796 Cherokee Avenue
Saint Paul, MN 55107

220, 120 Pembina Road
Sherwood Park, AB T8H 0M2

October 17, 2016

Mr. Guangyu Yan, Ph.D., P. Eng.
Municipal Approvals Engineer
Alberta Environment and Sustainable Resource Development
Red Deer – North Saskatchewan Region
250, Diamond Ave
Spruce Grove, AB T7X 4C7

Re: Resubmittal of Vantage Pointe Documents in Support of 2014 EPEA Application

Mr. Yan,

Due to the inactivity at Country Lakes and based on discussions with Neal Hollands prior to his retirement, the Homeowner's Association at Vantage Pointe understands that Alberta Environment and Parks (AEP) is willing to consider their EPEA Application originally submitted in 2014. Since that time, a number of requirements for the EPEA application have changed and the purpose of this application is to provide supplemental information to the originally submitted design. The following information is provided:

- Elevation data of homes adjacent to the wetland – Attachment A
- Nutrient analysis of discharge wetland – Attachment B
- Wetland water quality data – Attachment C
- Revised Design Basis Report – Attachment D
- Revised design plans – Attachment E
- Wetland Assessment Report from EBA – Attachment F
- Letter of Understanding from homeowners – Attachment G

Thank you in advance for your review of this information. If you have any questions, please contact me and I would be happy to assist you.

Sincerely,
SD Consulting Group – Canada, Inc.

Shane Sparks, P. Geo
Principal
Shane.sparks@sd-consultinggroup.com

Attachment A

Elevation Data of Existing Homes Adjacent to Wetland

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PROFESSIONAL ENGINEER ALBERTA BRYAN C. DESMET LICENSED TO PRACTICE

REV	DATE	DESCRIPTION
1	9/28/16	ISSUE FOR REVIEW
0	2/24/14	ISSUE FOR PERMIT APPLICATION

CONSULTANTS

SD CONSULTING
SHERWOOD PARK, AB
SAINT PAUL, MN
TEL. 612-280-9128
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VANTAGE POINTE

ELEVATIONS OF NEARBY HOMES

MAP B

C01_1044.03.dwg

Plot Date: 29 September 2016 by Carla Cross_SD

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Attachment B

Nutrient Analysis in Wetland

Current water quality in the wetland is provided in Attachment C. The proposed wastewater treatment system will discharge secondary treated and disinfected water with the following average values:

- Carbonaceous Biological Oxygen Demand (CBOD) - <25 mg/l
- Total Suspended Solids (TSS) – 25 mg/l
- Ammonia - 1 mg/L
- Phosphorus - 10 mg/L
- Nitrogen - 20 mg/L
- E. Coli < 1 CFU (after UV Disinfection is installed)
- Total Coliform < 1 CFU (after UV Disinfection is installed)

Impacts from CBOD and TSS to the wetland are extremely unlikely due to the advanced treatment and very low background levels. To determine the impacts to the wetland from nitrogen, ammonia, and phosphorus, a nutrient balance was completed and is provided as **Attachment A**. The nutrient balance was derived by assuming 50% removal and rates shown in Tables 9.11, 9.12, 9.15, 9.18 and 9.19 of *Treatment Wetlands, Second Edition* (Kadlec and Wallace, 2008). Results of the modeling are summarized below:

- **Total Nitrogen** – The wetland has the capacity to remove 4.790 kilograms/year (kg/yr) of total nitrogen. Assuming a concentration of 20 milligrams/Litre (mg/L) in the treated wastewater, and the peak wastewater flow, the effluent will contribute 241 kg/yr. At the actual flow of 12 m^3/yr, the treated effluent will contribute 88 kg/yr. Both of these values are well within the wetland's ability to assimilate.
- **Ammonia** – The wetland has the capacity to remove 2,939 kg/yr of ammonia. Assuming a concentration of 1 mg/L in the treated wastewater, and the peak wastewater flow, the effluent will contribute 12 kg/yr. At the actual flow of 5.7 m^3/yr, the treated effluent will contribute 4 kg/yr. Both of these values are well within the wetland's ability to assimilate.
- **Total Phosphorus** – The wetland has the capacity to remove 139 kg/yr of phosphorus. Assuming a concentration of 10 mg/L in the treated wastewater, and the peak wastewater flow, the effluent will contribute 120 kg/yr. At the actual flow of 5.7 m^3/yr, the treated effluent will contribute 44 kg/yr. Both of these values are well within the wetland's ability to assimilate.

Attachment C

Wetland Water Quality Data

	9/10/2015 mg/l	11/10/2015	3/16/2016	7/12/2016
BOD	27	<2.0	5	6
Ammonia-N	0.1	0.11	<0.025	<0.025
Dissolved P	0.08	0.049	0.28	0.05
TKN	5.76	2.7	2	2.4
Total P	1.11	0.12	0.4	0.14
TSS	720	23	45	54
pH	7.63	7.68	7.56	7.49

Attachment D

Revised Design Basis

796 Cherokee Avenue
Saint Paul, MN 55107

220, 120 Pembina Road
Sherwood Park, AB T8H 0M2

October 19, 2016 **By e-mail only:** guangyu.yan@gov.ab.ca

Mr. Guangyu Yan
Alberta Environment and Water
Suite 1 250 Diamond Avenue
Spruce Grove, Alberta T7X 4C7

RE: Revised Vantage Pointe Wastewater System Design Basis

Guangyu,

SD Consulting Group has prepared a wastewater treatment and disposal design for the existing Vantage Pointe residential development located east of Beaumont, Alberta in Leduc County. The existing septic tank effluent pump (STEP) collection system has an Alberta Environment and Sustainable Resource Development (AESRD) Registration; Registration number 249736-00-00, which was issued on May 25, 2009.

An existing 10,000 gallon holding tank collects the STEP system discharge, and a new secondary treatment, disinfection, and dispersed discharge disposal system is proposed. The residential development will include a total of 32 homes at full build-out, with a peak design flow of 49 m^3/day. The system design basis information is provided herein.

Wastewater Characteristics

Peak Flows

Per Table 2.2.2.2.A of the Alberta Private Sewage Systems Standard of Practice (SOP), the thirty-two 3-bedroom dwellings will have a peak design flow of approximately 49 m^3/day and an average design flow of 33 m^3/day.

(1) 1.5 Persons/Bedroom x 3 Bedrooms/Home x 32 Homes = 144 Persons

(2) 144 Persons x 340 L/Person/Day = 48,960 L/Day ~ 49 m^3/day

(3) 144 Persons x 228 L/Person/Day = 32,832 L/Day ~ 33 m^3/day

Note that measured water usage (since water is hauled in to the site), which is not likely to change, averages approximately 12 m^3/day.

Wastewater Strength

There are no plans to include any sources in the future that would increase wastewater strength beyond that of domestic strength wastewater. Therefore, raw wastewater strength is expected to be 220 mg/L of 5-day biochemical oxygen demand (BOD_5), 220 mg/L of total suspended solids (TSS), and 50 mg/L of fats, oils and grease (FOG). Since the collection system uses septic tanks and pumps at each home, expected concentrations of BOD_5, TSS and FOG to the treatment system are 130 mg/L, 80 mg/L and 20 mg/L, respectively. Assumed fecal coliform and nitrogen concentrations are also listed in **Table 1**.

Table 1: Design Concentrations of Wastewater

Parameter	Raw (mg/L)	Influent [1] (mg/L)	Final Effluent[2] (mg/L)
BOD_5	220	130	<15
TSS	220	80	<15
FOG	50	20	<1
Fecal Coliform per 100 mL	$>10^9$ MPN	$>10^6$ MPN	<200 MPN
Total Nitrogen as N	60	60	<20

Note 1 Influent to treatment system is septic tank effluent from the collection system

Note 2 Prior to discharge to wetland

Flow Variation

The STEP collection system provides some equalization of the wastewater flow. In addition, the recirculation tank will also provide some equalization. Typical morning and evening peak daily flows from residential developments are expected.

Potable Water Supply

Potable water is hauled into the development and stored in a community cistern, located as indicated in the design drawings. The community water distribution system sends water to each home. When the water level is low, potable water is delivered to the community cistern.

Existing Collection System and Holding Tank

Each home has a septic tank followed by a pump chamber with a pump that discharges the effluent to the sewer forcemain. The existing forcemain collects the STEP effluent and routes it to the existing 10,000 gallon community holding tank. All septage pumped from the individual STEP tanks will be disposed of offsite and in accordance with AESRD regulations.

AdvanTex Treatment System

The biological treatment of the wastewater will be provided by a secondary treatment system. The proposed wastewater system is an AdvanTex AX100 system manufactured by Orenco Systems, Inc., and the design is based on Alberta's best practicable technology.

The treatment system proposed for this project is a packaged wastewater treatment plant that utilizes an attached growth process. The overall treatment will consist of a septic tank providing preliminary treatment and located at each home as part of the STEP system. Secondary treatment will be provided by the AX100 units, which is a common treatment system in the Province of Alberta.

The AX100 units consist of a fiberglass basin filled with an engineered, textile material. Wastewater is pumped to the top of the filter pod where nozzles distribute the wastewater over the textile filters. As the wastewater trickles through the filters, treatment will be accomplished by bacteria that grow on the filters. At the bottom of the pods, the wastewater will be collected and flow back to the recirculation tank where it will be recirculated through the AX100 units. A recirculating ball valve sends only treated effluent forward to the disinfection system. The AX100 units will treat the wastewater to secondary standards, however based on past performance of the AdvanTex technology, the quality of the treated wastewater will likely be better than secondary standards.

The treatment system will include a recirculation tank, three AX100 units, UV disinfection system, and a disposal system to a natural wetland located on site. Details of the treatment system are provided in the design drawings. While the treatment system is being constructed, the holding tank will continue to service the homes. Once the treatment system is in operation, the holding tank will be utilized for emergency storage if necessary at some point in the future.

New UV Disinfection System

Per AESRD requirements, the required UV dose is dependent on influent wastewater characteristics and the effluent coliform standards. There are four methods to determine the UV dose requirements. Design and operating data from similar systems will be used for designing the UV disinfection system. For this wastewater facility, four UV units, arranged in a parallel configuration, are proposed to meet a 200 MPN/100 mL fecal coliform limit.

From its design guidelines, the proposed PL-UV1 unit can treat flows of 0.4 m^3/day to 16.4 m^3/day for wastewater effluents of 30 mg/L for BOD_5 and TSS. For wastewater effluents of 10 mg/L for BOD_5 and TSS, the flows can be doubled. Assuming secondary quality effluent, four UV units will be utilized so that peak flows can be treated with one unit out of service. Since peak flows are likely to be lower than 49 m^3/d and the effluent quality better than secondary levels, the use of four PL-UV1 UV units is conservative.

