Environment Act Proposal

Final Report

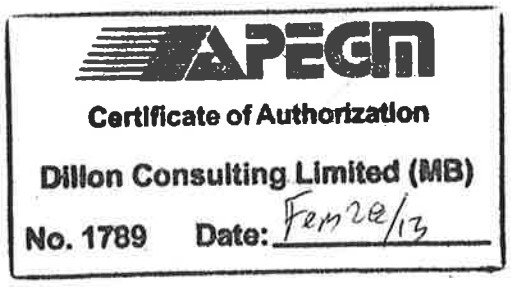
February 2013

Environment Act Proposal on behalf of
The Village of Dunnottar

Manitoba Water Services Board

12-6920-1000

John D. Ewing - Project Manager



Submitted by

Dillon Consulting Limited

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1 INTRODUCTION

The Village of Dunnottar (Dunnottar) endorsed the 2003 Lake Winnipeg Action Plan and has been active in its commitment to reduce nutrient loads to Lake Winnipeg. In 2004, Dunnottar invested in an evaluation of an in-place sludge reduction treatment process, recognizing sludge contributes to storage volume loss and adds nutrients back into the sewage effluent. Following its lagoon expansion in 2005-2006, in 2007 Dunnottar began a partnership with Dillon Consulting Limited (Dillon), Green Manitoba, the University of Manitoba, the National Research Council of Canada, and ALS Environmental to initiate an examination of the efficacy of passive filtration technologies in nutrient reduction treatment processes. Initial research and bench scale testing in 2007-2008 led to the construction of four pilot-scale passive filter cells to analyze the outcomes of media choice and flow direction. Field testing of the filter cells begun in 2009, contained within the existing Dunnottar lagoon operation. It was found that the two cells containing natural media performed the best, with the vertical flow cell yielding higher nutrient reduction rates than the horizontal flow cell. In 2011 Dunnottar received regulatory approval to discharge treated effluent directly from the two natural media filter cells. From August to October, 2011, approximately 350 m^3 of treated effluent was discharged off-site from the passive filter, with tests showing good quality effluent in compliance with the Environmental Licence. In 2012, Dunnottar again received regulatory approval to discharge off-site, releasing approximately 800 m^3 of treated effluent in compliance with the Environmental Licence.

Over its four operating seasons (2009-2012), the unsaturated vertical flow filter has demonstrated effective reduction of nutrients (N&P), pathogens, BOD and suspended solids in the lagoon effluent. The removal efficiency of all test parameters is high, ranging from 50% to 80% through the filter, with up to 60% reduction of total nitrogen and up to 70% reduction of total phosphorus.

By implementing a full-scale passive filter, Dunnottar expects to reduce its annual P load by approximately 50% to 82 kg/yr (at the anticipated 2013 annual discharge volume of 60,000 m^3), with ammonia concentrations well below toxic levels to fish.

This Environment Act Proposal report is in support of an application by Dunnottar to construct, operate, and continuously discharge (between June 16 and September 15 each year) from a full-scale polishing filter system, including a UV disinfection component. The filter system would augment Dunnottar's current operation but not negate the need for batch discharge from the lagoon between September 16 and October 31 each year.

It is intended that the current terms and conditions of Dunnottar's lagoon operating licence be carried forward, with the sole addition of terms permitting the construction of, operation of, and discharge from the passive filter system.

2 BACKGROUND

Dunnottar owns and operates a municipal wastewater lagoon system, operating under Environment Act License No.2704, issued October 6, 2005. Wastewater treatment systems are considered Class 2 developments under the Manitoba Environment Act, and approval for major alterations must be granted by Manitoba Conservation and Water Stewardship.

Although Dunnottar is a small community, with an estimated permanent population of 725, it is committed to reducing its impact on Lake Winnipeg. Dunnottar's proposal to implement a nutrient reduction strategy uses a passive filter to polish the lagoon effluent, recapturing nitrogen and phosphorus for harvesting. In addition to nutrient reduction, the proposed passive filter will reduce BOD, TSS, and fecal coliforms and, using UV treatment, disinfect the effluent. This will produce high quality effluent that can be safely discharged during the summer months.

2.1 Existing Facilities

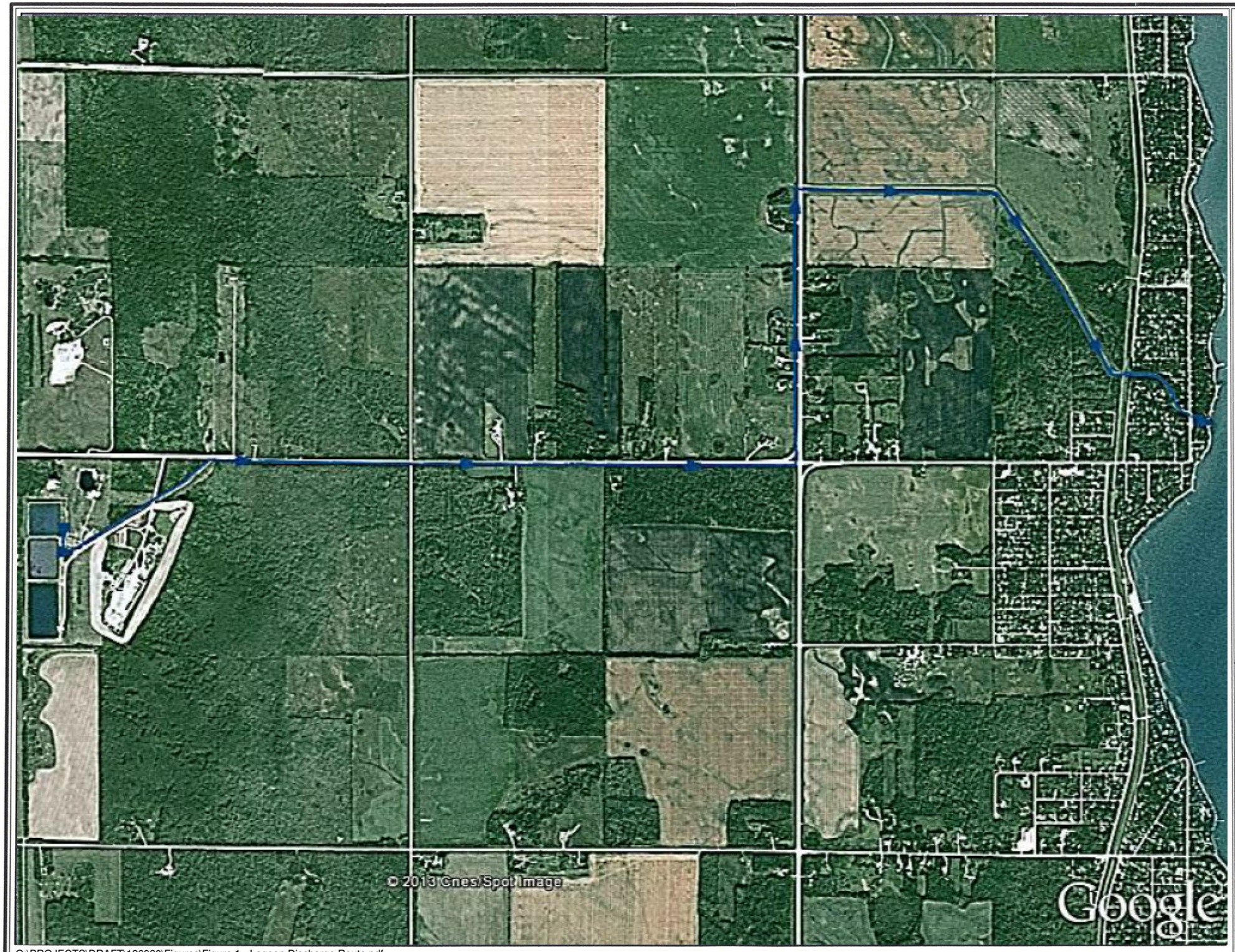
The existing Dunnottar Lagoon is a three-cell facultative lagoon. The first two cells (primary and secondary) were originally constructed in 1984. The third cell, also a secondary cell, was constructed in 2005 to increase the hydraulic capacity of the lagoon system. The cells operate in sequence: once the primary cell is full, the intervening valve is opened, the original secondary cell is filled, and finally the newer secondary cell is filled. Treated effluent is discharged from both secondary cells, after cell isolation and testing to verify each cell's effluent quality is in compliance with the operating licence discharge requirements.

The lagoon accepts liquid sewage from Dunnottar, which is collected from local residents' sewage holding tanks on a weekly basis and trucked to the lagoon. Solids, otherwise known as septage and removed from the septic tanks every one to three years as needed, are also taken to the lagoon for treatment. The lagoon has demonstrated over the past 30 years to be functioning in full compliance with its operating licence.

2.1.1 Lagoon Discharge Route, Unchanged

Discharge from the lagoon is permitted to flow through the local ditch system along Highway 225 for approximately 2.4 km, then 1.2 km north along PTH 9. At this point it flows east, under PTH 9, into Tegula Creek. It then flows approximately 1.5 km to Lake Winnipeg. There are no changes proposed to this discharge route, shown on **Figure 1**, next page.

The Lagoon is currently discharged once per year between September 16 and October 31. It is proposed to add to the current discharge period to also permit continuous release of treated effluent from the passive filter and UV disinfection system no earlier than June 16 and no later than September 15. No change is proposed for batch discharge from the lagoon: the secondary cells would continue to be emptied directly into the drainage route (after successful compliance testing) between September 16 and October 31.



Legend

Drainage Route

N
W E
S

0 125 250 500 750
Meters

Scale 1 : 15,840

North Amercian Datum (NAD83 - Zone 14)
Universal Transverse Mercator Projection

Client	Produced by
Village of Dunnottar	DILLON CONSULTING

Title

Figure 1: Lagoon Discharge Route

Data Source: Google Earth

Project Name: Village of Dunnottar Environment Act Proposal

Project Number	Date
12-6920	February 7, 2013

O:\PROJECTS\DRAFT\126920\Figures\Figure 1 - Lagoon Discharge Route.pdf

2.1.2 Hydraulic Loading

The 2005 lagoon expansion increased available storage volume in the lagoon system to 60,000 m^3, designed to provide 365 day storage for hydraulic load from 725 permanent residents and a summer population of 3,500 people. Operationally, the Dunnottar lagoon is not yet experiencing storage capacity issues.

