is also provided for budgeting purposes.

1.1 Purpose

The objective of this capital project is to develop a conceptual design for an expanded wastewater equalization (EQ) system including an interconnection to the new heat reduction system.

This report presents the recommended conceptual design for adding an EQ tank of equal size to the existing, operating strategy, and provisions to accommodate the heat reduction/recovery system that is presented in a separate report. Class 4 opinion are probable cost and schedule for the implementation of an EQ tanks with heat reduction provision have been developed and included for project budgeting purposes and timelines to realize the required wastewater improvements.

1.2 Report Organization

This report is divided into nine sections. The content is summarized below:

Section	Content
Section 1 - Introduction	Background on the project, a concise overview of its purpose and need, the report's content and acknowledgements
Section 2 –Review of background information	Discussion of background information that was reviewed in developing this report
Section 3 – Existing facility overview	Describe the existing wastewater handling units and associated components
Section 4 – Historical operating data	Review historical data to facilitate understanding of the strength of wastewater generated and discharged
Section 5 – Equalization tank basis of design	Overview of flow attenuation strategy and description of design criteria used in this report
Section 6 – Conclusions and recommendations	Summary of the work conducted in the previous sections

1.3 Acknowledgments

This report and its technical content were developed in close consultation and collaboration with DGD. Stantec would like to recognize and thank Diageo management and staff for their contributions connected with this effort, which included meeting attendance, document review and comment, response to questions, and providing data, input, and guidance relative to numerous inquiries throughout the of this conceptual design report.

2 Background Information

This section provides a discussion of the background information reviewed in developing this Report. Background information reviewed consisted of reports, as-built drawings and waste effluent quality data.

DGD currently uses a tank for temporary storage of wastewater to equalize flow and quality before being pumped into Gimli's forcemain system. The storage tank, (i.e., existing EQ tank) also acts as a detention tank to hold wastewater as required until the required wastewater pH is within stipulated limits for discharge. Starting and stopping of wastewater discharges related to pH control requires a certain volume of the EQ tank be held in reserve for detent purposes and consequently reduces the activate volume available to fully attenuate flow and quality variations. Upon review of monitored wastewater quality and variation in the measured data, the existing EQ tank is not able to consistently achieve the desired results with respect to wastewater homogenization and stable pH. Accordingly, a larger EQ volume is required to better facilitate pH control, fully homogenize quality variations, and permit a near constant discharge flow.

An initial review of the pH adjustment system suggests that it is possible to improve the performance and operation of the system. It is understood that DGD has taken steps to improve pH control to minimize EQ tank detention periods (i.e., flow stoppage) and be within a tighter pH range. Stantec can provide recommended modifications during the detail design as an additional service to optimize the operation and performance of the pH adjustment system. Modifications to the pH adjustment system is out of scope for this project.

A second issue impacting the GWWTP is the formation of H_2S in the forcemain due to the high temperature of the wastewater, its high organic strength and long retention time of wastewater in the forcemain system. These factors under normal pH conditions will result in elevated H_2S levels due to the forcemain acting as thermophilic/mesophilic reactor. Figure 2-1**Error! Reference source not found.** illustrates the fraction of H_2S in solution at a given pH and temperature. It is important to note that the fraction of H_2S increases significantly below a pH of 8.

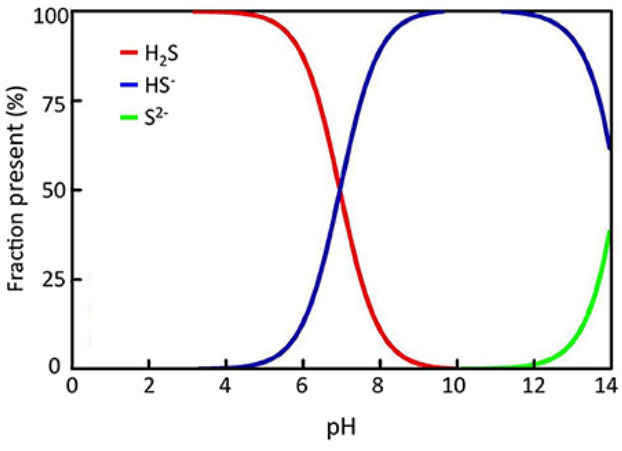

Figure 2-1: Dissociation of Hydrogen Sulfide with Temperature and pH (Source: Holmer, M. and Hasler-Sheetal, H. (2014)).