Wetland Discharge Design Details

Lateral Design and Dosing Volume Requirements

The disposal of the treated effluent in the wetland will occur through infiltration into the ground and evaporation. In order to improve infiltration and evaporation rates of the treated water will be dispersed into the wetland instead of using a single end of pipe disposal. The concept is to mimic natural flow into the wetland, rather than discharging at one point where a preferential flow path could develop and could lead to short circuiting within the wetland.

The wetland discharge system has been designed so that the inlet can handle the peak flows from the wastewater system. Using Darcy's Law and assuming pea gravel will be used to facilitate flow into the wetland, a 30 m (100 foot) long trench has been designed for the dispersed wetland discharge. The hydraulic conductivity of dirty pea gravel (5 to 14 mm) has been reported to be 12,000 m/d, and assuming only 50% of this value, a conservative hydraulic conductivity value of 6,000 m/d will be utilized.

Darcy's Law: $Q = K_s A_c S_w$

K_s = Saturated Hydraulic Conductivity	6,000 m/d [(1)]
A_c = Cross Sectional Area at 0.076 m water depth	30 m x 0.076 m = 2.28 m^2
S_w = Slope = Assumed Average	0.01 m
Q = Average Flow through Discharge Inlet	6,000 m/d x 2.28 m^2 x 0.01 = **137 m^3/d**

1 – Source: Table 8-2 lists 12,000 for dirty 5-10 mm pea gravel: WERF Manual "Small-scale Constructed Wetland Treatment Systems" (2006).

Using Darcy's Law, the theoretical minimum capacity of the inlet is 137 m^3/d. With a 49 m^3/d peak design flow, the inlet has a calculated 2.8 safety factor; therefore, clogging within the inlet is not anticipated to be an issue.

The inlet to the natural wetland will consist of a lateral in a gravel mound, which is detailed in the design drawings. Half of the orifices will spray upward (12 o'clock position). To facilitate drainage between doses, the other half of the orifices will point downward (6 o'clock position) and be covered with an orifice shield.

A minimum dose of 5 times the volume of the lateral pipe plus the volume of the supply piping has been selected, which is commonly used in onsite soil disposal systems that drain downhill. Based on 30 m of 38 mm of the lateral pipe and 45 m of 38 mm supply piping (both Sch 40 PVC), the total pipe volume is approximately 0.10 m^3 (27 US gallons). Multiplying the lateral piping volume by 5, the minimum dose volume for the wetland discharge system is approximately 0.26 m^3 (69 US gallons). The ½ HP, single phase, PF30 pump has been selected for dosing the wetland inlet. With a duty point of 8 m^3/hr at 11 m of total dynamic head (or 35 US gpm at 36 feet TDH), the minimum timer setting for the dosing pump is 2 minutes. This setting can easily be met by adjusting the Pump ON float to be at least 100 mm above the Pump OFF float.

The alternating, duplex dosing pumps will be placed within a 15 m^3 (4,000 US gallon) fiberglass plastic tank. The event counter and pump run timers can be used to monitor daily flows.

Summary

The existing Vantage Pointe wastewater system includes a STEP collection system and holding tank. The proposed improvement project will add a secondary treatment system, UV disinfection, and disposal to a natural wetland. The proposed design is intended to be a conservative approach for utilizing a natural wetland system for disposal of treated wastewater.

Thank you in advance for your review of this information. If you have any questions, please contact me at 612-280-9128 or by e-mail at Bryan.desmet@sd-consultinggroup.com .

Sincerely,

SD Consulting Group – Canada (APEGGA PTP #P10913)

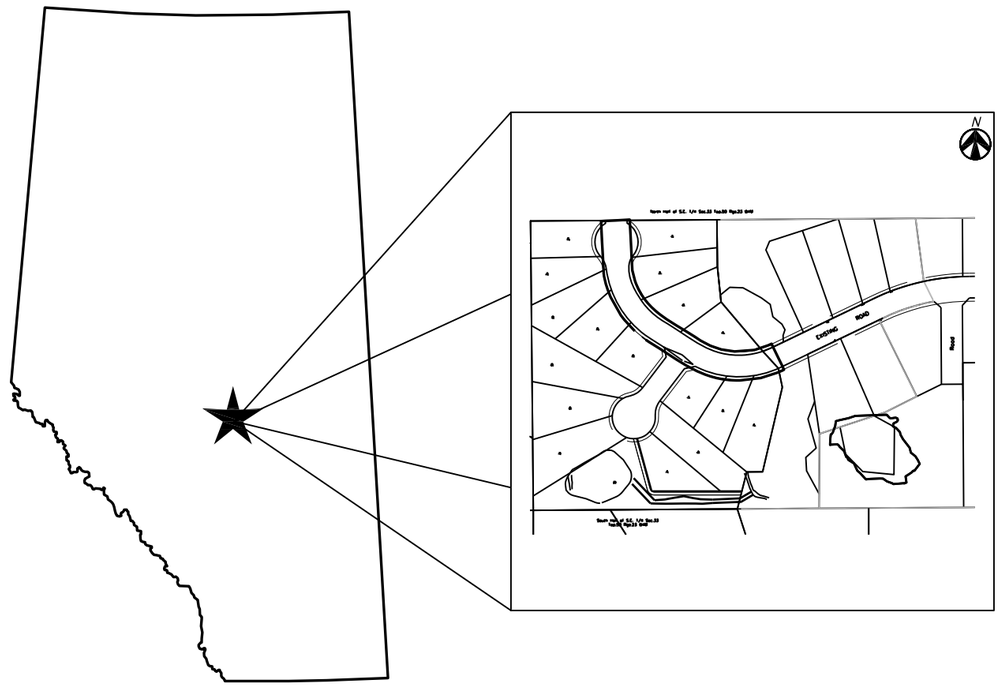
Bryan DeSmet, P. Eng.
Principal

Attachment E

Revised Design Plans

VANTAGE POINTE
WASTEWATER TREATMENT SYSTEM
LEDUC COUNTY, ALBERTA

ISSUE FOR PERMIT APPLICATION
OCTOBER 2016



DRAWING LIST

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PROFESSIONAL ENGINEER ALBERTA
BRIAN C. DESMET
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SD CONSULTING
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Plot Date: 3 October 2016 By Carla Cross_SD

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CONSULTANTS

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VANTAGE POINTE

SITE PLAN

C1

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Plot Date: 3 October 2016 by Carla Cross_SD

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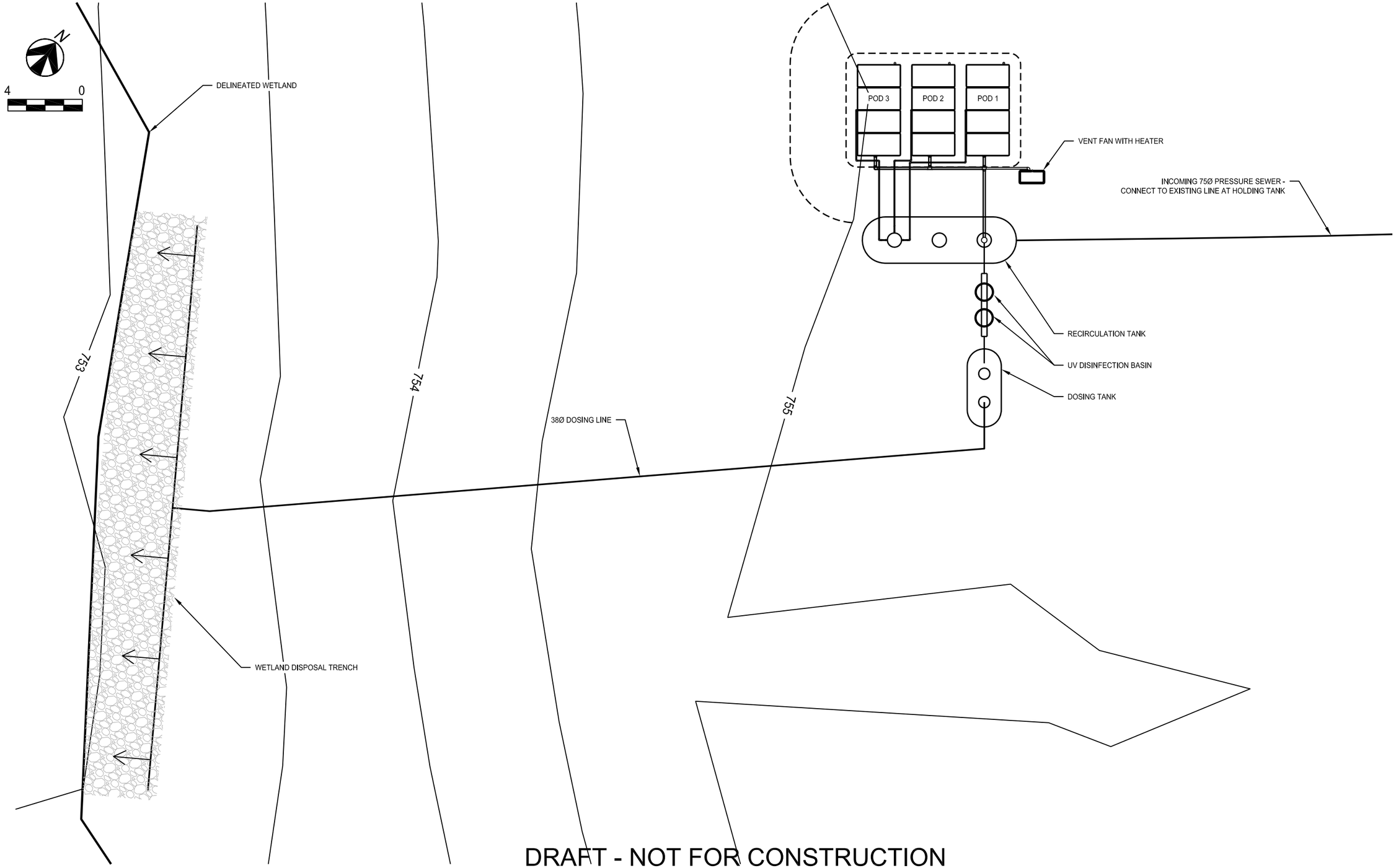