The introduction of the full-scale passive filter, which can operate continuously during the summer to treat and discharge flows up to 500 m^3/d, would increase the effective hydraulic capacity of the Dunnottar system. That is, the existing lagoon would only need to provide storage for wastewater received during the winter and start of summer (i.e. between November 1 and June 15). Hence the lagoon would be able to accommodate an average winter load of 265 m^3/d (up from 100 m^3/d), the amount of wastewater produced from an estimated 1325 permanent residents on the basis of 200 L/p/d loadings.

The passive filter will provide:

- A reduction in Total Phosphorus annual loading to Lake Winnipeg; and
- Effective capacity growth equivalent to the loading from an additional 600 permanent residents.

2.1.3 Organic Loading

Although the permanent population of Dunnottar has increased since the last lagoon treatment capacity assessment in 2002, the summer peak population of 3500, on which the maximum organic loading rate is based, has not. Hence the maximum organic loading rate would still be 39 kg BOD_5/ha/day, below the licenced maximum 56 kg BOD_5/ha/day. Therefore, no additional treatment surface area is contemplated as part of this proposal.

2.2 Previous Studies and Activities

In August 2002, Dillon prepared a report entitled *Sewage Lagoon Expansion*. This report determined the required volume for a new secondary cell and reported the findings of preliminary boreholes that were drilled in the vicinity of the proposed lagoon expansion site. A copy of this report was attached to the subsequent Environment Act Proposal Form submitted by Dillon in 2005 to request regulatory approval to implement the recommended lagoon expansion. The 2005 Environment Act Proposal also defined the environmental setting of the site, including land use/vegetation, wildlife, fisheries, and historic/archaeological resources; it discussed potential environmental impacts during construction and operation of the proposed project; and it identified mitigation measures.

The research and development of the passive filter has been in the public "view" since the early stages of conceptual planning in 2007. Since 2009, Dillon has also prepared and submitted annual operating, monitoring, and contingency plans and final operating reports to Manitoba Conservation documenting the operations and observed operating effectiveness of the pilot passive filter, installed adjacent to the Dunnottar sewage lagoon. The pilot-scale passive filter construction and operating details are similar to this proposal for a full-scale passive filter.

The details of the passive filter have been presented in numerous conferences and public meeting formats for the past several years, outlining Dunnottar's proposal to reduce effluent nutrient loading and increase the effective storage capacity of its existing facultative lagoons through continuous low flow rate summer discharge from the passive filter. This includes a presentation to Living Lakes Canada in 2012, a presentation to the Economic Development Association of Manitoba 2012 Spring Forum, inclusion in a locally produced video marketing Lake Friendly initiatives, and a segment on the CBC production "The Nature of Things" aired originally in 2012.

Locally, details on the passive filter have been circulated in the "Dunnottar News," a public mail-out from the Village Council and on an information sheet (see **Appendix A**), which has been available for public information at the Village office. The Dunnottar local community and area residents have been aware of this project development for several years and the response observed by the proponents is positive and supportive of the passive filter purpose and objectives.

3 DESCRIPTION OF DEVELOPMENT

3.1 Site

3.1.1 Certificate of Title

The proposed full-scale passive filtration and UV disinfection system additions to the Dunnottar sewage lagoon are to be located adjacent to the existing sewage lagoon in the R.M. of St. Andrews approximately 4.5 km west of Dunnottar. The existing sewage lagoon borders the town landfill, on the south side of Provincial Highway 225. It is located in the northwest quarter of Section Eight in the Seventeenth Township and Fourth Range, East of the Principal Meridian in Manitoba (NW 08-17-04E). The parcel of land that makes up the site is currently owned by Dunnottar. A copy of the Certificate of Title for this property is provided in **Appendix B.**

3.1.2 Mineral Rights

The mines and mineral rights beneath the site of the proposed development are owned by Canpar Holdings Ltd.; sand and gravel rights are held privately by the current surface owner. A copy of the Certificate of Title for Mines and Minerals is included in **Appendix B**.

3.1.3 Current Land Use

The proposed site for the construction is currently undeveloped land within the existing sewage lagoon land parcel. Properties surrounding the site are used mainly for agricultural and residential (farm homesteads) purposes, with the exception of the Dunnottar landfill, which is located immediately east of the existing sewage lagoon. The proposed site and lands adjoining the site are all classified as Agricultural A80.

Construction and operation of the proposed passive filter system will not change the land use designation on the property. Land use on properties adjacent to the plant site will not be altered by the expansion and operation of the sewage lagoon. In addition, the road paralleling the northern edge of the lagoon site (Provincial Highway 225) and the access road bisecting the property will continue to be operational.

3.2 Construction

3.2.1 Proposed Design

The proposed construction work will include:

- A two-cell full-scale passive filtration system, complete with all internal media and piping;
- An ultraviolet disinfection component, including power hook-up; and
- Influent and effluent manholes and pumps.

Passive Filter

The passive filter will consist of two vertical flow 25 m x 50 m cells for a total bed volume of 3000 m^3. At average design flow rates of 250 m^3/d, the filter rate will be 0.004 m/hr. The system can accommodate peak flows of 500 m^3/d.

The passive filter is proposed to be installed adjacent to Dunnottar lagoon, as shown on **Figure 2** and **Figure 3** (next pages). It will be an earthen structure, excavated and surrounded by a berm made of re-compacted clayey soil with low permeability. The filter cells will be lined with a 30 mil PVC geomembrane liner. The cells will be filled with natural media (select sizes of rocks, sand, and gravel) and will be covered with organic soil which will be planted with local plants that can contribute to the nutrient reduction and removal processes. The organic soil layer will also contain perforated piping that distributes the wastewater flow across the filter bed. The total bed depth will be 1.2 m, with 0.3 m of liquid freeboard. The choice of native materials will contribute to a very natural structure that can blend into the surrounding environment. See **Figure 4** for cross-sectional details**.**

UV Disinfection

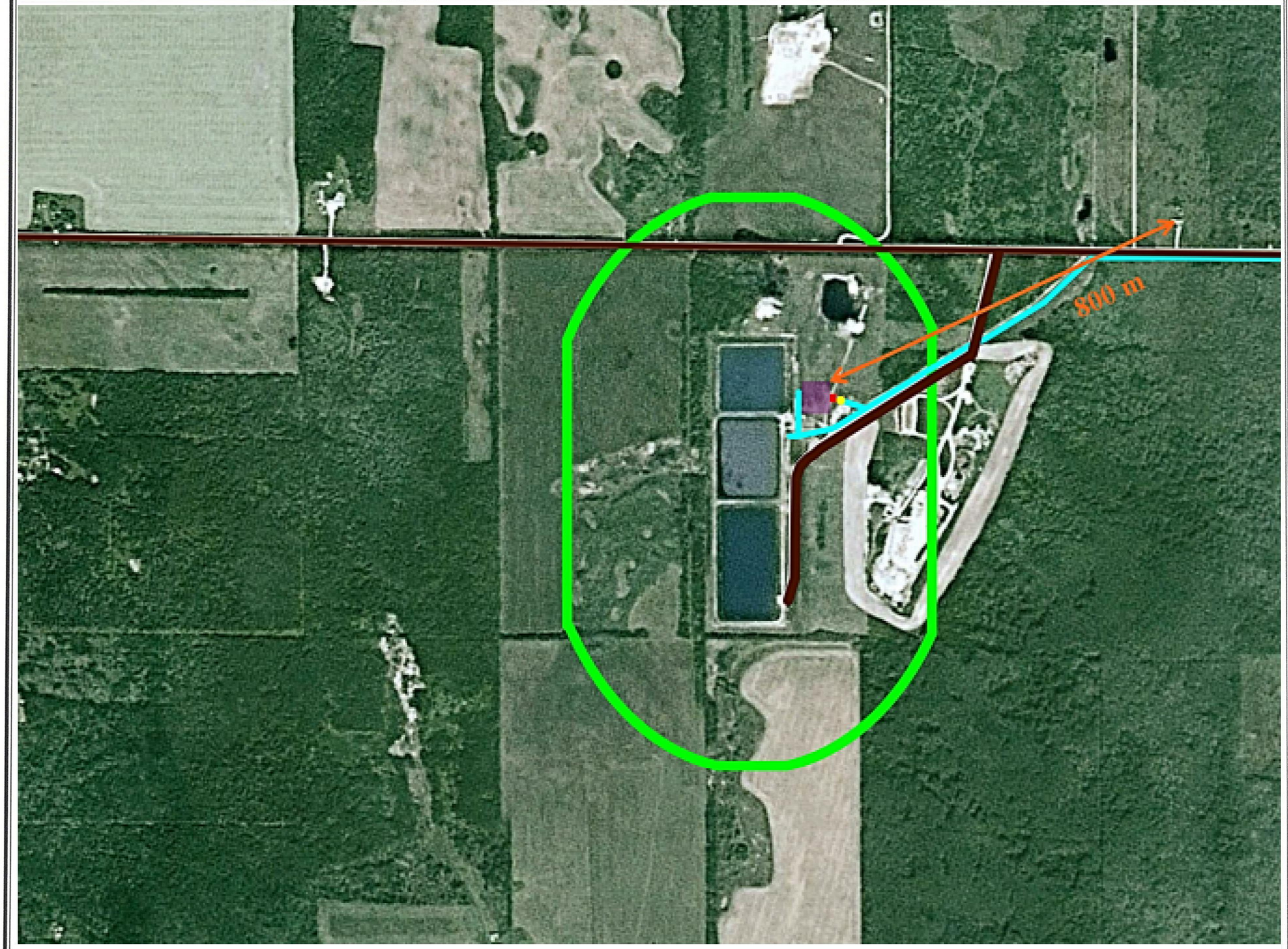
An in-line UV disinfection unit will be installed in the effluent discharge piping that leads from the passive filter discharge point to the existing lagoon effluent discharge drain, as shown on **Figure 2**. The UV disinfection unit and control panel will be housed in a small pre-constructed building to provide weather-shielded maintenance access. It will be capable of continuous operation during discharge to augment the pathogen-inactivation capabilities of the passive filter, if required.