The forcemain system was reviewed to expand the system to accommodate future growth projections and system operation. The long residence times creates and environment conducive to the in-pipe formation of H_2S and could be a system wide problem for Gimli. The high organic strength of Diageo's wastewater coupled with high temperature will result anaerobic conditions in the forcemain causing the wastewater to go septic. Reducing the wastewater temperature will significantly reduce the mesophilic/thermophilic anerobic conditions in the forcemain system and formation of H_2S. In the future, it might be necessary to add a controlled air supply to keep the section of forcemain servicing Diageo from going anaerobic or adding a chemical such as ferric chloride ($FeCl_3$) to bind with the H_2S and neutralize septicity that could arise.

2.1 Previous Studies, Reports and Drawings

DGD provided reports and drawings that were reviewed as a part of the development of this Conceptual Design Report (CDR). A summary of each of the reports and drawings, including relevance to the current work, is provided in Table 2-1:.

Table 2-1: Background Information List

Report or Drawing Title
Flow Equalization System Operation
Diageo Process & Instrumentation Diagram (P&ID)
Diageo Gimli WWTP Phase I Engineering Services
Diageo Clearwater Switchover Lift Station
Diageo Production Floor Drawings
Diageo Underground services
Daily Raw Waste Quality and Flow Data
S:CAN data – six minutes sample interval
Equalization Tank Historical Trend
Reverse Osmosis (RO) Notice of Alteration Form
Forcemain Operations Review
Phase 3 Forcemain Schematic Layout

3 Existing Wastewater Facility Overview

This section describes the various wastewater streams and the waste handling facilities associated with the streams.

3.1 Groundwater Use

DGD currently uses well water (groundwater) for domestic uses and in the plant.

1. Clear water: Clear water is subjected only to a temperature change when it passes through heat exchangers and is discharged directly to Lake Winnipeg.

2. Dealkalizers; The dealkalized water is then collected and pumped to the production water system

RO reject will be blended with the clear water and discharged to Lake Winnipeg. The expected blend stream maximum flow will increase. The implementation of the RO system will have a two-fold positive effect by:

1. Eliminating the discharge of acid regeneration water, reducing the sulfur mass in wastewater discharge and commensurate H_2S formation in the forcemain; and

2. Wastewater pH fluctuation in the equalization tank, and its impact on the GWWTP.

The RO pre-treatment process, greensand filters, will generate a flow that will be discharged to the plant sewer system. This stream will have a very small impact on wastewater quality and total volume of wastewater directed to the GWWTP.

3.2 Wastewater Streams

DGD generates three types of wastewater streams:

1. Clear water

2. Raw waste influent

3. Spent water

3.3 Raw Waste Influent Handling Facilities

DGD utilizes a lift station, a pH adjustment and equalization tank to handle the raw wastewater influent generated at the plant.

The lift station conveys raw wastewater influent from the sump to the equalization tank. The storage system consists of an equalization tank and recirculation system.

3.3.1 EXISTING EQUALIZATION SYSTEM OPERATION

The existing equalization system provides a controlled and regulated flow of wastewater to the GWWTP. The tank drains and fills to buffer the various surge flows from the distillery operations.

The equalization tank is operated with four defined zones:

- Mixing zone
- Flow control zone
- Active buffer zone
- Reserve buffer zone

The equalization system is equipped with three controls as described in the following subsection.

3.3.1.1 Equalization Tank Mixing

The recirculation pump provides continuous effluent circulation in the tank, provided the tank level is above the minimum threshold.