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VANTAGE POINTE

WASTEWATER TREATMENT SYSTEM LAYOUT

C1a

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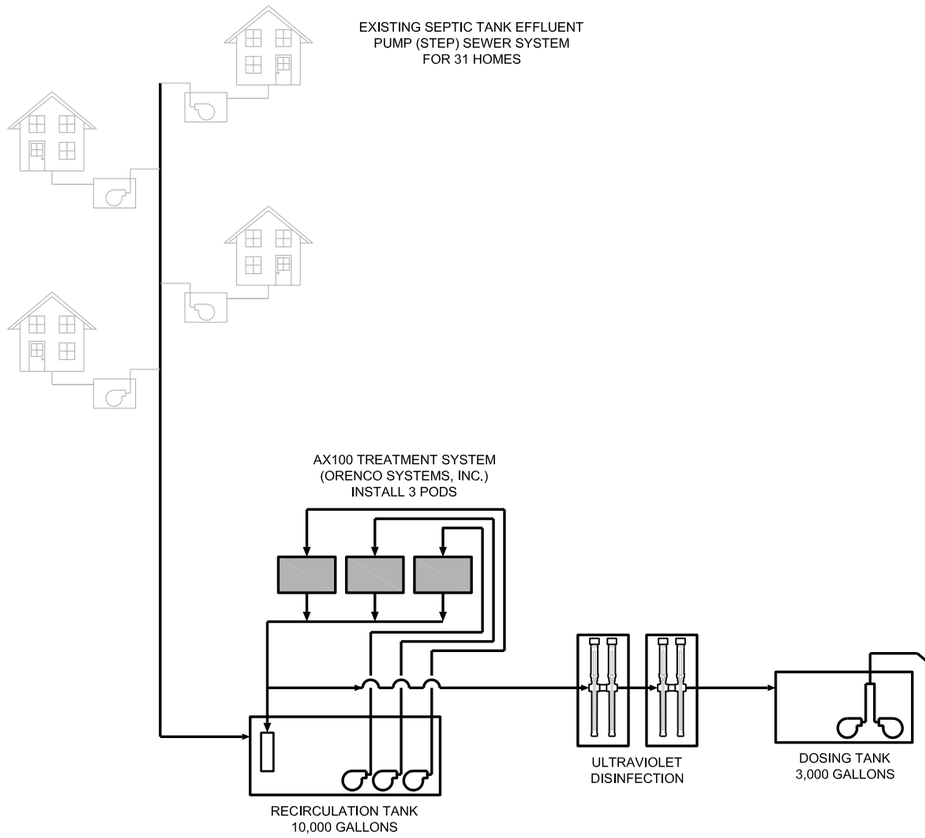

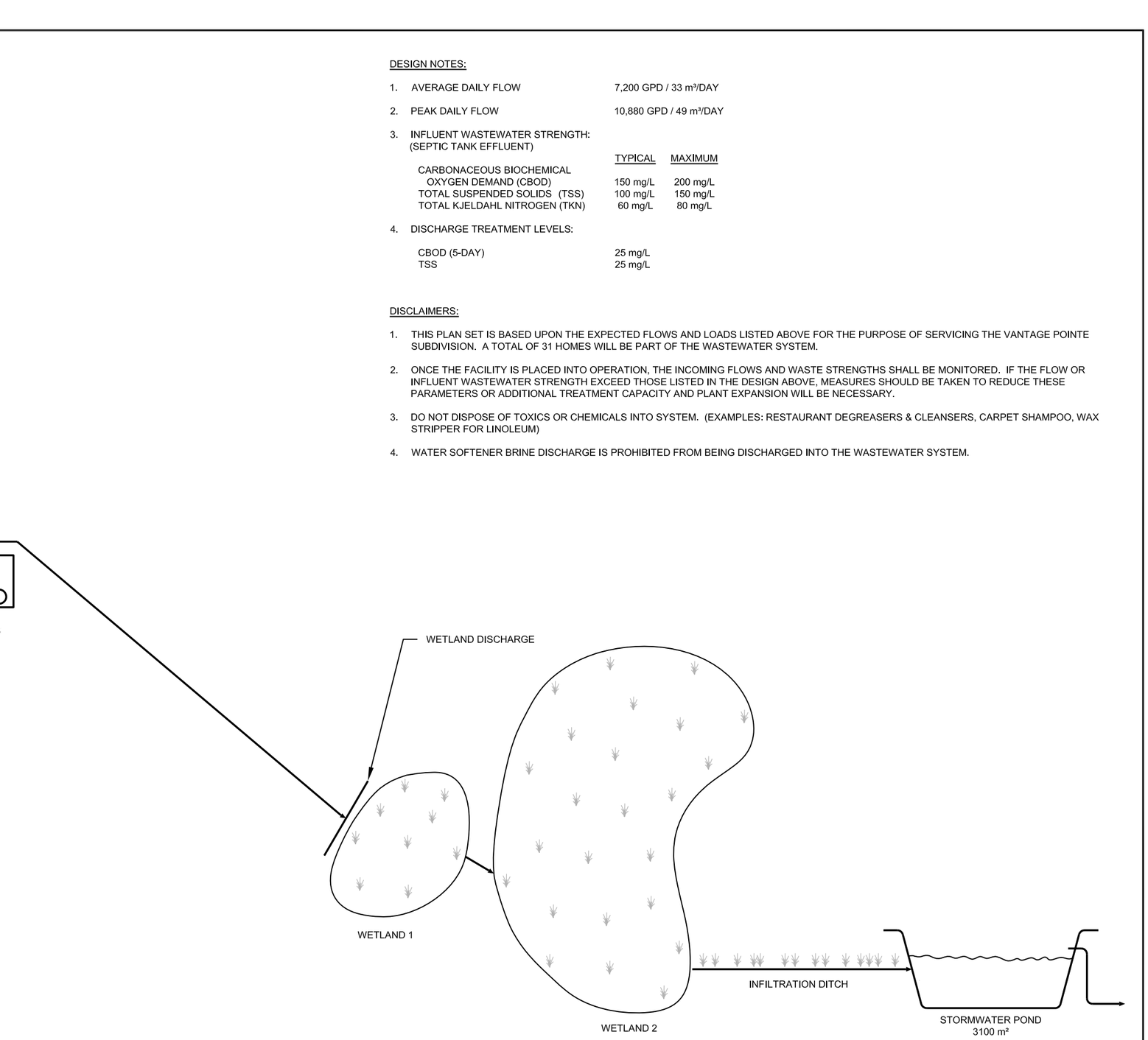

DESIGN NOTES:

1. AVERAGE DAILY FLOW — 7,200 GPD / 33 m³/DAY
2. PEAK DAILY FLOW — 10,880 GPD / 49 m³/DAY
3. INFLUENT WASTEWATER STRENGTH: (SEPTIC TANK EFFLUENT)

	TYPICAL	MAXIMUM
CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (CBOD)	150 mg/L	200 mg/L
TOTAL SUSPENDED SOLIDS (TSS)	100 mg/L	150 mg/L
TOTAL KJELDAHL NITROGEN (TKN)	60 mg/L	80 mg/L

4. DISCHARGE TREATMENT LEVELS:

CBOD (5-DAY)	25 mg/L
TSS	25 mg/L

DISCLAIMERS:

1. THIS PLAN SET IS BASED UPON THE EXPECTED FLOWS AND LOADS LISTED ABOVE FOR THE PURPOSE OF SERVICING THE VANTAGE POINTE SUBDIVISION. A TOTAL OF 31 HOMES WILL BE PART OF THE WASTEWATER SYSTEM.
2. ONCE THE FACILITY IS PLACED INTO OPERATION, THE INCOMING FLOWS AND WASTE STRENGTHS SHALL BE MONITORED. IF THE FLOW OR INFLUENT WASTEWATER STRENGTH EXCEED THOSE LISTED IN THE DESIGN ABOVE, MEASURES SHOULD BE TAKEN TO REDUCE THESE PARAMETERS OR ADDITIONAL TREATMENT CAPACITY AND PLANT EXPANSION WILL BE NECESSARY.
3. DO NOT DISPOSE OF TOXICS OR CHEMICALS INTO SYSTEM. (EXAMPLES: RESTAURANT DEGREASERS & CLEANSERS, CARPET SHAMPOO, WAX STRIPPER FOR LINOLEUM)
4. WATER SOFTENER BRINE DISCHARGE IS PROHIBITED FROM BEING DISCHARGED INTO THE WASTEWATER SYSTEM.

NOTES:

1. FLOW UNITS ARE IN IMPERIAL GALLONS PER DAY (GPD)
2. VOLUME UNITS ARE IN IMPERIAL GALLONS (1 IMPERIAL GALLON = 1.2 US GALLON)

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SD CONSULTING
SHERWOOD PARK, AB
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VANTAGE POINTE

WASTEWATER SYSTEM PROCESS SCHEMATIC

C2

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Plot Date: 18 October 2016 by Carla Cross_SD