Influent and Effluent Manholes and Pumps

Wastewater coming to the passive filter will flow from the third cell of the Dunnottar lagoon, using the existing outlet valve and piping. An added tee will allow flow to be directed to either or both of the passive filter influent wet well and/or the current lagoon drainage route. During passive filter operation, wastewater will be pumped from the influent wet well to the passive filter distribution piping, as shown on **Figure 5**. Flow rates to the passive filter will be controlled by adjusting the pumping rate and opening or closing the tee valves.

Treated effluent will be gathered at the bottom of the passive filter and collected in an effluent wetwell, where it can be pumped back to the lagoon or discharged directly to the existing lagoon drainage channel (see **Figure 1** for lagoon drainage route and **Figure 4** for design details).

Both influent and effluent wetwell pumps will be submersible pumps alternating operation in a standard duplex arrangement. The effluent wetwell pump control panel will also be housed in the UV building.



Legend

- Access Route
- Discharge Route
- Passive Filter Footprint
- UV Disinfection Unit
- Nearest Residence
- Effluent Quality Monitoring Point
- 1000 ft Buffer

N
W E
S

Client: Village of Dunnottar	Produced by: DILLON CONSULTING

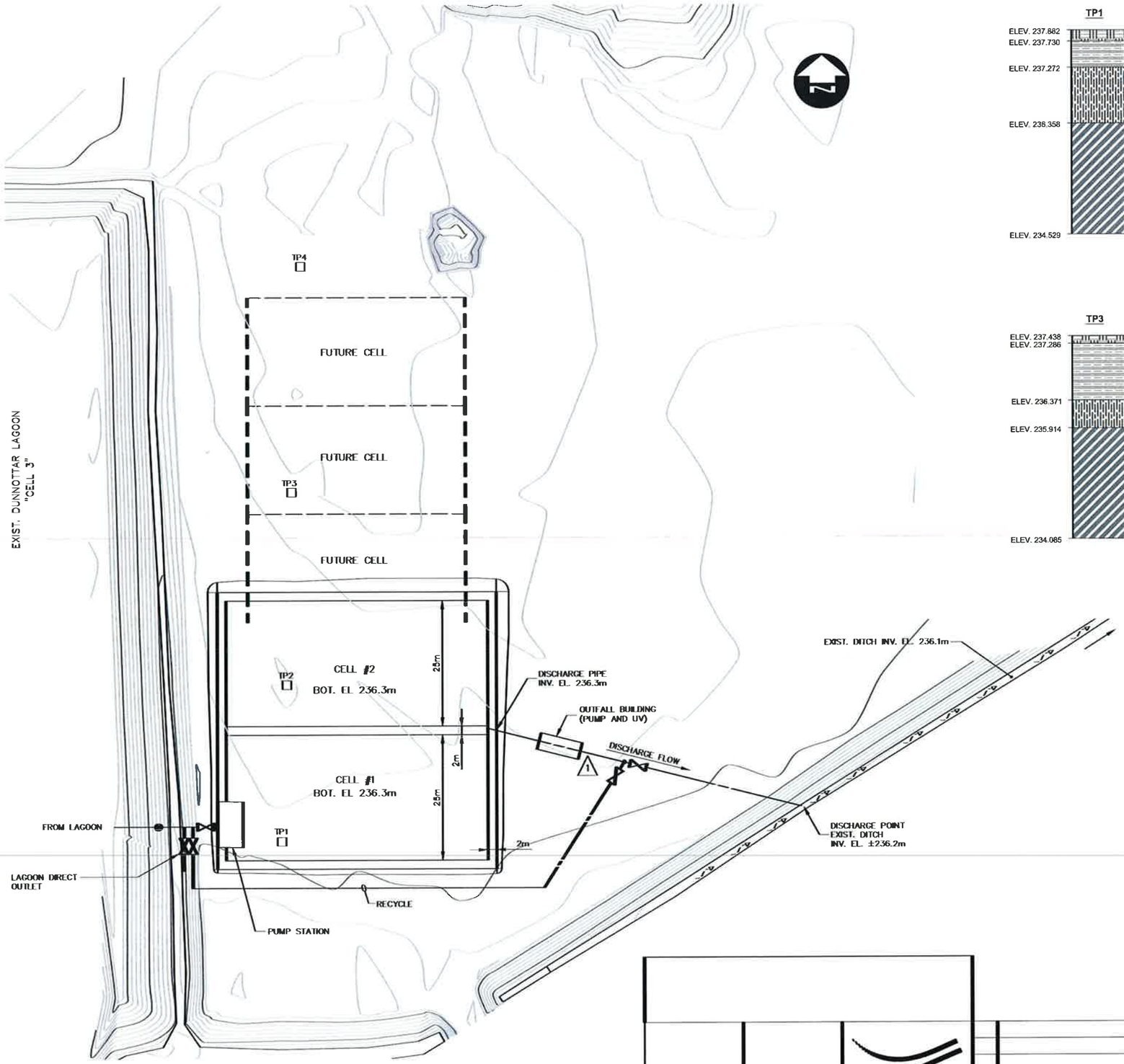
Title: **Figure 2: Site Layout**

Data Source: Google Earth

Project Name: Village of Dunnottar Environment Act Proposal

Project Number	Date
12-6920	February 27, 2013

O:\PROJECTS\DRAFT\126920\Figures\Figure 2 - Site Layout.pdf



SITE PLAN
SCALE 1 : 500

0 25 50
SCALE IN METRES

TP1

ELEV. 237.882
ELEV. 237.730
ELEV. 237.272
ELEV. 236.358
ELEV. 234.529

GRAVELLY SAND - DARK BROWN, GRASS COVERED
Clay - dark brown, moist, with silt
CLAYEY SILT - LIGHT BROWN, MOIST, STIFF, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
SILTY CLAY - LIGHT BROWN, MOIST, STIFF TO FIRM, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
END OF TEST PIT AT 3.4 M BELOW EXISTING GRADE (ELEV. 234.529).
- NO SEEPAGE OR SLOUGHING OBSERVED DURING TEST PITTING.
- TEST PIT BACKFILLED WITH EXCAVATED SANDY CLAY MATERIALS.

TP2

ELEV. 237.570
ELEV. 237.418
ELEV. 236.656
ELEV. 236.503
ELEV. 235.893
ELEV. 234.217

GRAVELLY SAND - DARK BROWN, GRASS COVERED
SAND - LIGHT BROWN, MOIST, AND SILT, FINE TO MEDIUM GRAINED, SOME GRAVEL SIZES
CLAY - DARK BROWN, MOIST, WITH SILT
CLAYEY SILT - LIGHT BROWN, MOIST, STIFF, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
SILTY CLAY - LIGHT BROWN, MOIST, STIFF TO FIRM, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
END OF TEST PIT AT 3.4 M BELOW EXISTING GRADE (ELEV. 234.217).
- NO SEEPAGE OR SLOUGHING OBSERVED DURING TEST PITTING.
- TEST PIT BACKFILLED WITH EXCAVATED SANDY CLAY MATERIALS.

TP3

ELEV. 237.438
ELEV. 237.286
ELEV. 236.371
ELEV. 235.914
ELEV. 234.085

GRAVELLY SAND - DARK BROWN, GRASS COVERED
CLAY - DARK BROWN, MOIST, WITH SILT
CLAYEY SILT - LIGHT BROWN, MOIST, STIFF, SILT LENSES, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
SILTY CLAY - LIGHT BROWN, MOIST, STIFF TO FIRM, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
END OF TEST PIT AT 3.4 M BELOW EXISTING GRADE (ELEV. 234.085).
- NO SEEPAGE OR SLOUGHING OBSERVED DURING TEST PITTING.
- TEST PIT BACKFILLED WITH EXCAVATED SANDY CLAY MATERIALS.

TP4

ELEV. 237.246
ELEV. 237.119
ELEV. 233.893

GRAVELLY SAND - DARK BROWN, GRASS COVERED
SILTY CLAY - LIGHT BROWN, MOIST, STIFF, SOME GRAVEL SIZES, OCCASIONAL COBBLES / BOULDERS
END OF TEST PIT AT 3.4 M BELOW EXISTING GRADE (ELEV. 233.893).
- NO SEEPAGE OR SLOUGHING OBSERVED DURING TEST PITTING.
- TEST PIT BACKFILLED WITH EXCAVATED SANDY CLAY MATERIALS.

APEGM
Certificate of Authorization
Dillon Consulting Limited (MB)
No. 1789 Date: Feb 20/13

LEGEND:

TP# TEST PIT LOCATIONS – EXCAVATED APRIL 2012

1 EFFLUENT QUALITY COMPLIANCE STATION

NOTE:

- FINAL FILTER ELEVATION SUBJECT TO ADJUSTMENT TO SUIT CONSTRUCTION REQUIREMENTS FOR CUT/FILL BALANCE AND TO SUIT LOCAL SITE.
- TOPO SURVEY DATE APRIL, 2012.
- GEODETIC ELEV. SHOWN.