3.3.1.2 Equalization Tank Effluent Flow Control

The discharge flow to the forcemain is controlled by the effluent pumps VFDs and throttling valve position based on the waste level in the equalization tank. The system also includes:

- A pH controller.
- Level indicators.
- Temperature indication.
- Alarms i.e., low temperature

A beacon on the equipment building's roof will light up in the case of a fault.

4 Historical Operating Data

4.1 Historical Daily Raw Waste Effluent Quality and Flow Data

A review of the historical data of wastewater pumped from the equalization tank is provided in this section. This data is analyzed to determine the strength of the wastewater and subsequently determine alternatives to mitigate its impact on the GWWTP.

The results indicate that the DGD wastewater can be classified as medium to high strength. Due to the high organic content, long residence time in the forcemain, and elevated wastewater temperature, it is expected that septic conditions will develop. Accordingly, mitigative measures such as wastewater cooling and equalization are being undertaken by DGD to help reduce operating issues at the GWWTP.

4.2 Data Review

A review of the historical data of wastewater pumped from the equalizations tank was analyzed to determine the diurnal pattern for key parameters, such as temperature, pH and flow. Analysis of the diurnal temperature profiles indicates that the raw waste temperature can rapidly increase or decrease. Temperature fluctuation of this magnitude could be better equalized if the operating volume of the equalization tank is increased.

Similarly, an analysis of the pH profiles indicates that pH can rapidly increase or decrease.Wastewater pH fluctuations of this magnitude cannot be equalized by increasing the operating volume of the equalization tank. With the implementation of the RO system, the pH fluctuations will be less intense and frequent.

4.3 Equalization Tank Historical Trend

A review of the equalization tank's historical trends is provided in this section. The equalization tank has multiple functions: pH adjustment, flow equalization and quality homogenization. Periodic shutdowns negatively impact the biological process at the GWWTP. Sequencing batch reactors (SBRs) are sensitive to flow surge and variable organic load strength.

5 Equalization System Basis of Design

This section describes of the upgrades required to bring the equalization system to the level of performance needed to attenuate wastewater flow and quality variability. The proposed upgrade consists of a dual tank equalization system where the first tank (existing tank) will be used for pH adjustment, and flow and pollutants load buffering and the second tank (new tank with mixing system) will be used for flow control. In addition, the first tank can be used to capture and hold out off specification discharges that can not be treated at GWWTP or bled back in at a rate that can be handled at the GWWTP.

The new tank will be equipped with recirculation pump mixing system. The wastewater flow will be pumped from the lift station to the first EQ tank and then to the second EQ Tank. The first EQ tank will be used for pH adjustment and quality homogenizing by maximizing the volume of liquid stored in this tank. The second tank will be used for flow control and emergency storage. Effluent from the second EQ tank will be conveyed by pumps to the Gimli WWTP. Should an upset occur during the distillery operations, the 1st EQ tank can be used to capture and hold the contents and the 2nd tank can be used in single tank mode. This provides DGD flexibility and robustness in wastewater discharges to GWWTP and disposal options of the captured off specification wastewater.

6 Conclusion and Recommendations

This report developed design criteria for equalization system improvements based on historical data, Stantec design experience and industry good practices.

The key conclusions of this study are:

- DGD wastewater effluent can be classified as medium to high strength.
- Anaerobic conditions are likely to develop due to the long retention time in the forcemain.
- Raw wastewater temperature can rapidly increase or decrease
- Raw wastewater pH can rapidly increase or decrease with the implementation of the RO system. The waste pH fluctuation will be less intense and frequent.
- Long and frequent shutdowns of the wastewater effluent pumping can negatively affect the biological process at the GWWTP

Upgrades of the equalization system coupled with an effluent cooling system will increase buffer storage and attenuate effluent flows, loads and temperature variability. The proposed upgrade consists of adding a second equalization tank. The dual tank equalization system will be operated as follows:

- The first tank (existing tank) will be used for pH adjustment and flow and pollutants load buffering by maximizing the volume of waste stored in this tank.
- The second tank will be used for flow control and emergency storage.
- The second tank will operate at constant flow with variable level.
- The system can be operated in a single tank mode to provide flexibility for operation and maintenance.