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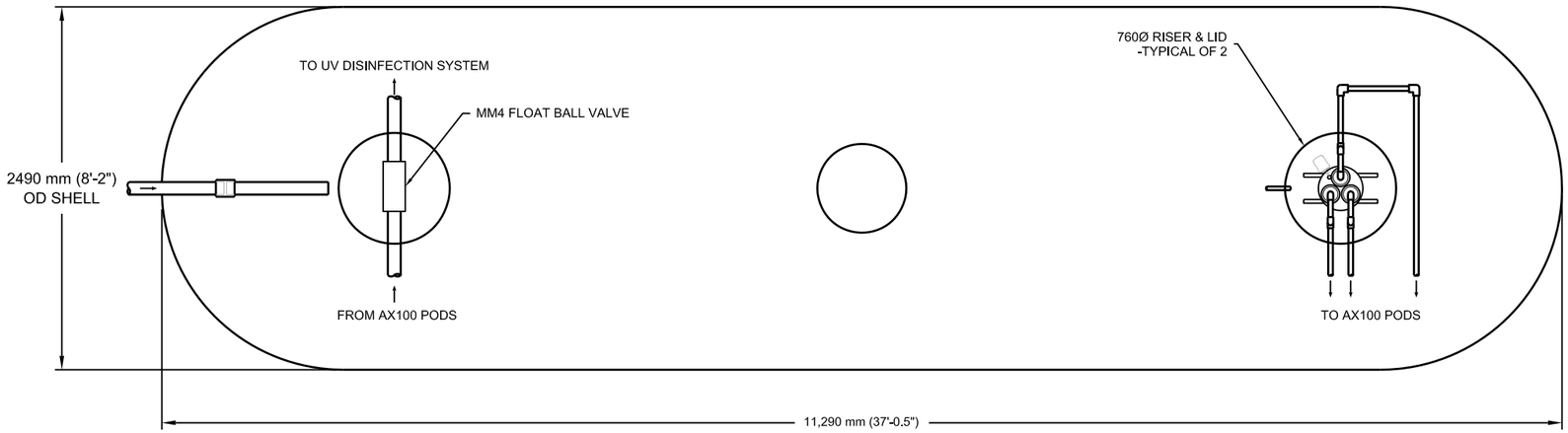
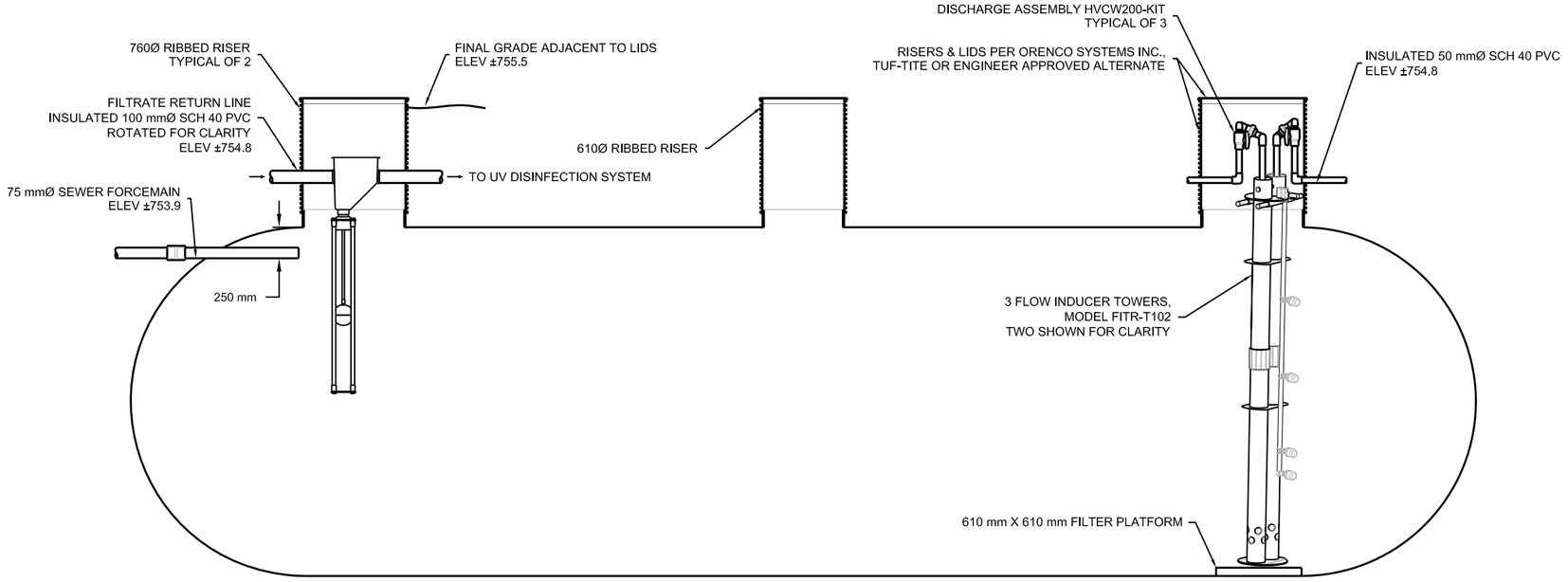


10,000 GALLON RECIRCULATION TANK PLAN VIEW

SCALE: NONE

TANK SPECIFICATIONS:

1. THE RECIRCULATION TANK SHALL BE THE XERXES 8'Ø, 10,000 GALLON MODEL (12,000 US GALLON).
2. THE TANK SHALL MEET OR EXCEED THE REQUIREMENTS OF CAN/CSA-B66 "DESIGN, MATERIAL AND MANUFACTURING REQUIREMENTS FOR PREFABRICATED SEPTIC TANKS AND SEWAGE HOLDING TANKS". TANK DIMENSIONS SHOWN IN PLANS ARE FOR XERXES MODELS ONLY. SHOP DRAWINGS MUST BE SUBMITTED TO ENGINEER FOR REVIEW PRIOR TO ORDERING TANKS.
3. INSTALL TANK PER MANUFACTURER SPECIFICATIONS. PROVIDE A MINIMUM 75 mm LEVELING BASE OF 19 mm (3/4") MINUS GRANULAR BACKFILL. TANKS SHALL BE TESTED FOR WATER TIGHTNESS PER MANUFACTURER'S INSTRUCTIONS.
4. ALL TANK OPENINGS SHALL BE LOCATED AT LEAST 75 mm ABOVE GRADE. FINAL GRADE SHALL ENSURE THAT STORMWATER RUNOFF IS DIVERTED AWAY FROM OPENINGS. RISERS & GROMMETS SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS. APPROVED RISER MANUFACTURERS: (1) ORENCO SYSTEMS INC. (2) TUF-TITE OR (3) ENGINEER APPROVED ALTERNATE.
5. LIDS SHALL BE AIR-TIGHT AND SEALED WITH PINNED, STAINLESS STEEL (SST) BOLTS AND HAVE THE TEXT "WARNING: DO NOT ENTER" TO DISCOURAGE TAMPERING. ALL LIDS SHALL ALSO BE INSULATED PER MANUFACTURER.
6. THE SOIL COVER OVER THE TOP OF EACH TANK SHALL BE AT LEAST 1.2 m OR THE TOP OF TANK MUST BE INSULATED PER ALBERTA STANDARD OF PRACTICE.



10,000 GALLON RECIRCULATION TANK CROSS SECTION

SCALE: NONE

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VANTAGE POINTE

RECIRCULATION TANK

C3

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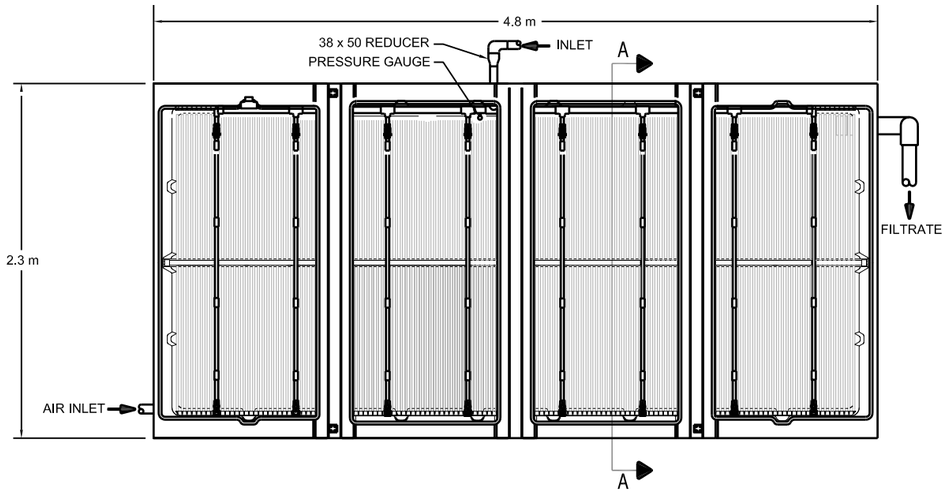
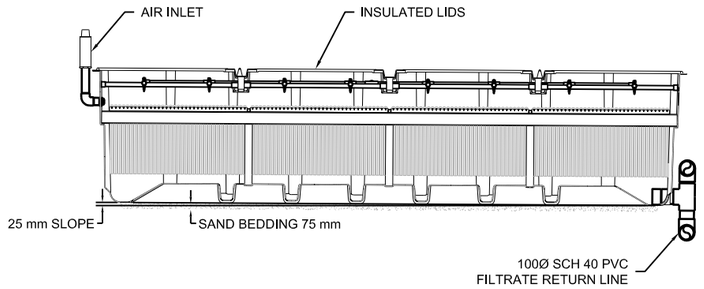


TOP VIEW OF AX100
SCALE: NONE



AX100 SECTION A-A
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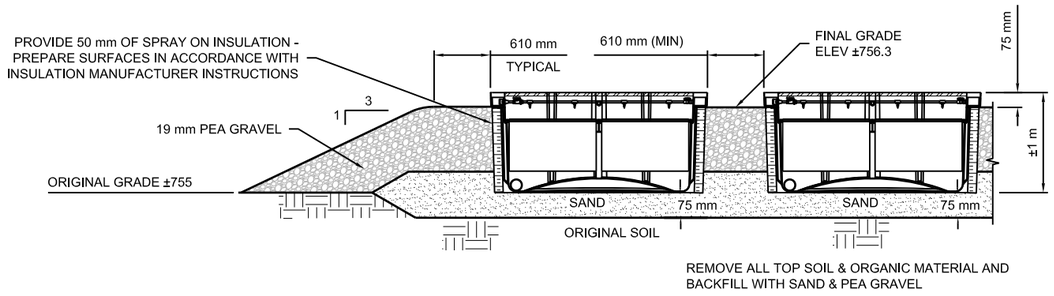
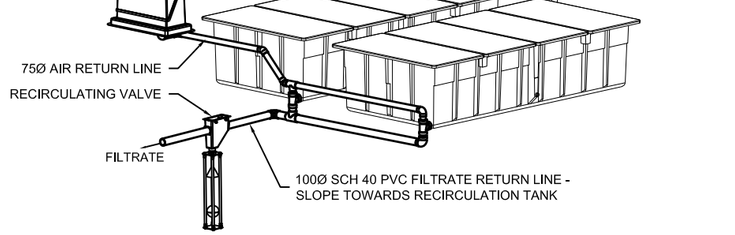
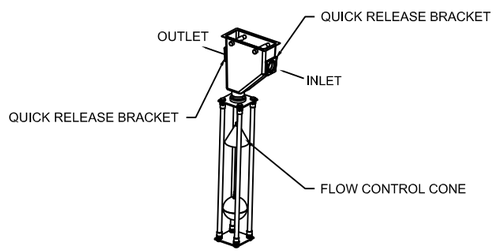


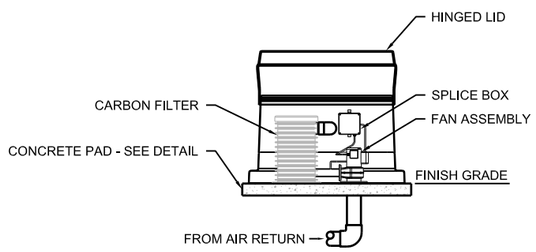
INSTALLATION DETAILS
SCALE: NONE



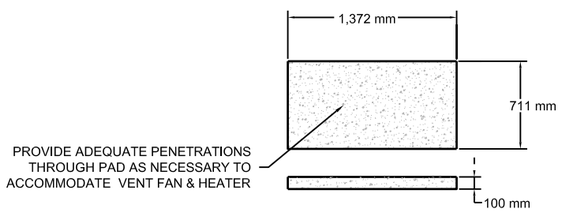
AX100 FILTRATE RETURN LINE ISO VIEW
SCALE: NONE



RECIRCULATING BALL VALVE
SCALE: NONE



VENT FAN ASSEMBLY WITH HEATER
SCALE: NONE



ASSEMBLY PAD DETAIL
SCALE: NONE

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VANTAGE POINTE

AX100 TREATMENT SYSTEM DETAILS

C4

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Plot Date: 18 October 2016 by Carla Cross_SD