PROVINCE OF MANITOBA
T.A.R. PARKINSON
Member
33891
REGISTERED PROFESSIONAL ENGINEER

DILLON CONSULTING

NO.	REVISIONS	DATE	BY

DESIGNED BY J.D.E.
REVIEWED BY S.K.B.
DRAWN BY
CHECKED BY
DATE FEB 12, 2013
SCALE AS NOTED

DUNNOTTAR PASSIVE FILTER

SITE PLANS AND TESTHOLE LOGS

FILE NO. 126920
DRAWING NO. 3

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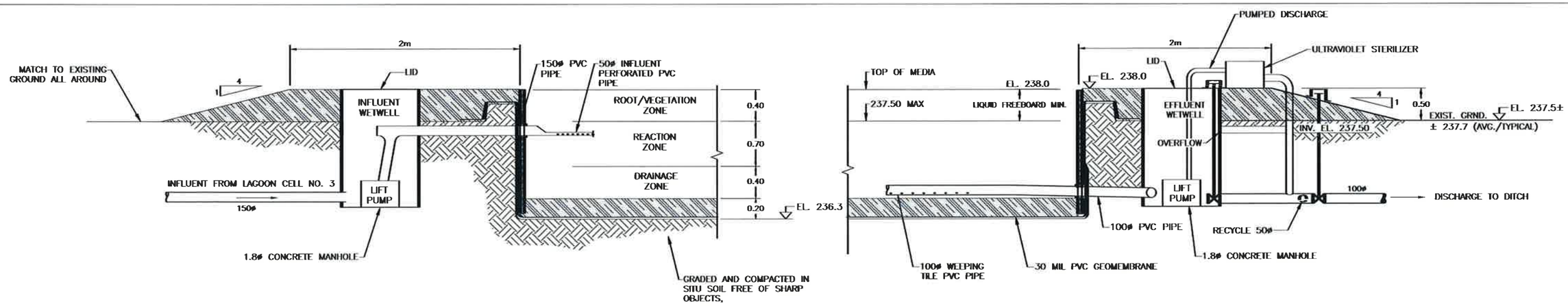
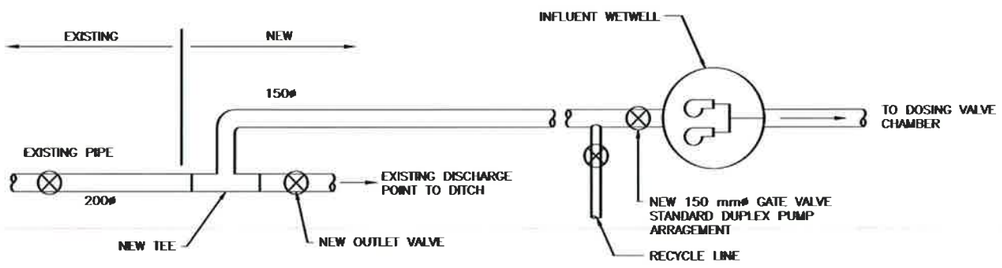


CROSS-SECTION – FILTER
N.T.S.



ANCHOR TRENCH DETAIL
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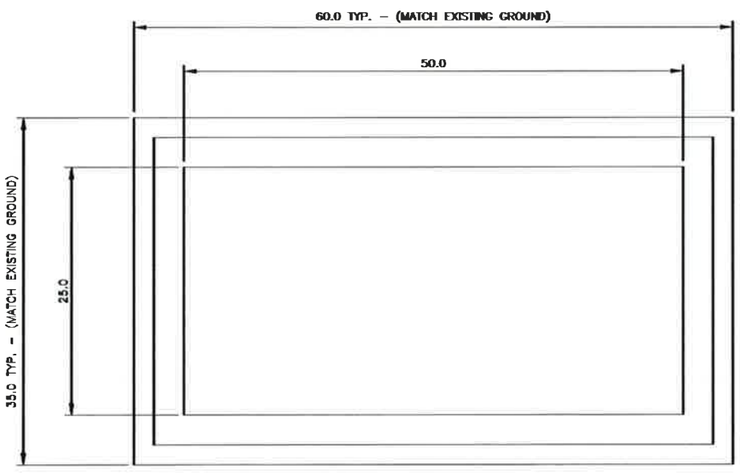
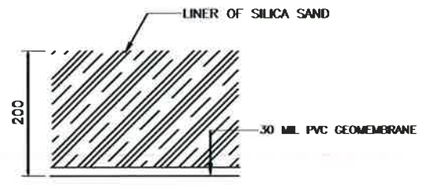
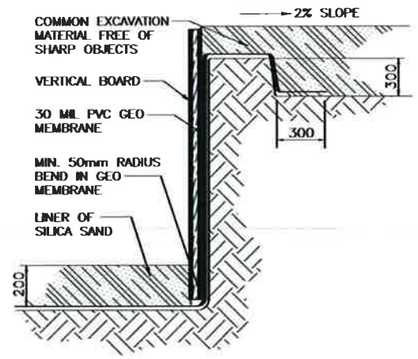


PLAN – FILTER CELL DIMENSIONS
N.T.S.



TYPICAL LINER COVER DETAIL
N.T.S.



TYPICAL WALL SECTION – FILTER CELL
N.T.S.

APEGM
Certificate of Authorization
Dillon Consulting Limited (MB)
No. 1789 Date: Feb 20/13

PROVINCE OF MANITOBA
I.A.R. PARKINSON
Member 33891
REGISTERED PROFESSIONAL ENGINEER

DILLON CONSULTING

NO.	REVISIONS	DATE	BY

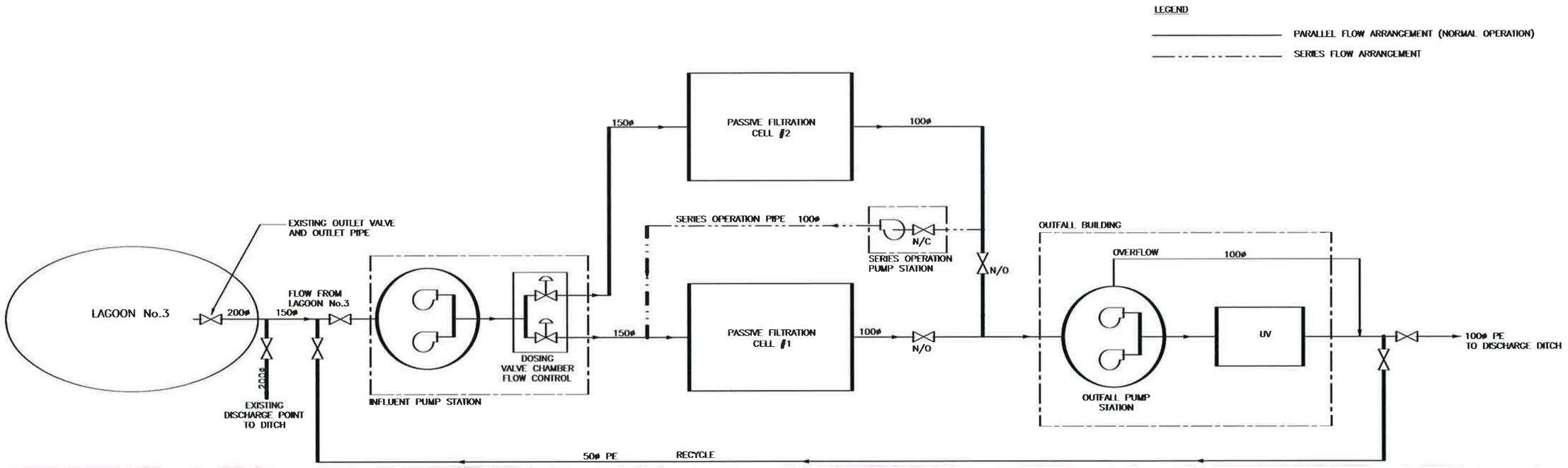
DESIGNED BY J.D.F.
REVIEWED BY S.K.B.
DRAWN BY
CHECKED BY
DATE FEB 12, 2013
SCALE AS NOTED

DUNNOTTAR PASSIVE FILTER

FILTER CROSS-SECTION AND DETAILS

FILE NO. 126920
DRAWING NO. 4

4DILLON ACAD FILE: G:\CAD\115303\REPORTS\DUNNOTAR CROSS SECTION AND DETAILS.DWG 02/07/13



PROCESS FLOW DIAGRAM
N.T.S.

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No. 1789 Date: Feb 20/13

PROVINCE OF MANITOBA
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DRAWN BY
CHECKED BY
DATE FEB 12, 2013
SCALE AS NOTED

DUNNOTTAR PASSIVE FILTER

PROCESS FLOW DIAGRAM

FILE NO. 126920
DRAWING NO. 5

3.2.2 Proposed Construction

Existing clayey soil material on-site, as identified in the borehole logs on **Figure 3** will be used to construct the containment structure around the filter cells. The filter cells will be lined with an impermeable PVC geomembrane liner. Area grading, drainage, and general landscaping will be undertaken as required; the topographic survey shows no significant efforts required (**Figure 3**).

No ditches in the vicinity of PR 225 will be disturbed. The contractor will, as a general condition of the contract, be required to restore any damage to any property resulting from this work.

3.2.3 Proposed Schedule

At this time, construction is expected to begin in spring 2013 once approval has been received from Manitoba Conservation and once a contractor has been retained for the proposed work. Construction of the proposed system is expected to take approximately eight weeks. The full-scale filter and UV disinfection systems would begin operation in summer 2013.

3.2.4 Funding

This project is being funded on a 50/50 basis by Dunnottar and the Manitoba Water Services Board.

3.3 Operation

The operation of the passive filter will consist of setting and adjusting flow rates to the passive filter from time to time (by changing the rate of the influent pump); opening and closing the appropriate valves during start-up and shut-down; and harvesting vegetation from the passive filter surface as necessary.

3.3.1 Proposed Discharge

The lagoon is currently discharged once per year, in the fall, between September 16 and October 31. No change is proposed: the addition of the full-scale passive filter system will not affect the lagoon operational procedures. The lagoon system will continue to fill the primary cell first. When "full," the valve to the older secondary cell will be opened, and similarly then the valve to the newer secondary cell will be opened. The lagoon will continue to be isolated, tested, and discharged annually, as may be required, to release the remaining stored liquid prior to the winter operating season.

The licence addition proposed is that continuous discharge also be permitted from the passive filter and UV disinfection unit between June 16 and September 15. The UV disinfection unit will follow directly after the filter and will be monitored to evaluate the need for the unit and its efficacy.

No changes to the current lagoon discharge route or grades of the existing discharge route off the Dunnottar property are proposed.

3.3.2 Modifications to Lagoon Operation

The only change to the lagoon operation will be the opening of a valve allowing flow from the northern-most secondary cell to the passive filter during the spring and summer. The start and end dates of the filter operation may be adjusted based on suitable weather for the operation, but the passive filter will not discharge to the drainage outlet except between June 16 and September 15.

3.3.3 Pilot-Scale Filter

It is intended that the existing pilot-scale passive filter will continue to be operated for research and development purposes, including to test flow variations and filter bed operating life. It will be operated in the same manner as approved by Manitoba Conservation in 2012, and the reporting will be the same. The request to continue to operate the pilot-scale passive filter has been presented in a separate letter to Manitoba Conservation.

3.3.4 Contingency Plans

The contingency plan is to address problems which could occur during facility operations. Such problems may be due to design, construction or operational incidents, or unpredictable events.