DIAGEO CANADA, GIMLI, MB - WASTEWATER DISCHARGE IMPROVEMENTS - CONCEPTUAL DESIGN REPORT FOR WASTEWATER COOLING

January 20, 2023

Prepared for:
Diageo Canada, Gimli MB

Prepared by:
Stantec Consulting Ltd.

Project Number:
111220588

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	Draft Report	RJL	Jul 22, 2022	AC	Jul 22, 2022		
1	Final Report	RJL	Jul 22, 2022	NS	Jan 11, 2023	BH	Oct 31, 2022

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1 Introduction

The Diageo Gimli Distillery is faced with the challenge of reducing the thermal impact of wastewater discharged from their facility to the municipality's forcemain.

It is the objective of this suite of projects to reduce the wastewater discharge temperature to a target of ≤ 30°C by cooling the wastewater streams adequately. Initially, it was thought sufficient to simply dispose of the waste energy through some means of atmospheric heat rejection. Upon further review, and in keeping with Diageo's sustainability stewardship, Stantec identified that there are feasible means to recover this energy and make use of it in the distillery process.

1.1 Purpose

The purpose of this conceptual design report is to explain the analysis undertaken to date with recommendations to implementation a heat recovery program as a primary objective, with the potential for heat rejection as a future option.

1.2 Report Organization

This report is divided into eight sections. The content is summarized below:

Section	Content
Section 1 - Introduction	Background on the project, a concise overview of its purpose and need, the report's content and acknowledgements
Section 2 –Review of background information	Analysis of background information that was reviewed in developing this report
Section 3 – Boiler Combustion Air Preheat	Description of the existing heat recovery system on the boiler combustion air system
Section 4 – Existing Heat Exchanger Upgrade	Description of the existing energy transfer systems from the distillation condensate stream to the ventilation preheat and chilled water loops
Section 5 – Equalization Tank Heat Recovery	Description of the new equalization tank heat recovery scheme
Section 6 – Future Heat Rejection	Description of the proposed potentially required heat rejection system
Section 7 – Conclusions and recommendations	Summary of the work conducted in the previous sections

1.3 Acknowledgments

This report and its technical content were developed in close collaboration with the Diageo Staff. Stantec would like to recognize and thank the Diageo staff for their feedback and contributions connected with this effort, which included meeting attendance, document review and comment, response to questions, and providing data, input and guidance relative to numerous inquiries throughout its preparation.

2 Review of Background Information

This section provides a discussion of the background information reviewed in developing this Report. Background information reviewed consisted of reports, process and as-built drawings and equipment specifications.

As a starting point, a review of the Diageo distillery process was undertaken to understand what processes contribute to the high wastewater temperature. An understanding of the sequence of process operations and their physical location in the Diageo facility was required to assess the situation. The piping and instrumentation diagram (P&IDs) were initially reviewed to understand the process steps, process inputs, process outcomes, and wastewater streams. Discussions with the Diageo staff also occurred and was very beneficial in understanding the processes and possible opportunities for energy re-use or transfer. It was identified that three processes were impacting the wastewater discharge temperatures:

1) The distillation process produces a continuous stream of heated wastewater. As such, it is likely the most significant contributor to the heated wastewater stream.

2) Where distillation occurs, and the alcohol product is boiled off during the cycle. At the end of the cycle leftover wastewater is discharged into the sewer, and the process is started over.

3) There are other miscellaneous heated processes that generate continuous heated wastewater. Some of these are cooled using plant cooling water.

It was concluded that two different approaches to heat recovery would have to be undertaken:

a) Source capture for the continuous processes; and,

b) End-of-line capture for the batch and miscellaneous wastewater streams.