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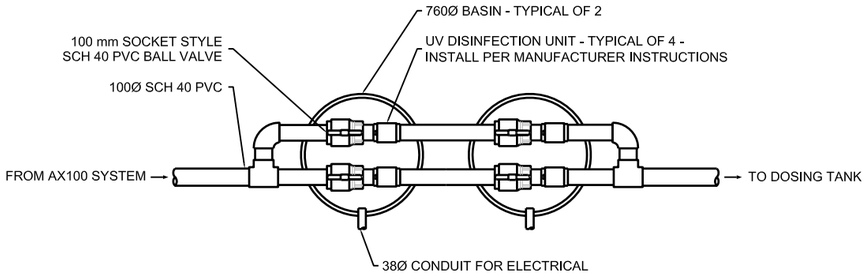
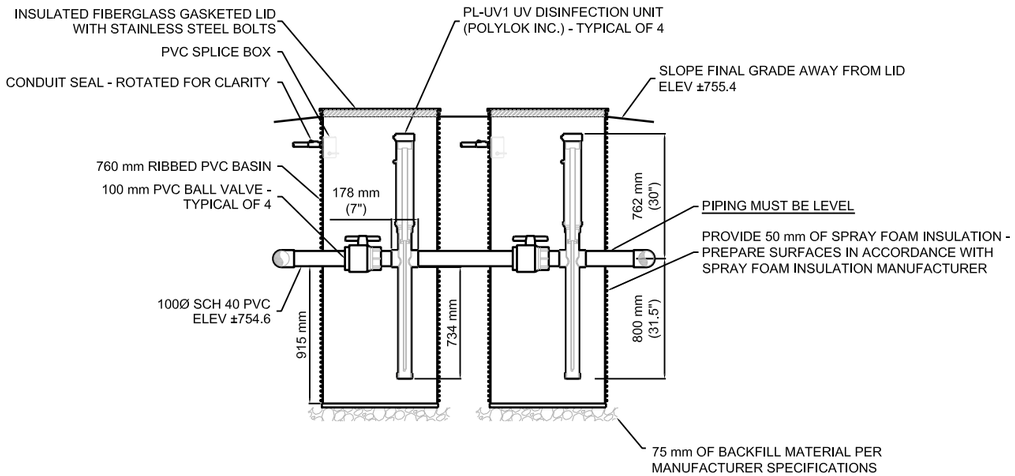


UV DISINFECTION BASIN PLAN VIEW

SCALE: NONE

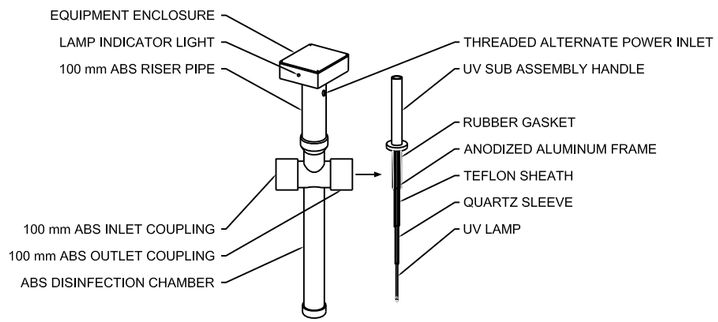
NOTES:

1. ACCESS OPENING SHALL BE LOCATED AT LEAST 50 mm ABOVE GRADE. FINAL GRADE SHALL ENSURE THAT STORMWATER IS DIVERTED AWAY FROM OPENINGS.
2. LIDS SHALL BE INSULATED TO PROVIDE THE MINIMUM EQUIVALENT OF AN R-8 INSULATION VALUE.
3. SIDEWALLS SHALL BE INSULATED PER ARTICLE 4.2.2.6 FROM THE ALBERTA PRIVATE SEWAGE SYSTEMS STANDARD OF PRACTICE (2015 EDITION).
4. APPROVED BALL VALVE MANUFACTURERS: SPEARS MANUFACTURING, ASAHI/AMERICA, HAYWARD OR ENGINEER APPROVED ALTERNATE.
5. COORDINATE WITH UV SYSTEM MANUFACTURER REGARDING ELECTRICAL REQUIREMENTS.



UV DISINFECTION BASIN CROSS SECTION

SCALE: NONE



UV DISINFECTION CHAMBER & SUB ASSEMBLY

SCALE: NONE

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PROFESSIONAL ENGINEER ALBERTA BRYAN C. DESMET PERMIT TO PRACTICE

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VANTAGE POINTE

UV DISINFECTION

C5

C05_1044.03.dwg

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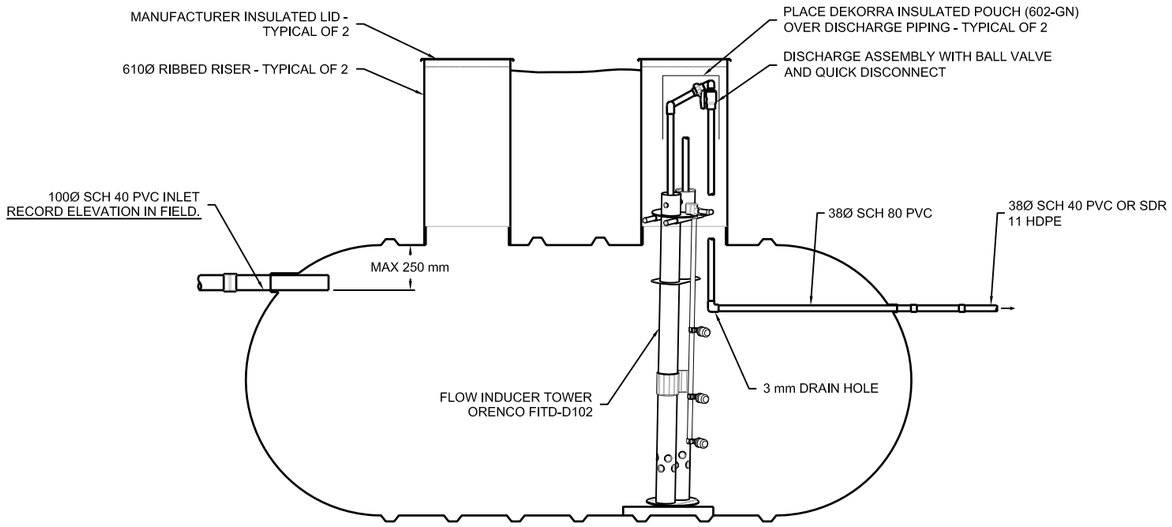
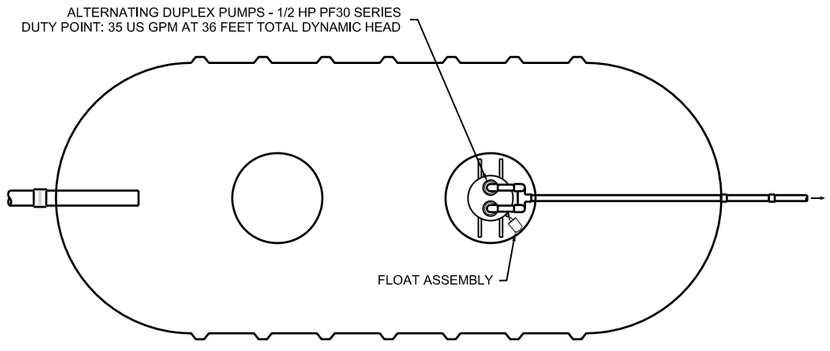


DOSING TANK CROSS SECTION

SCALE: NONE

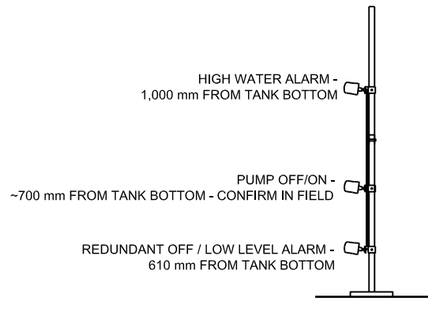
TANK SPECIFICATIONS:

1. THE DOSING TANK SHALL BE THE 4,000 US GALLON, 6 FOOT DIAMETER MODEL MANUFACTURED BY ZCL INC OR ENGINEER APPROVED ALTERNATE.
2. TANK SHALL MEET OR EXCEED THE REQUIREMENTS OF CAN/CSA-B66 "DESIGN, MATERIAL AND MANUFACTURING REQUIREMENTS FOR PREFABRICATED SEPTIC TANKS AND SEWAGE HOLDING TANKS". ZCL SHALL PROVIDE DEADMEN ANCHOR SYSTEM FOR DOSING TANK .
3. SHOP DRAWINGS MUST BE SUBMITTED TO ENGINEER FOR REVIEW PRIOR TO ORDERING TANK & UV SUMPS. PROVIDE SHOP DRAWINGS FOR TANK, RISERS, LIDS, FILTER, PUMPS & DISCHARGE ASSEMBLIES, FLOW INDUCER TOWERS, CONTROL PANEL, AND EXTERNAL JUNCTION BOX.
4. INSTALL TANK AND DEADMEN PER MANUFACTURER SPECIFICATIONS. PROVIDE A MINIMUM 300 mm LEVELING BASE OF 19 mm (3/4") MINUS GRANULAR BACKFILL. TANK SHALL BE PROPERLY VENTED TO ATMOSPHERIC PRESSURE.
5. ALL TANK OPENINGS SHALL BE LOCATED AT LEAST 75 mm ABOVE GRADE. FINAL GRADE SHALL ENSURE THAT STORMWATER RUNOFF IS DIVERTED AWAY FROM ALL OPENINGS. LIDS SHALL BE AIR-TIGHT AND SEALED WITH PINNED, STAINLESS STEEL (SST) BOLTS AND HAVE THE TEXT "WARNING: DO NOT ENTER" TO DISCOURAGE TAMPERING.
6. LEAK TESTING: SEAL ACCESS WAYS AND INLET AND OUTLET PIPING. FILL TANK WITH CLEAN WATER TO 50 mm ABOVE POINT OF RISER CONNECTIONS AND LET TANK STAND FOR ONE HOUR. IF THERE IS A MEASURABLE DROP IN THE WATER SURFACE ELEVATION, REFILL TANK AND LET STAND FOR ONE HOUR. TANK PASSES WATER TIGHTNESS TEST ONCE WATER LEVEL IS HELD FOR ONE HOUR WITHOUT ANY MEASURABLE LOSS.
7. SOIL COVER OVER THE TOP OF DOSING TANK SHALL BE AT LEAST 1.2 m OR TOP OF TANK MUST BE INSULATED.