In the event of an observed upset condition, the following reporting process will be followed:

1 Dunnottar CAO will be notified through Dunnnottar's office;

2 Dunnottar CAO, assisted by Dillon, will assess the situation and determine next steps;

3 Local action to repair or replace any malfunctioning equipment will be undertaken by Dunnottar and will be recorded in the operating log sheets; and

4 Manitoba Conservation and Water Stewardship will be notified in the event the condition may impact the environment, as soon as it is known; otherwise any disruption to normal operation will be recorded and reported at year end.

Some examples of incidents that could occur are detailed in **Table 1** below.

Table 1: Contingency Plan Communications

Condition/ Incident	Action	Incident Report to MB Conservation	Year End Report to MB Conservation
1. Heavy rains saturated filters	• Turn down or shut off feed pump, until system stabilizes. • Determine cause and resolve.	No	Yes
2. Filter field clogging	• Turn down or shut off feed pump, until system stabilizes; excavate part of field to examine nature of clogging/blockage.	No	Yes
3. Pump failure	• System feed pump is interlocked to effluent pump operation. • Inspect to ensure lock out is working, and repair failed feed pump.	No	Yes
4. Effluent quality/ discharge quality	• Shut down feed pump to filter if deviation from 'normal' results is significant. • Shut down filter and examine cause. • Direct all filter effluent back to lagoon and cease discharge off site.	No	Yes
5. Vandalism	• Inspect condition and repair.	Yes	Yes
6. On-site safety issue, illegal entry	• Inspect condition and repair.	Yes	Yes
7. Raw Influent release off-site	• Determine extent and cause of release. • Rectify issue and restart operation.	Yes	Yes

3.4 Maintenance

No changes to the lagoon maintenance are proposed. Passive filter vegetation will be harvested on an as-needed basis and tested for operational improvement purposes, including mass and phosphorus uptake estimates. The harvested vegetation will then be composted at the adjacent Dunnottar landfill, and the compost will be made available to residents. It is expected that the natural media will not require replacement for at least 25 years. The UV disinfection unit will be cleaned and bulbs replaced as needed. Pumps and manholes will be inspected and serviced annually.

3.5 Decommissioning

No decommissioning of the Dunnottar pilot-scale filter or its lagoon system is currently planned. If decommissioning should be required at some future time, site decommissioning would be undertaken in a manner consistent with up-to-date environmental standards and legislation, as well as a consideration of the intended future use(s) at the site.

4 DESCRIPTION OF ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Potential environmental impacts as a result of pollutants being released by the lagoon facility, as well as any potential effects to wildlife, fisheries, surface and ground water, forestry, heritage resources, and social and economic conditions are not anticipated as a result of the construction and operation of the full-scale passive filter and UV disinfection unit.

4.1 Regional Context

The project site is situated in the Gimli Ecodistrict, within the eastern portion of the Interlake Plain Ecoregion of the Boreal Plains Ecozone. The Gimli Ecodistrict lies along the southwestern shore of the south basin of Lake Winnipeg. It extends from Birds Hill in the south to the Fisher River Lowland near Dallas, Manitoba in the north (Smith et al., 1998). Dunnottar is a shoreline community located on the southern end of Lake Winnipeg.

4.1.1 Climate

The project site is located in the Interlake Plain Ecoregion of Canada. This Ecoregion forms a portion of the extensive Subhumid Low Boreal Ecoclimate Region that extends from south-eastern Manitoba to the Peace River in north-central Alberta. The climate is characterized by short, warm summers and long, cold winters. The Ecodistrict has a humid, moderately cold, Cryoboreal to subhumid, cool, Boreal soil climate. The region experiences variable winds, an abundance of sunshine, and occurrences of severe weather incidences in all seasons (Smith et al., 1998).

Climate can be defined as the generally prevailing weather conditions of a region throughout the year, and is typically described by variables such as air pressure, cloud cover, humidity, precipitation, hours of sunshine, temperature, wind speed and wind direction. Environment Canada has collected climate data for several areas within Canada from 1971 to 2000. The Environment Canada weather reporting station considered to be closest to the Study Area is located at the Gimli Airport. This station is located at Latitude 50°38’ N and Longitude 97°01’ W at an elevation of 222.8 m above sea level. **Table 2**, next page, summarizes the Canadian Climate Normals data from 1971 to 2000 for the Gimli Airport.

The annual mean temperature is 1.8°C and the average growing season is 176 days. The mean daily temperature in January is -18.2°C while in July the mean daily temperature is about 19.2°C. The mean annual precipitation is about 532.5 mm, of which about three-quarters falls as rain and one-quarter falls as snow. Precipitation varies greatly on a yearly basis and is highest from late spring through summer. The average annual moisture deficit is nearly 100 mm. The average annual wind speed is 12.3 km/h and is most frequently blowing from the northwest (Environment Canada, 2012).

Table 2: Climate Normals Summary for Gimli, Manitoba (1971-2000)[1]

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average Temperature (°C)	-18.2	-14.8	-7.3	2.7	10.6	16.1	19.2	17.5	11.6	4.8	-5.2	-15.4	1.8
Daily Maximum (°C)	-12.8	-9.3	-1.8	8.2	16.3	21.6	24.9	23.2	16.9	9.5	-1.1	-10.5	7.1
Daily Minimum (°C)	-23.5	-20.3	-12.8	-2.9	4.7	10.5	13.5	11.8	6.3	0	-9.2	-20.3	-3.5
Rainfall (mm)	0.3	0.3	8.8	19.8	47.6	94.1	69.7	64.2	65.6	30.3	5.3	1.8	407.8
Snowfall (cm)	27.6	21.7	24.1	11.4	2.2	0	0	0	1.1	8.4	26.6	25	148.1
Precipitation (mm)	22.2	17.3	30	30	49.8	94.1	69.7	64.2	66.7	38.3	27.6	22.5	532.5
Windspeed (km/h)	11.8	11.4	12.1	12.5	12.6	12.6	11.1	11.4	13.2	13.9	13.1	12.1	12.3
Most Frequent Direction	NW	NW	NW	N	N	SE	W	W	`W	S	S	S	NW

[1] *Environment Canada, 2012*

4.1.2 Heritage Resource

Gordon Hill, an Impact Assessment Archaeologist with the Province of Manitoba Historic Resources Branch, was contacted for information on heritage resources that may be located within the vicinity of the proposed construction site. Mr. Hill was also asked whether or not the proposed project could potentially impact any historical resources in the area. Mr. Hill indicated that after review, the Historic Resources Branch had no concerns with the project. (A letter response from Historic Resources Branch is included in **Appendix C**.)

4.1.3 Socioeconomics

The construction of the passive filter system will take place at the existing lagoon facility, which is located on Dunnottar-owned property that has historically been dedicated for this purpose. As an outcome of this project, the community within the vicinity of the lagoon can expect the elimination of unplanned sewage discharges that can potentially negatively affect Lake Winnipeg and a reduction in nutrients contributing to eutrophication and blue-green algae production in Lake Winnipeg can also be expected.

Moving to continuous discharge during the summer months does pose a risk to public health and safety for the recreational users of Lake Winnipeg. However, the implementation of a UV disinfection unit to inactivate harmful pathogens such as fecal coliforms or viruses is expected to mitigate this risk effectively.

As a result of this development, no potentially negative impacts to social and economic aspects of the area within the vicinity of the lagoon are anticipated.

4.2 Terrestrial Environment

4.2.1 Physiographic Setting

The project site is located in the southern portion of the Lake Winnipeg South drainage division of the Nelson River drainage system (Land Resource Unit, 1999). Topographically the area is a level to depressional glaciolacustrine lowland and a gently undulating lake terrace, characterised by fluvioglacial, shallow glaciolacustrine deposits and water-worked glacial till. Slopes range from long and nearly level in the lowlands to short and less than two percent in the lake terrace areas. At the project site, slopes are very gentle at approximately 0.5 m/km eastward towards Lake Winnipeg (Smith et al, 1998). The elevation at the project site is about 220 m above sea level (masl). Surface deposits are comprised of extremely calcareous, very stony, water-worked loamy glacial till, which covers a limestone bedrock.

4.2.1 Soils and Agriculture

Soil materials in the Gimli Ecodistrict and the Lake Winnipeg Terrace were deposited during the time of glacial Lake Agassiz. They consist primarily of thin, clayey lacustrine and till materials underlain by loam, textured, stony glacial till. The flat topography and fine textures throughout the area result in the majority of soils being classified as imperfectly to poorly drained. Complexes of Dark Gray Chernozemic and Eutric Brunisol soils developed on loamy and clayey glacial till deposits are common in the area and weakly developed Dark Gray Chernozem soils occur on rapidly to imperfectly drained sand and gravel deposits (Land Resource Unit, 1999).

The majority of the soils in the RM of St. Andrews have moderate to moderately severe limitations for arable agriculture. The Canada Land Inventory (1965), Soil Capability for Agriculture, classifies the soils at the project site as having severe (Class 4) to very severe (Class 5) limitations to the production of crops. The soils in this area are also rated as poor for irrigation suitability due to its fine texture and poor drainage. These soils are frequently saturated and subject to surface ponding, particularly during spring runoff or following heavy rains. Unfavorable workability and potential degradation due to erosion by wind are other important limitations for agriculture at the project site (Land Resource Unit, 1999). Major management considerations are related to clayey soil texture and wetness. Seasonal high water tables and saturated soils are common and surface water ponds in poorly drained level to depressional areas. Moderately to excessively stony conditions are associated with the loamy till soils and areas of thin lacustrine soils underlain by glacial till. Soils throughout the municipality are dominantly non-saline.

4.2.2 Vegetation

The Interlake Plain Ecoregion has a subhumid low boreal ecoclimate which presents a mosaic of farmland and forest, marking the southern limit of the boreal forest and northern extent of arable agricultural land. The Interlake Plain Ecoregion generally consists of some forested areas that contain mostly trembling aspen with some white spruce and balsam poplar. Poorly drained areas of this Ecoregion contain sedge, willow, and meadow grass vegetation. Saskatoons and high bush cranberry are more common on flood plains and in areas of higher elevation (AAFC-PFRA, 2005). White spruce and balsam fir are the climax species but are not widely represented due to the long history of fires, both natural and prescribed.