3 Boiler Combustion Air Preheat

The first process that was reviewed was the continuous distillation still. Currently, this stream discharges directly to drain with the wastewater being conveyed to the GWWTP via the municipalities wastewater forcemain system. Stantec determined that a temperature reduction approach to this stream would be the most impactful to the overall objective of this project.

It was understood that an existing wastewater cooling process had been implemented. Many years ago, this wastewater stream had been used to pre-heat the natural gas heating boilers' combustion air.

The system had functioned effectively when operational and cooling the wastewater year-round was a potential solution to the high temperature wastewater if the system could be restored. The restoration of system operation was reviewed with a trusted mechanical contractor, and they confirmed the viability of a repair.

Stantec provided costing for two options:

1) to reroute the drain line above the floor and then interconnect with the drainage header; and

2) provide a new above grade, exterior drain line to the exterior lift station

Diageo indicated that a new exterior drain line was the preferred option. Based on the direction provided by Diageo, Stantec undertook a review of the routing, its feasibility, and the ability to support the additional piping.

Further review and discussion concluded that a drain line running from the Production Building directly to the location of a new EQ Tank Heat Exchanger Building, and then connecting to the existing wet well would be the most viable and cost-effective approach.

Initial anticipated line size is 4-inch diameter.

4 Existing Heat Exchanger Upgrade

The second process that was reviewed was the plant equipment cooling water to the ventilation air preheating system that connects to two waste energy recovery streams:

1) for plant combustion and ventilation air pre-heating; or,

2) for atmospheric heat rejection

Currently, the existing heat exchanger that allows the heat transfer to occur requires replacement. A replacement in-kind heat exchanger or a larger capacity heat exchanger replacement is recommended to allow this system to continue to reduce wastewater temperature.

Performance specifications for the existing heat exchanger have been located and preliminary selections of replacement equipment are in progress.

5 Equalization (EQ) Tank Heat Recovery

A separate wastewater cooling process was considered for the EQ tank system. Consideration of a side-stream removal of the contents of the tank was considered. In this arrangement, the equalized hot wastewater would be pumped from the tank through a new heat exchanger. Heat would be transferred from the wastewater to a glycol/water mixture and used as the working fluid to transfer the energy back into the process building. The cooled wastewater would be pumped back into the tank. The cooled wastewater in the tank would be pumped to the municipality's forcemain.

The glycol/water mixture would be pumped back to the process building and a return line would bring the cooled glycol mixture back to the EQ tank heat exchanger, following the same route as the supply line.

Preliminary selection of a set of duty/standby wastewater to glycol mixture heat exchangers have been obtained and are under review.

6 Future Heat Rejection

While it is believed the three processes and heat reduction/recovery approaches described previously would be sufficient to satisfactorily reduce the wastewater temperature, it is possible that additional cooling may be required.

There are a number of options available for future cooling:

1) Increasing cooling tower capacity;

2) Locating new dry or wet fluid coolers

3) Introduce water chillers

7 Conclusion and Recommendations

This report developed design criteria for conceptual designs for heat recovery systems to be implementation based on Diageo processes, analyses of opportunities, Stantec design experience, and industry good practices.

The key conclusions of this conceptual design study are:

- There are existing and potential heat recovery opportunities.
- An existing heat recovery system for the boiler combustion air preheat can be returned to service.
- An existing process water indirect heat recovery system is operational but requires equipment replacement.
- Should these system measures not fully achieve the design goal of reducing the wastewater temperature, a new tertiary system can be implemented to cool the wastewater stored in the EQ tank(s).
- The EQ tank heat recovery could be supplemented with additional heat rejection devices.
- The proposed solutions can be implemented in phases.
- It is therefore recommended that the projects proceed in the following order:

1. **Immediate Action:** Re-establishment of the boiler combustion air preheat system drain line.
2. **Immediate Action:** Replacement of the existing second floor heat exchanger.
3. **Near term:** Implementation of a new heat recovery system at the EQ tanks
4. **Intermediate to longer term** – Implementation of additional heat rejection equipment