DOSING TANK PLAN VIEW

SCALE: NONE



FLOAT TREE DETAIL

SCALE: NONE

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VANTAGE POINTE

DOSING TANK

C6

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Plot Date: 18 October 2016 by Carla Cross_SD

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CONTROL PANEL SPECIFICATIONS:

THE SUPPLY POWER IS 230 VAC, 1 PHASE. THE CONTROL PANEL SHALL HAVE THE FOLLOWING FEATURES:

1. DEADFRONT
2. OPERATOR INTERFACE WITH HYPER TERMINAL OR TELEMETRY SYSTEM WITHOUT OPERATOR SOFTWARE PURCHASE REQUIRED.
3. USER NAME & PASSWORD.
4. MAINTENANCE LOG ENTRY.
5. REAL TIME MONITORING OF PUMP OPERATION AND FLOAT SETTINGS.
6. REAL TIME AMP DRAW SENSING, AVERAGE AMP DRAW & PUMPS IN CURRENT AND PAST CONDITIONS.
7. CAPABILITY OF TIMER SETTING MODIFICATION.
8. USER LOGS FOR ALARMS AND PUMP RUN TIMES WITH CAPABILITY OF CALCULATING FLOW FOR EACH PUMP.
9. PAGE ALARM TO CALL OUT OPERATOR IN THE EVENT OF ALARM CONDITION.
10. ALARM POINTS FOR: (1) HIGH WATER LEVEL (2) PUMP FAIL AND (3) POWER FAILURE.
11. TIMERS SHALL BE PROGRAMMED THROUGH THE PLC AND ABLE TO BE MODIFIED BASED ON CONNECTION DIRECTLY AT THE PANEL OR THROUGH THE PHONE LINE, REMOTELY.
12. TIMERS SHALL BE CAPABLE OF SKIPPING PUMPS IF TAKEN OUT OF SEQUENCE AND ALLOW IMMEDIATE OFF/ON CYCLES OF THE NEXT PUMP IN SEQUENCE.
13. CONTROL PANEL ENCLOSURES SHALL BE PROTECTED BOTH INSIDE AND OUT AGAINST CORROSION PER CEC REQUIREMENTS.
14. CONTROL PANEL ENCLOSURES SHALL BE NEMA 4X AND FABRICATED OF FIBERGLASS OR 304 GRADE STAINLESS STEEL.
15. PROVIDE LAMINATED ELECTRICAL SCHEMATICS ON THE INNER DOOR OF EACH CONTROL PANEL.
16. PROVIDE STICKER OR NAME PLATE STATING THE VOLTAGE OF THE CONTROL PANEL AND THE APPROPRIATE LOCK OUT-TAG OUT CIRCUIT TO DEACTIVATE POWER TO THE PANEL. PLACE ON OUTSIDE DEAD FRONT OF CONTROL PANEL AND PROVIDE A STICKER OR NAME PLATE THAT STATES "ELECTRICAL HAZARDS - AUTHORIZED PERSONNEL ACCESS ONLY."
17. PROVIDE CONDENSATION HEATER WITH ADJUSTABLE THERMOSTAT AND CIRCUIT BREAKER. FOR PANELS EXCEEDING 508 mm X 712 mm, A FORCED AIR HEATER SHALL BE PROVIDED.
18. INSTALL A GENERATOR RECEPTACLE WITH PLUG ON THE OUTSIDE OF THE CONTROL PANEL.
19. PROVIDE A DISCONNECT SWITCH FOR A SINGLE SHUT-OFF POINT FOR ALL POWER ENTERING PANEL.
20. AMBER PILOT LIGHTS (IDEC LIGHT OR APPROVED ALTERNATE) SHALL BE PROVIDED TO INDICATE FLOAT CIRCUIT OPERATIONS & BE PERMANENTLY LABELED AS TO FUNCTION.
21. EACH MOTOR SHALL HAVE A GREEN RUN LIGHT (IDEC LIGHT OR APPROVED ALTERNATE).
22. PROVIDE RED EXTERNAL ALARM LIGHT AND GREEN EXTERNAL "POWER ON" LIGHT ON TOP OF PANEL.
23. INCLUDE A DEDICATED 115V, SINGLE PHASE, 15 AMP (MINIMUM) CIRCUIT FOR SERVICE TO EACH UV DISINFECTION UNIT.

OTHER REQUIREMENTS INCLUDE:
1. CONTRACTOR SHALL PROVIDE ALUMINUM GRADE, FLOOR STANDING ENCLOSURE WITH CONCRETE PAD UNLESS PANEL IS INSTALLED INSIDE A BUILDING.
2. MOUNTING HARDWARE AND FASTENERS SHALL BE STAINLESS STEEL AND HAVE SS LOCKABLE LATCH ON FRONT PANEL.
3. COMPONENT FASTENERS MUST BE MACHINE SCREWS WITH BACK PLATE DRILLED FOR MOUNTING ALL INTERNAL COMPONENTS.
4. CONTRACTOR SHALL PROVIDE GAS "SEAL OFFS" IN CONDUIT PRIOR TO ENTERING CONTROL PANEL.
5. CONTRACTOR SHALL PROVIDE AN UNINTERUPTIBLE POWER SUPPLY SUITABLE FOR OPERATING THE PLC IN THE EVENT OF A POWER OUTAGE OF UP TO 6 HOURS .
6. CONTRACTOR SHALL SUPPLY TELEPHONE SERVICE TO MAIN CONTROL PANEL. BURY TELEPHONE WIRE IN SEALED CONDUIT SEPARATE FROM POWER LINES.
7. PROVIDE POWER SURGE ARRESTOR.
8. PROVIDE POWER/CONTROL CABLES OF ADEQUATE LENGTH WITHOUT SPLICING, UNLESS APPROVED BY ENGINEER.
9. CONTRACTOR SHALL SUPPLY CAT LOCKS (OR APPROVED ALTERNATE) FOR SECURING ALL CONTROL PANELS.

MOTOR TABLE

NAME	# UNITS	SIZE (HP / kW)	POWER	LOCATION	RECOMMENDED MODEL
RECIRCULATION PUMP	3	0.75 / 0.56	1Ø	RECIRCULATION TANK	PF500712
UV DISINFECTION UNIT	4	<0.07 / <0.05	1Ø	UV BASINS	POLYLOK PL-UV1
VENT FAN & HEATER	1	1.5 / 1.1	1Ø	NEXT TO AX100 PODS	PER ORENCO
DOSING PUMP	2	0.5 / 0.4	1Ø	DOSING TANK	PF300512

FUNCTIONAL DESCRIPTIONS:

1. RECIRCULATION PUMPS:
THREE PUMPS MUST BE PROVIDED FOR DOSING THE 3 AX100 PODS. EACH PUMP MUST HAVE ITS OWN DEDICATED TIMER TO CONTROL ON & OFF FUNCTIONS, A COMMON ON/OFF TIMER IS NOT ACCEPTABLE. THERE SHOULD BE A TIMER TO OVERRIDE THE OFF TIMES IN A HIGH WATER LEVEL SITUATION. THIS HIGH FLOW TIMER SHOULD BE CAPABLE OF OPERATING THE NEXT PUMP IN SEQUENCE ON AN ACCELERATED TIME OFF FUNCTION. THE OPERATOR NEEDS THE ABILITY TO DOSE THE PODS PER MANUFACTURER SPECIFICATIONS SO THAT NONE ARE HYDRAULICALLY OVERLOADED. EACH PUMP SHOULD HAVE THE CAPABILITY TO BE TAKEN OUT OF SEQUENCE. THE HAND/OFF/AUTO (HOA) SWITCH SHOULD BE MARKED "OUT OF SEQUENCE" IF A PUMP IS IN "OFF" MODE.

FOUR FLOATS MUST BE PROVIDED. EACH FLOAT SHOULD DICTATE A SPECIFIC RESPONSE FROM THE CONTROL PANEL. FLOAT DESCRIPTIONS ARE BELOW.
a. REDUNDANT OFF/LOW LEVEL CUTOFF - POWER TO TIMERS IS DISABLED IF FLOAT IS DOWN. AN ALARM SHOULD SOUND, RED LIGHT FLASH AND OPERATOR NOTIFIED.
b. TIMER ON/OFF - WHEN ACTIVATED, TIMER STARTS IN "OFF" MODE FIRST AND CYCLES THROUGH TO "ON" MODE. REPEAT TO NEXT PUMP IN SEQUENCE. WHEN FLOAT IS DOWN, TIMER IS DISABLED.
c. OVERRIDE TIMER - FLOAT ENABLES A SECONDARY TIMER SETTING TO ALLOW INCREASED DOSING FREQUENCY FOR HIGHER THAN NORMAL LEVELS IN RECIRCULATION CHAMBER.
d. HIGH WATER LEVEL - ALARM SHOULD SOUND, RED LIGHT FLASH, AND OPERATOR NOTIFIED.

2. UV DISINFECTION UNIT:
INSTALL FOUR UV UNITS TO RUN CONTINUOUSLY. IF THE LAMP OUTPUT DROPS BELOW AN ACCEPTABLE LEVEL FOR PROPER UV DISINFECTION,THE ALARM CIRCUIT WILL TURN OFF THE GREEN LAMP INDICATOR LIGHT LOCATED ON THE OUTSIDE OF THE EQUIPMENT ENCLOSURE. THIS WILL ALSO ACTIVATE AN ALARM TO NOTIFY THE OPERATOR.

3. FINAL EFFLUENT PUMPS:
TWO PUMPS SHALL BE PROVIDED FOR TRANSFERRING WASTEWATER FROM THE DOSING TANK TO THE WETLAND DISCHARGE TRENCH. IN RESPONSE TO DEMAND, THE PANEL WILL CONTROL THESE TWO MOTORS, ALTERNATING THE FIRST ("LEAD") MOTOR EACH CYCLE. EACH PUMP MUST HAVE THE CAPABILITY TO BE TAKEN OUT OF SEQUENCE. THE HAND/OFF/AUTO (HOA) SWITCH SHOULD BE MARKED "OUT OF SEQUENCE" IF A PUMP IS IN THE "OFF" MODE.

THREE FLOATS MUST BE PROVIDED. EACH FLOAT SHOULD DICTATE A SPECIFIC RESPONSE FROM THE CONTROL PANEL. FLOAT DESCRIPTIONS ARE BELOW.
a. PUMP OFF - WHEN FLOAT IS DOWN, PUMP IS DISABLED.
b. PUMP ON - WHEN ACTIVATED, PUMP TURNS ON AND DOSES A SPECIFIC VOLUME UNTIL THE SECOND FLOAT TURNS THE PUMP OFF. REPEAT TO NEXT PUMP IN SEQUENCE.
c. HIGH WATER LEVEL - ALARM SHOULD SOUND, RED LIGHT FLASH AND OPERATOR NOTIFIED.