Cultivation and the development of an extensive network of drainage ditches also resulted in a widespread disappearance of the natural vegetation. Some local pockets of natural vegetation do occur in poorly-drained areas on unbroken land and along natural waterways. These poorly drained areas and riparian areas also support slough grasses, marsh reed grasses, sedges, cattails and willows.

The lagoon site as well as the area immediately surrounding the site has been heavily disturbed as a result of past lagoon and landfill construction activities. The area immediately surrounding the lagoon site has also been disturbed. Most surrounding properties are utilized as cropland, pasture land, or have been developed within the townsite. Potential environmental effects to vegetation as a result of the proposed construction are not anticipated.

4.2.3 Wildlife

The project site is located in the Interlake Plain Ecoregion for which the characteristic mammals include white-tailed deer, black bear, moose, coyote, beaver, and snowshoe hare (Smith et al., 1998). The white-tailed deer is especially well established in the area, thriving in the mixture of cultivated fields, pastures and aspen forests. However, the Canada Land Inventory (1971) classifies the land around the project site as having severe limitation to the production of ungulates (Class 6). Poor soil moisture and adverse topography (i.e. flatness of the land) are limitations to white-tail deer production. The area immediately surrounding Dunnottar has been disturbed as a result of agricultural development, and during construction of the drainage ditch (Tegula Creek). The existing lagoon and cultivated lands surrounding the project site provide poor wildlife habitat. Areas northwest and southwest of the subject site contain dense wooded areas. Species such as white-tailed deer, songbirds, and the occasional moose are likely found within these areas.

Bird species characteristic to this area of Manitoba include hawks, owls, woodpeckers, sparrows, blackbirds and waterfowl. Colonial birds frequent the area including Franklin's Gulls, Black-crowned Night-Herons, cormorants, Sandhill Cranes, Canada Geese, Pelicans, and Western Grebes. The Netley Marsh, on the south end of Lake Manitoba, is designated as a Canadian Important Bird Area (IBA) and provides habitat to many colonial and migratory waterfowl. The flat topography and deficient soil moisture at the project site limits the development or permanency of wetlands and therefore, the property and project site has been classified by the Canada Land Inventory (1969) as having moderately severe limitations to the production of waterfowl (Class 5). The eastern shoreline of Lake Winnipeg is an important area for waterfowl species; however, the water level fluctuations associated with the lake reduce its habitat potential (i.e., nesting success).

A number of amphibians and reptiles occur within the Gimli Ecodistrict including the common and widespread red-sided and plains garter snakes (Smith et al., 1998). Other herpetological species that can be found in the area include the spring peeper, eastern American toad, Canadian toad, Cope's treefrog, boreal chorus frog, wood frog, northern leopard frog, common mudpuppy, gray tiger salamander, common snapping turtle and western painted turtle (Preston, 1982).

4.2.4 Species of Conservation Concern

Undisturbed areas of native vegetation have greater potential to support species of conservation concern. These may include species protected under federal and/or provincial legislation. Federally, species of concern are recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and are protected under *the Species at Risk Act* (SARA). Provincially, species of concern are protected in Manitoba under *the Endangered Species Act* (MBESA) and are also listed by the Manitoba Conservation Data Centre (MBCDC) as very rare to uncommon. **Table 3**, next page, provides a list of federally and provincially protected species that have distributions that overlap the project site.

A review of the Manitoba Conservation Data Centre records indicated that the federally and provincially endangered piping plover (*Charadrius melodus*) has been observed within the Dunnottar area. The occurrences all occurred near the shoreline. Piping plovers primarily utilize the habitat along the shores of large lakes, with Lake Winnipeg currently supporting the main breeding population in Manitoba. The main threat to this species is heavy human activity and disturbances on beaches. The heavily disturbed nature of the lagoon site and the surrounding area does not provide the habitat necessary for the piping plover's survival.

A screening of the Manitoba Conservation Data Centre (MBCDC) database in February 2013 indicated that there were no known occurrences of species of concern within the property and the project site. Chris Friesen, a Biodiversity Information Manager at the Manitoba Conservation Data Centre, also stated there were no recorded occurrences of rare species within the vicinity of Dunnottar's landfill and sewage lagoon as of February 2013. A copy of the response is provided in **Appendix C.** Due to the location of the project site on existing agricultural land, the potential for rare plants and animals to occur at this location is very unlikely. No adverse effects to species of conservation concern will result from the proposed construction.

Table 3: List of Federally and Provincially Protected Species in the Region

Species			Species at Risk Status		MBCDC Provincial Rank[3]
Taxon	Scientific Name	Common Name	SARA[1]	MBESA[2]	
Birds	*Caprimulgus vociferous*	Whip-poor-will	Threatened	No Status	S3B
	Coturnicops noveboracensis	Yellow Rail	Special Concern	No Status	S3S4B
	Contopus cooperi	Olive-sided flycatcher	Threatened	No Status	S3S4B
	Charadrius melodus circumcinctus	Piping Plover	Endangered	Endangered	S1B
	Dolichonyx oryzivorus	Bobolink	Threatened	No Status	S4B
	Chordeiles minor	Common Nighthawk	Threatened	No Status	S3B
	Ixobrychus exilis	Least Bittern	Threatened	Endangered	S3B
	Lanius ludovicianus excubitorides	Loggerhead Shrike (Eastern Population)	Threatened	Endangered	S2B
	Melanerpes erythrocephalus	Red-headed Woodpecker	Threatened	Threatened	S3S4B
Amphibians	*Lithobates pipiens*	Northern Leopard Frog	Special Concern	No Status	S4
Plants	*Cypripedium candidum*	Small White Lady Slipper	Endangered	Endangered	S1
	Symphyotrichum (Aster) sericeus	Western silvery aster	Threatened	Threatened	S2S3
	Platanthera praeclara	Western Prairie Fringe Orchid	Endangered	Endangered	S1
	Solidago riddellii	Riddell's Goldenrod	Special Concern	Threatened	S2
	Spiranthes magnicam porum	Great Plains Ladies'-tresses	Not Listed	Endangered	S1S2
	Veronicastrum virginicum	Culver's-root	Not Listed	Threatened	S1

[1] *Government of Canada, 2012;*
[2] *Manitoba Conservation, 2012;*
[3] *Manitoba Conservation Data Centre, 2012.*

4.2.5 Groundwater

Groundwater flows in an eastward direction within the vicinity of the existing wastewater lagoon. Groundwater monitoring wells were installed to monitor the operation of the lagoon and determine whether wastewater is leaching from the lagoon; no leaks have been detected. The lagoon has demonstrated over the past 30 years to be functioning in compliance with its operating license.

The geology throughout most of the area consists of low-permeability lacustrine clayey soils overlying tills to significant depths. Within this type of geological environment, is not expected that significant seepage through low-permeability clayey soils and tills into buried holding tanks could occur. The aquifer in this area is relatively well protected by overlying clayey materials.

4.3 Aquatic Environment

The treatment system has potential to impact the aquatic environment that receives its treated effluent. Discharge is routed through overland ditches to Tegula Creek, which flows into Lake Winnipeg. A maximum of 500 m^3/d of treated effluent will be discharged from the passive filter system. As the proposed modifications will provide superior treatment (particularly with respect to nutrient reduction) to the existing lagoon system alone, this modification will be beneficial to the aquatic environment.

4.3.1 Surface Water

The main surface waterbodies within the vicinity of the proposed project site are Lake Winnipeg and Tegula Creek. Tegula Creek flows through the centre of Dunnottar and into Lake Winnipeg. Flow in the creek exists only during spring runoff periods and periods of heavy precipitation. Typically, the creek is dry during the rest of the year. In view of the creek's small drainage area of 25 to 39 km^2 (10 to 15 square miles), creek flooding concerns are negligible. Creek levels within Dunnottar fluctuate with Lake Winnipeg water levels.

Concerns for surface water as a result of lagoon operations are due mainly to nutrient loadings to Lake Winnipeg, which have been linked to increased algal growth in the Lake. The existing facultative sewage lagoons provide some conversion and reduction of nitrogen, N, and removal of phosphate P, through the facultative oxidation process and precipitation processes. The proposed modifications to the Dunnottar system will reduce nutrient loading to Lake Winnipeg by increasing the system's ability to remove nitrogen and phosphorus from the effluent stream.

4.3.2 Fisheries

Based on the fish species inventory conducted by Manitoba Conservation and Water Stewardship, there are 54 species of fish found in Lake Winnipeg. Out of the 54 species, there are four fish species in Lake Winnipeg that have been designated "at risk" by the Committee on the Status of Endangered Species (COSEWIC). They include silver cub (*Macrhybopsis storeriana) (SARA* – Special Concern*)*, bigmouth buffalo (*Ictiobus cyprinellus*) *(SARA* – Special Concern), shortjaw cisco (*Coregonus zenithicus*) *(SARA* - Threatened) and chestnut lamprey (Ichthyomyzon castaneus) *(SARA* – Special Concern. Although the silver chub is thought to be abundant within Lake Winnipeg, it has been identified as a concern because of low dissolved oxygen levels and water temperature fluctuations in the lake within the past few years, which can potentially have negative effects on the species.

During the preparation of the 2005 Environment Act Proposal, Rob Cann, the Provincial Angling Manager for Manitoba Conservation Fisheries Branch was contacted to obtain fish species inventory information for the creek. His results indicated that there have been no fisheries studies done on Tegula Creek to date, and it can only be assumed that certain fish species may use the creek in the spring, when it is likely that lake water pools into it. Fish species that may inhabit the creek in the spring could include brown bullhead, carp, freshwater drum, northern pike, sauger, walleye, white bass, and white sucker. Spring spawning species such as northern pike and white suckers may be attracted to the outflow of the

creek and move up it in an attempted spawning run. These species are opportunistic spawners, and often move up small creeks searching for spawning sites. However, there does not appear to be any available spawning habitat for these species in Tegula Creek.

Lake Winnipeg is an area of importance to fisheries in proximity to the project site. There is intermittent connectivity between the Tegula Creek at the project site and Lake Winnipeg, approximately 5 km downstream from the lagoon. The discontinuous flow of water within the Tegula Creek restricts fish passage and results in a lack of fish and any fish habitat at the project site. It is primarily functioning in providing indirect fish habitat in the form of water, nutrients and food to receiving waters. Considering its small size and short period of flow, the contribution of water, food, and nutrients to Lake Manitoba is minimal. No changes to the current lagoon discharge route or grades of the existing discharge route off the Dunnottar property are proposed.