4. VENT FAN WITH HEATER:
FAN WITH A CARBON FILTER TO CONTROL ODOURS SHALL RUN CONTINUOUSLY. A 1 kW HEATER SHALL ALSO RUN PER A THERMISTOR IN ONE OF THE AX100 UNITS.

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VANTAGE POINTE

CONTROL PANEL SPECIFICATIONS

C7

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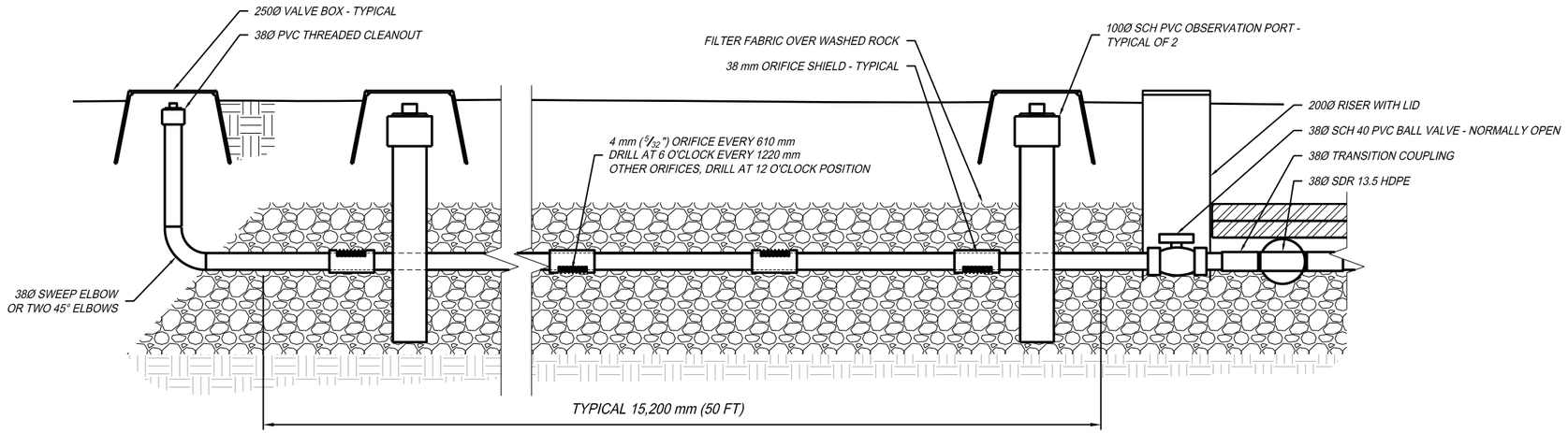
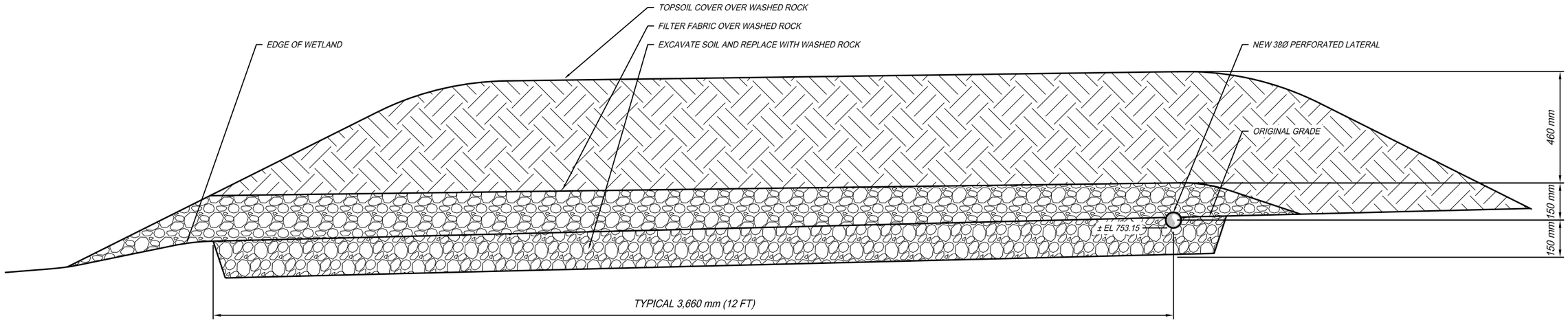


DISPERSED DISCHARGE CROSS SECTION 1

SCALE: NONE



DISPERSED DISCHARGE CROSS SECTION 2

SCALE: NONE

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VANTAGE POINTE

DISPERSED WETLAND TRENCH DETAILS

C8

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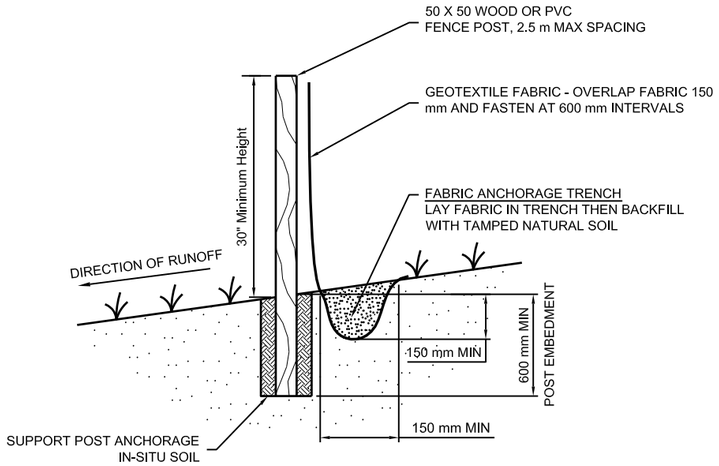

SILT FENCING DETAIL

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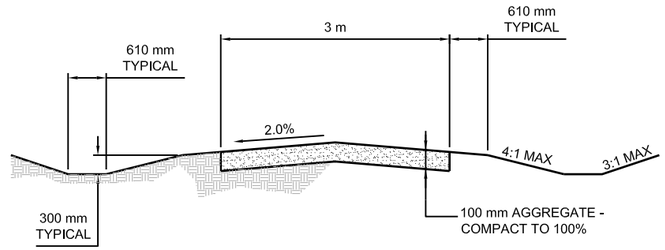

ACCESS DRIVE DETAIL

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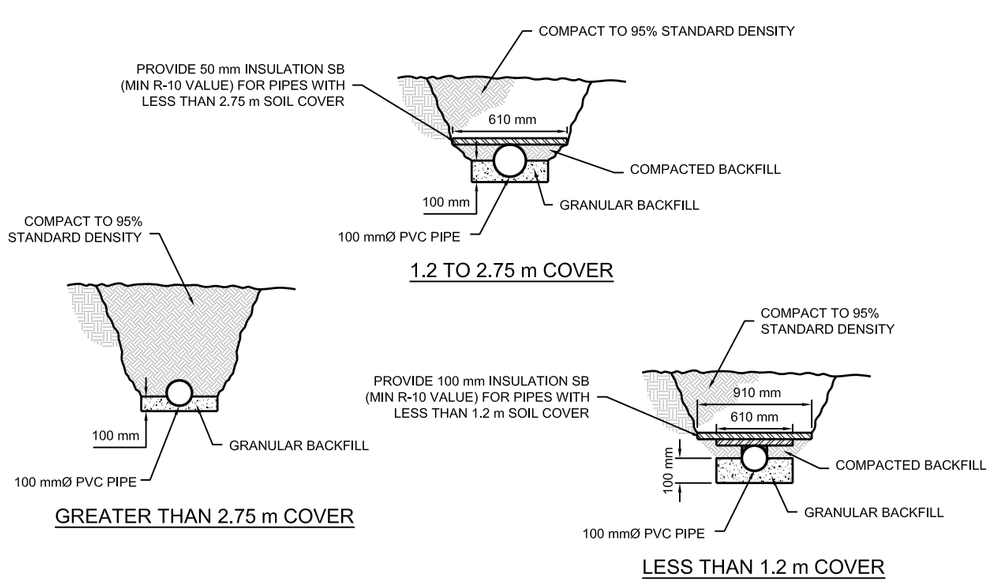

TYPICAL TRENCH SECTION

SCALE: NONE

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VANTAGE POINTE

SITE WORK DETAILS

C9

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Attachment F

Wetland Assessment Report from EBA

Vantage Pointe Wetland Assessment for Wastewater Disposal

PRESENTED TO

Quarry Land Developments

OCTOBER 17, 2016
ISSUED FOR USE
FILE: ENVIND03640-01

Tetra Tech EBA Inc.
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
Tel 780.451.2121 Fax 780.454.5688

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EXECUTIVE SUMMARY

Tetra Tech EBA Inc. (Tetra Tech) was retained by Quarry Land Developments to conduct a wetland assessment for a wastewater treatment system at the Vantage Pointe residential development that would incorporate a natural wetland into the wastewater treatment process. The assessment was based on the Alberta Environment and Sustainable Resource Development *Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement*.

The objective of this assessment was to characterize the environmental components associated with the subject wetland in order to assist in determining the feasibility of using the wetland for discharge of tertiary treated wastewater. This report is part of an application package prepared by SD Consulting pursuant to the *Environmental Protection and Enhancement Act*.

After conducting the wetland assessment, Tetra Tech anticipates that the wetland has the capacity to hold the discharged wastewater. Furthermore, construction within the wetland is not expected; therefore, compensation requirements under the Alberta *Water Act* are not anticipated. Consultation with Alberta Environment and Sustainable Resource Development is recommended to confirm that an Approval under the Alberta *Water Act* is not required. Tetra Tech recommends that measures be taken to avoid hydrologically impounding the wetland (i.e., blocking existing drainages), and to minimize the potential for inundation, backup, or ice build-up at the proposed discharge point.

Tetra Tech did not observe any vegetation species of management concern during the wetland assessment; however, two Noxious weeds – creeping thistle (*Cirsium arvense*) and perennial sow-thistle (*Sonchus arvensis*) – were identified and should be controlled according to the Alberta *Weed Control Act*. No wildlife species of management concern were observed at the time of the site visit. Based on wildlife species ranges, several wildlife species of management concern have the potential to be found in the area. These species are not anticipated to be impacted by the Project; however, individuals and their nests/dens are protected by legislation. Therefore, Tetra Tech recommends including a wildlife component to the monitoring program to ensure wildlife species are not being negatively impacted.

Major impacts to soils are not anticipated to occur as a result of the Project. It is recommended that any required construction activities occurs when the ground is frozen in order to reduce potential impacts to the soils such as soil compaction, rutting, erosion, and sediment releases. Tetra Tech recommends use of equipment with specialized tires or tracks and/or rigmats, and sediment control measures if required. Where stripping/removal of soil is required, the soil should be retained on-site and stored for replacement once construction is complete.