Adverse effects resulting from the effluents discharged from lagoon systems include higher levels of phosphorous and nitrogen, a depletion of dissolved oxygen, and increased ammonia levels. Untreated discharges, particularly of toxic levels of ammonia, could result in a loss of fish habitat or direct mortality and aberrations. The proposed modifications will provide superior treatment (particularly with respect to nutrient reduction) to the existing lagoon system alone which will be beneficial to the aquatic environment. Consequently, any adverse effects to the aquatic environment and fisheries associated with the construction and operation of the project are not significant.

5 MITIGATION AND RESIDUAL EFFECTS

5.1 Construction Environmental Management Practices

5.1.1 Proposed Sediment and Erosion Control Measures

Construction activity will be limited to the area comprising the passive filter and a materials staging area, immediately south of the passive filter to the lagoon haul road. Excess excavated materials will be deposited within the existing borrow pit, located immediately to the northeast of the passive filter area. Surface area disturbance will be limited. However, an erosion and sediment control plan will be implemented to include key components to mitigate potential surface soils erosion and sediment transport from the Village property. The existing lagoon discharge route is established with hearty ground vegetation consisting of native sedge materials and grasses along the treated effluent discharge route for the lagoon outflow that discharges ultimately into Lake Winnipeg approximately 5 km downstream.

The purpose of the erosion and sediment control plan is to minimize the potential for downstream aquatic habitats to be negatively impacted by sediments transported from the construction site and to ensure compliance with federal and provincial regulatory requirements.

Sediment and erosion control measures will be used to control runoff at the site and will incorporate a variety of standard measures to avoid the potential adverse effects of construction-related activities (e.g., clearing, topsoil handling, and grading at the site). Silt curtains will be incorporated to minimize the potential for surface runoff from precipitation events to transport soil sediments from the site. Regular monitoring and maintenance of all sediment and erosion control measures will occur throughout the construction phase to ensure control measures remain effective throughout the duration of the project construction activities. Following the construction phase, exposed soils created by construction activities will be seeded, where necessary, to stabilize the site as quickly as possible. Environmental monitoring at the site may take place, as necessary, during the construction phase, to monitor turbidity levels and total suspended sediments in downstream surface water. Samples may be collected throughout the construction phase for analysis.

Sediment traps (i.e. straw bales) will be incorporated at strategic locations along the existing lagoon outflow channel/ditch to help capture suspended sediments that may reach the outflow channel to prevent them from being transported further downstream of the Village owned property, where they could negatively impact downstream aquatic habitats. These will be installed in the outflow channel prior to the clearing of the passive filter site. The straw bales will be maintained throughout the construction phase and until the site has been adequately stabilized after construction.

5.1.2 Storage of Gasoline & Associated Products

All fuel handling and storage facilities located on-site during lagoon expansion will comply with *The Dangerous Goods and Transportation Act* Storage and Handling of Petroleum Products Regulation and the Manitoba Fire Code.

5.2 Monitoring

5.2.1 Current Practices

Sewage Lagoon

The environmental management practices that are currently in place at the Dunnottar sewage lagoon involve pre-discharge monitoring of the effluent for biochemical oxygen demand (BOD_5), fecal foliform bacteria, and total coliform bacteria. The results are forwarding to Manitoba Conservation and Water Stewardship prior to discharge in the fall. The lagoon operator conducts sampling several weeks to a month prior to discharge to allow sufficient time for resampling and/or chlorination procedures to be enacted in the event that sampling results do not meet current criteria. No changes are proposed to these monitoring procedures.

Pilot-Scale Filter

The approved 2012 monitoring program for the pilot-scale passive filter was as follows:

- Monthly water quality monitoring during June to October at the passive filter influent and effluent points of the parameters listed in **Table 4**, below;
- Bi-weekly effluent compliance monitoring for fecal coliforms, total coliforms, and BOD_5, both at the existing discharge route and the point where the effluent leaves the lagoon property (about 500 m downstream along the existing lagoon discharge route);
- Flow rate data collected two times per week from June to October;
- Water levels monitored weekly from June to October;
- Monthly photographic records of vegetation from June to October; and
- Daily site visits, recorded with log sheets and photo records.

Table 4: Water Quality Testing Program Parameters – 2012 Operating Season

Parameter (mg/L)	Parameter (mg/L)	Parameter (mg/L)
BOD_5	$N\text{-}NO_2$	Temperature (°C)
COD	TP	Conductivity
TOC	PO_4	pH
TKN	TSS	DO
$N\text{-}NH_3$	SS	Coliforms, Total (MPN/100 mL)
$N\text{-}NO_3$	Metals	Coliforms, Fecal (MPN/100 mL)

5.2.2 Proposed Monitoring Regime

The breadth and depth of the 2012 pilot passive filter monitoring program was to provide performance data for use in optimizing the design of this proposed full-scale passive filter. The following proposed monitoring program is less extensive, as it describes solely the sampling proposed for compliance purposes. Other testing will be undertaken at the Village's discretion for operational or further research purposes. Results of the sampling related to compliance with the operating licence will be included in an annual operating report.

Surface Water

The operation of the passive filter will start with a 'seasonal' flow initiation period, typically in the spring, in which sewage effluent from the sewage lagoon storage cells will circulate through the passive filter and back to the lagoon storage cells until stable effluent quality is established. This period is expected to vary in duration, but be in the order of one to two weeks.

After initial operation stability is achieved, effluent discharge from the passive filter to the existing on-site sewage discharge ditch will be established. The discharge rates are proposed to be a maximum of 500 m^3/d. Surface water quality monitoring for compliance will be conducted during passive filter discharge operating conditions at the outlet from the UV system (see **Figure 2),** as follows:

Surface water parameters analyzed:

1. Total coliforms;
2. Fecal coliforms;
3. Total suspended solids (TSS);
4. Five-day biochemical oxygen demand (BOD_5); and
5. Total phosphorus (TP).

Surface sample frequency:

1. Prior to initiating passive filter seasonal discharge and
2. Late summer, during passive filter discharge operations.

Groundwater

Monitoring wells associated with the existing lagoon operation will be utilized to include the passive filter operation. The existing monitoring wells are constructed to meet the approval of Manitoba Conservation requirements. The current groundwater monitoring program for the site requires annual sampling in the fall for nitrate and chloride as indicators of lagoon performance. As the passive filter construction will be lined with a geomembrane, similar to lagoon cell #3; as the filter is operating immediately adjacent to the existing lagoon; and as the passive filter will not operate with a hydraulic head over the liner, the existing groundwater monitoring well network is considered sufficient to continue to collect relevant groundwater quality information. Results will be included in an annual operating report.

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APPENDIX A

PASSIVE FILTER INFORMATIONAL PAMPHLET

DILLON CONSULTING

Village of Dunnottar
Wastewater Treatment and Nutrient Removal: Passive Filtration at Work

GOAL

Increase quality of the water discharged to Lake Winnipeg from the Village of Dunnottar's sewage lagoons by decreasing nitrogen (N), phosphorous (P), heavy metals and fecal coliform content **using a passive filter process**.

Pilot Project:

In 2008 the Village of Dunnottar began construction of a passive filter. At 10 m x 7.2 m x 1.2 m deep, the filter provided nearly 90 m^3 of storage in four cells, isolated from the surrounding environment by an impermeable liner.

Three years of field trials yielded very promising results, and in July 2011 Dunnottar received approval to continuously discharge the filtered effluent to Lake Winnipeg. Dunnottar continues to operate the pilot passive filter and is using the data to design and install a full-scale passive filter.

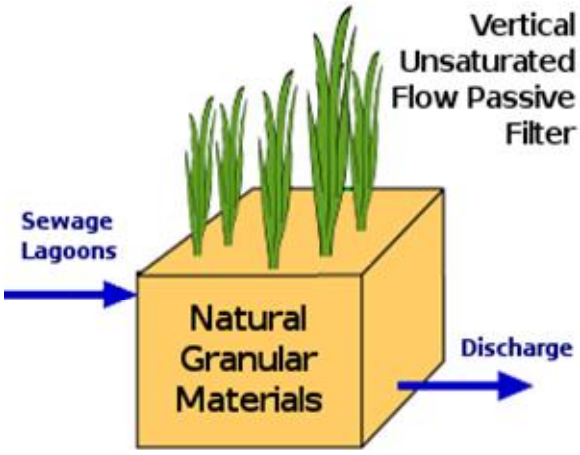
Award of Excellence

Benefits Achieved:

- ✓ Reduced nutrient levels (N and P)
- ✓ Reduced biomass growth (algae), contributing to improved aquatic ecosystem health.
- ✓ Reduced pathogen counts (indicated by fecal coliforms).
- ✓ Reduced toxic heavy metals adsorbed to suspended solids.
- ✓ Added no chemicals or energy to the process.
- ✓ Used all natural granular media in the filter.
- ✓ Recaptured phosphorous for agricultural use.
- ✓ Flow rate designed to maximize plant growth and nutrient capture.
- ✓ Enhanced organic reduction.

Results:

Best Performing Filter Cell



Passive Filter Process Patent Pending

Parameter	% Removal 2009-2011
Total Kjeldahl Nitrogen	60
Total Phosphorous	70
Fecal Coliforms	>80
Bio-chemical Oxygen Demand	>60
Total Suspended Solids	>90

Filter media and vegetation are demonstrating significant phosphorous removal from the effluent.

Consulting Engineers of Manitoba 2009 Environmental Award of Excellence
Manitoba Excellence in Sustainability Award 2008 Recipient

APPENDIX B

LAND AND MINERAL RIGHTS TITLES

AUG 10 2004

Cert. No. 909625

M

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

VILLAGE OF DUNNOTTAR

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE NORTH-WEST QUARTER OF SECTION EIGHT IN THE SEVENTEENTH TOWNSHIP AND FOURTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA,

TOGETHER WITH THE RIGHT TO ENTER UPON AND REMOVE THE SAME, AND OTHER RIGHTS, AS MORE FULLY SET FORTH IN A TRANSFER REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS No. D65561.

EXCEPTING AND RESERVING THEREOUT ALL MINES AND MINERALS OTHER THAN GRAVEL, ~~IN UPON OR UNDER THE SAID LAND TOGETHER WITH FULL POWER UNTO US, OUR SUCCESSORS, LESSEES, LICENSEES AND ASSIGNS AND OUT AND THEIR RESPECTIVE AGENTS, EMPLOYEES, SERVANTS AND WORKMEN TO SEARCH FOR, WORK, GET, STORE, REFINE, TRANSPORT AND CARRY AWAY THE SAME.~~

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this FOURTH day of MAY One thousand nine hundred and FIFTY-NINE

Signed in the presence of

Richardson

W. A. Finck

Deputy District Registrar for Winnipeg

From No. 908565 Transfer 265551

NATURE OF INSTRUMENT	DAY AND HOUR OF ITS PRODUCTION	NAMES OF THE PARTIES
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar

Post-It® Fax Note 7671E | Date [illegible] | # of pages ▸ 4
To TARA COLE McCAFFERY | From NORA KENTZ
Co./Dept. DILLON CONSULTING | Co. VILLAGE OF DUNNOTTAR
Phone # | Phone #
Fax # | Fax #

TITLE FOR LANDFILL/LAGOON SITE

Cert. No. 909625

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

VILLAGE OF DUNNOTTAR

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all th at piece or parcel of land known and described as follows, the North-west quarter of Section Eight in the Seventeenth Township and Fourth Range, East of the Principal Meridian in Manitoba, excepting [illegible] mines and minerals other than gravel together with the right to enter upon and remove the

The land mentioned in a certificate of title shall by implication and without special mention in the certificate, unless the contrary be expressly declared, be deemed to be subject to:

(a) Any subsisting reservation contained in the original grant of the land from the Crown.
(b) Any municipal charge, rate or assessment existing at the date of the certificate, or subsequently imposed on the land.
(c) Any right-of-way or other easement, howsoever created, upon, over or in respect of the land.
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land thereunder.
(e) Any drainage levy or mechanics' lien affecting the land.
(f) Any order of attachment, judgment or order for the payment of money against the registered owner of the land, registered since the date of the certificate of title, and which has been maintained in force under the provisions of any Act of the province relating thereto.
(g) Any certificate of lis pendens issued out of a court in the province and registered since the date of the certificate of title.
(h) Any right of expropriation by statute.
(i) The title of a person adversely in actual occupation of and rightly entitled to the land at the time is was brought under the Act, and who continues in such occupation:
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

same, and other rights, as more fully set forth in a transfer registered in the Winnipeg Land Titles Office as No.D55551.

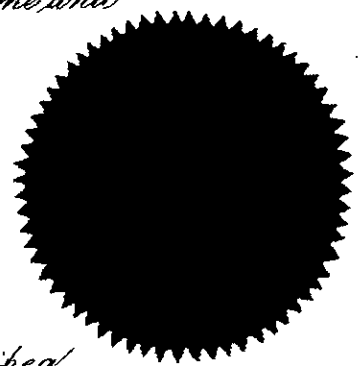
IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this Fourth day of May One thousand nine hundred and fifty-nine

Signed in the presence of

J. Nicholson

W. A. Finch.

Deputy District Registrar for Winnipeg.



Tupper & Co. From No. 908565 909625 Transfer D55551 Application

NATURE OF INSTRUMENT	DAY AND HOUR OF ITS PRODUCTION	NAMES OF THE PARTIES	REGISTRATION NUMBER
TUPPER, ADAMS & ADAMS CROWN TRUST BLDG. WINNIPEG, - CANADA Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar	
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar	
Mortgage for $	The day of 19 at o'clock in the noon	Deputy District Registrar	
Mortgage for	The day of 19 at o'clock in		

$	the noon		Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon		Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon		Deputy District Registrar
Mortgage for $	The day of 19 at o'clock in the noon		Deputy District Registrar

DATE: 2004/08/11
TIME: 13:30
POST

MANITOBA

STATUS OF TITLE

TITLE NO: 1547441

STATUS OF TITLE..... ACCEPTED
ORIGINATING OFFICE..... WINNIPEG
REGISTERING OFFICE..... WINNIPEG
REGISTRATION DATE..... 1998/02/03
COMPLETION DATE..... 1998/02/11

PRODUCED FOR.. L
ADDRESS.....

PRODUCED BY... C.ROSS

LEGAL DESCRIPTION:

CANPAR HOLDINGS LTD.

IS REGISTERED OWNER, SUBJECT TO SUCH ENTRIES RECORDED HEREON IN:

ALL MINES AND MINERALS AS SET FORTH IN INSTRUMENT NO. D 55551 WLTO, IN UPON OR UNDER THE FOLLOWING DESCRIBED LAND:

NW 1/4 SEC 8-17-4 EPM

ACTIVE TITLE CHARGES:

NO ACTIVE TITLE CHARGES EXIST ON THIS TITLE

ACCEPTED THIS 3RD DAY OF FEBRUARY, 1998
BY D.THOMAS FOR THE DISTRICT REGISTRAR OF
THE LAND TITLES DISTRICT OF WINNIPEG.

UNCERTIFIED EXTRACT PRODUCED FROM THE LAND TITLES DATA STORAGE SYSTEM ON 2004/08/11 OF TITLE NUMBER 1547441 .

********** END OF STATUS OF TITLE FOR TITLE 1547441 WPG **********

APPENDIX C

ENVIRONMENTAL IMPACTS CORRESPONDENCE

Manitoba

Memorandum

DATE: February 7, 2013

TO: Scott Gray
Dillon Consulting
1558 Wilson PLace
Winnipeg MB

FROM: Gordon Hill
Impact Assessment
Archaeologist
Historic Resources
Branch
Main Floor 213 Notre
Dame Avenue
Winnipeg MB
R3B 1N3
PHONE NO: (204) 945-7730

SUBJECT: HERITAGE RESOURCES

YOUR FILE:
HRB FILE: AAS-12-5574

PASSIVE FILTRATION SYSTEM
DUNNOTTAR LAGOON
NW 8-17-4 EPM
RM ST. ANDREWS

In response to your memo regarding the above-noted proposed project, I have examined Branch records for areas of potential concern. The potential to impact significant heritage resources is low, and, therefore, the Historic Resources Branch has no concerns with the project.

If at any time however, significant heritage resources are recorded in association with these lands during development, the Historic Resources Branch may require that an acceptable heritage resource management strategy be implemented by the developer to mitigate the affects of development on the heritage resources.

If you have any questions or comments, please contact me at 945-7730.

C. Gordon Hill

Gray, Scott <sgray@dillon.ca>

CDC screening

Friesen, Chris (CON) <Chris.Friesen@gov.mb.ca> Thu, Feb 14, 2013 at 4:22 PM
To: "Gray, Scott" <sgray@dillon.ca>

Scott

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no relevant occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. **An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present**; in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife and Ecosystem Protection Branch, Manitoba Conservation.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information please contact me directly at (204) 945- 7747.

Chris Friesen

Biodiversity Information Manager

Manitoba Conservation Data Centre

204-945-7747

chris.friesen@gov.mb.ca

http://www.gov.mb.ca/conservation/cdc/

From: Gray, Scott [mailto:sgray@dillon.ca]
Sent: February-04-13 3:46 PM
To: Friesen, Chris (CON)
Subject: CDC screening

Hi Chris,

We are renewing an Environmental Act Licence for a passive filtration system at the Dunnottar sewage lagoon and would like an updated screening of the CDC for the project site. One was previously completed in 2005 and there were no occurrences of species of concern within the project area.

The site is located in the R.M of St. Andrews approximately 4.5 km west of Dunnottar. It is located on NW 8-17-04E shown on the attached photo (The UTM coordinates for the centre of the property are; 14U 640805 E, 5589749 N).

Thanks,

Scott Gray

Biologist
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba, R3T 0Y4
T - 204.453.2301 ext. 4005
M - 204.290.8543
SGray@dillon.ca
www.dillon.ca

Kevin Trapp - Lake Winnipeg Fish Species List

From: "Cann, Rob (WSD)" <RoCann@gov.mb.ca>
To: "'ktrapp@dillon.ca'" <ktrapp@dillon.ca>
Date: 5/25/2005 3:51 PM
Subject: Lake Winnipeg Fish Species List
CC: "Biggin, Wade (WSD)" <WaBiggin@gov.mb.ca>

Hi Kevin, here is the list of Lake Winnipeg species you requested. If you require further species inventories, please contact Wade Biggin at wabiggin@gov.mb.ca.

Thanks.

Species

BLACK BULLHEAD
BLACK CRAPPIE
BLACKNOSE DACE
BLACKNOSE SHINER
BLACKSIDED DARTER
BROOK STICKLEBACK
BROWN BULLHEAD
BURBOT
CARP
CENTRAL MUDMINNOW
CHANNEL CATFISH
CHESTNUT LAMPREY
CISCO
CREEK CHUB
EMERALD SHINER
FATHEAD MINNOW
FLATHEAD CHUB
FRESHWATER DRUM
GOLDEN SHINER
GOLDEYE
IOWA DARTER
JOHNNY DARTER
LAKE CHUB
LAKE STURGEON
LAKE WHITEFISH
LOGPERCH
LONGNOSE DACE
LONGNOSE SUCKER
MIMIC SHINER
MOONEYE
MOTTLED SCULPIN
NINESPINE STICKLEBACK
NORTHERN PIKE

PEARL DACE
QUILLBACK
RAINBOW SMELT
RIVER DARTER
RIVER SHINER
ROCK BASS
SAND SHINER
SAUGER
SHORTJAW CISCO
SILVER CHUB
SILVER LAMPREY
SILVER REDHORSE
SLIMY SCULPIN
SPOONHEAD SCULPIN
SPOTTAIL SHINER
TADPOLE MADTOM
TROUT PERCH
WALLEYE
WHITE BASS
WHITE SUCKER
YELLOW PERCH

Rob Cann
Provincial Angling Manager
Water Stewardship - Fisheries Branch
200 Saulteaux Crescent, Winnipeg, MB R3J 3W3
Ph: 204.945.7816 Fax: 204.948.2308

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