Expected effluent water quality is anticipated to be near or below existing conditions in the wetland. Five water quality parameters of the existing water exceeded surface water quality guidelines: dissolved phosphorous, total phosphorus, sulphide, aluminium, and iron. It is unknown whether these exceedances are due to natural water and soil chemistry, or if they are related to nearby agriculture, development, and/or disturbances. Tetra Tech recommends monitoring water quality in the wetland to ensure the Project is not negatively impacting the wetland. If the six parameters continue to be elevated, additional measures may be required (e.g., modifying the system design, adding different substrates to the wetland, introducing specific vegetation species) to help lower the specific parameters identified.

If these recommendations are followed, the proposed wastewater treatment system is not expected to have negative impacts on wetland water quality or biological features. Tetra Tech can assist in the design and implementation of the monitoring program.

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APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Quarry Land Developments and their agents. Tetra Tech EBA Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Quarry Land Developments, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA Inc.'s Services Agreement. Tetra Tech's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech) was retained by Quarry Land Developments to conduct a wetland assessment for a wastewater treatment system at the Vantage Pointe residential development that would incorporate a natural wetland into the wastewater treatment process. The assessment was based on the Alberta Environment and Sustainable Resource Development *Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement* (herein referred to as the Guidelines [Alberta Environment 2000]).

The purpose of the Guidelines is to provide a general system for evaluating proposed wetlands for feasibility of use as wastewater treatment wetlands. In the case of using natural wetlands, the objective is to evaluate whether use as a treatment wetland will alter the baseline conditions. The Guidelines provide general considerations for evaluating—where applicable—the ecological function of natural wastewater treatment wetlands, including: flood storage capability, water quality improvement, habitat for rare plants or plant communities, significant habitat for breeding waterfowl, significant habitat for migrating waterfowl or shorebirds, habitat for breeding area and disturbance-sensitive fauna, corridor for floral or faunal distribution, fisheries habitat, habitat for significant animal species, and social or economic benefit (Alberta Environment 2000).

The objective of this assessment was to characterize the environmental components associated with the subject wetland to assist in determining the feasibility of using the wetland for receiving discharge of tertiary treated wastewater. This report is part of an application package prepared by SD Consulting Group – Canada Inc. (SD Consulting) pursuant to the *Environmental Protection and Enhancement Act* (EPEA) (Province of Alberta 2000a). The assessment included both a desktop review and a field survey component.

Tetra Tech, SD Consulting, Quarry Land Developments, and Alberta Environment and Parks (AEP) have been working together since 2014 developing plans for a similar residential development project nearby (Country Lakes Estates). This assessment was conducted at the same time as the Country Lakes Estates assessment (September 2014), and this report generally follows the same format as the Country Lakes Estates Wetland Assessment for Wastewater Disposal (Tetra Tech EBA 2014).The wetland assessment took place before the implementation date (June 1, 2015) of the Alberta Wetland Policy (Government of Alberta 2013); therefore the assessment did not follow the methods outlined in the *Alberta Wetland Assessment and Impact Report Directive* (Government of Alberta 2015a). Tetra Tech was advised by AEP to provide this wetland assessment report with the data collected and following the previous report format that was reviewed by AEP.

2.0 PROJECT BACKGROUND

The Vantage Pointe residential development (the Site) is located approximately 7 kilometres (km) east of Beaumont, Alberta within the SE quarter section of 33-050-23 West of the Fourth Meridian (W4M), near the intersection of Range Road 233 and Township Road 504. There are 32 houses in the development, with a population of approximately 144 people.

There is an existing septic tank effluent pump collection system and 10,000 gallon holding tank on site; the wastewater is currently being shipped off-site for disposal. A secondary treatment, UV disinfection, and dispersed discharge disposal system has been proposed. A natural wetland is located centrally in the residential development (Figure 1). The proposed system will treat wastewater to tertiary standards and use the natural wetland for disposal of the treated wastewater. Disposal of treated effluent into the wetland will occur through a dispersed method using a chambered trench and lateral design; the trench will be located east of the wetland, parallel to the wetland boundary. The effluent water sprays the water in two directions within the trench, mimicking natural flow into the wetland. The water infiltrates into the ground and ultimately into the wetland and/or evaporates. The system has a peak design flow of approximately 49 cubic metres (m^3) of wastewater per day and an average design flow of 33 m^3 per day; actual anticipated flow is approximately 15 m^3 per day. The proposed design of the wastewater treatment system and discharge location was determined by SD Consulting (Appendix B).

3.0 ENVIRONMENTAL SETTING

The Site is located in the White Zone of Alberta (Government of Alberta 2014a)—which includes the settled, privately-owned areas of Alberta, including agricultural lands—and within the Central Parkland Natural Subregion of the Parkland Natural Region (Natural Regions Committee 2006). Surrounding land use is a combination of agricultural and residential, with multiple intact natural areas remaining.

The Site is located within the Prairie Pothole Region, which comprises areas that were shaped by receding glaciers 10,000 years ago, and formed shallow depressions that act as temporary and semi-permanent wetlands and which are called Prairie Potholes (Ducks Unlimited 2014). Subsequently, many shallow wetlands and ephemeral drainages are found within the region. The Site is located within the Saskatchewan-Nelson continental drainage basin, and the North Saskatchewan River basin and sub-basin (Government of Alberta 2016).

Canadian Climate Normals between 1981 and 2010 for the Edmonton International weather station (nearest station, which is approximately 26 km northwest of the Site) are characterized by the following parameters (Government of Canada 2016):

- Average temperature: 2.6 °C
- Extreme maximum temperature: 35.6 °C (August, 2008)
- Extreme minimum temperature: -48.3 °C (January, 1972)
- Average annual rainfall: 338.8 mm
- Average annual snowfall: 118 cm
- Extreme daily precipitation: 75.6 mm (July, 1990).

4.0 METHODS

4.1 DESKTOP REVIEW

Tetra Tech conducted a background information search in order to identify land use information, geographic information, potentially sensitive elements, historical information, and any additional data where information gaps existed for the Site and surrounding areas. All searches were conducted using specific buffered distances (specified below) from 53.353471° -113.300621° (approximate centre of the Site).

Wetland and Hydrology

Tetra Tech consulted or reviewed the following:

- The Fish and Wildlife Internet Mapping Tool (FWIMT) (Government of Alberta 2016a) for information regarding local wetlands and hydrological information (i.e., nearby wetlands, waterbodies, watercourses, and watershed units);
- The *Code of Practice - Red Deer Management Area Map* (Alberta Environment 2006) to determine if any classified watercourses with Restricted Activity Periods (RAPs) are present nearby or connected to the Site; and
- Available historical satellite imagery (Google Earth Inc. 2015) in order to determine if recent changes have occurred within or surrounding the wetland.

Vegetation and Terrain

Tetra Tech conducted a search of the Alberta Conservation Information Management System (ACIMS) *Element Occurrence Data* (Government of Alberta 2015b) for vegetation elements of management concern (i.e., vegetation resources that are rare or sensitive in nature that may be of value for their contribution to biodiversity at a local, regional, provincial, national, or international scale) within 1,000 m of the Site. Tetra Tech also used the ACIMS *Tracked Elements Listed by Natural Subregions – July 2015* (Government of Alberta 2015c) database to compile a list of tracked vegetation elements of management concern – including vascular plant species and ecological communities – that are known to occur within the Central Parkland Natural Subregion of Alberta. Vegetation elements of management concern are any that meet one of more of the following criteria:

- Species listed as 'Special Concern,' 'Threatened' or 'Endangered' under Schedule 1 of the federal *Species at Risk Act* (Government of Canada 2002);
- Species assessed as 'Special Concern,' 'Threatened' or 'Endangered' according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2014);
- Species listed as 'Threatened' or 'Endangered' under Schedule 6 of the *Wildlife Regulation* of the Alberta *Wildlife Act* (AWA) (Province of Alberta 2000b);
- Species assessed as 'Special Concern,' 'Threatened' or 'Endangered' according to the Alberta Endangered Species Conservation Committee (ESCC) (Government of Alberta 2014c); and
- Vascular plant species and ecological communities listed as Tracked on the ACIMS *Tracked Elements Listed by Natural Subregions – July 2015* (Government of Alberta 2015c).

Scientific and common names of vegetation species followed the nomenclature provided in the ACIMS *List of all Vascular Plant Taxa Confirmed for Alberta as recorded in the ACIMS database – October 15 2015* (Government of Alberta 2016b).

Additionally, Tetra Tech conducted a search for protected areas (Government of Alberta 2014b) and Environmentally Significant Areas (ESAs) (i.e., lands considered to be important for the long-term maintenance of biological diversity, soil, water, and natural processes [Fiera Biological Consulting Ltd. 2014]) within 1,000 m of the Site.

Wildlife

Tetra Tech compiled a list of all wildlife species of management concern known or having the potential to occur within 1,000 m the Site by querying the FWIMT database (Government of Alberta 2016a) and species' ranges (Federation of Alberta Naturalists 2007; Ridgely et al. 2007; IUCN 2014). In addition to the criteria listed for vegetation, wildlife species of management concern are any that:

- Have provincial and/or federal restricted activity dates or setback distances (Government of Alberta 2011; Environment Canada 2009); or
- Are ranked as 'Sensitive', 'May Be At Risk', or 'At Risk', by the Alberta Wild Species General Status Listing - 2010 (Government of Alberta 2012).

4.2 SITE VISIT

Tetra Tech conducted a site visit on September 13, 2014. Two Tetra Tech staff conducted the assessment, which lasted approximately three to four hours.

Wetland and Hydrology

Tetra Tech located, confirmed, and delineated (where possible) the wetland boundary using available satellite imagery (Google Earth Inc. 2015) and field observations. Tetra Tech classified the wetland according to the *Classification of Natural Ponds and Lakes in the Glaciated Prairie Region* (Stewart and Kantrud 1971) and the *Canadian Wetland Classification System* (National Wetlands Working Group 1997). The field survey crew also noted any hydrological features (e.g., culverts, drainages) linked to the wetland and took digital photographs of the overall wetland.

Vegetation and Terrain

Tetra Tech compiled a vegetation inventory for the wetland by recording all vegetation species as they were encountered at the Site. During the site visit, the field survey crew also documented any terrestrial features (e.g., slopes) that may affect the development of Project.

Wildlife

Tetra Tech recorded incidental wildlife species as they were encountered during the site visit.

Soils

Tetra Tech conducted a topsoil assessment in the wetland area proposed to receive the treated water by excavating one 30 centimetre (cm) deep soil pit using hand-operated equipment (i.e., spade shovel). Soil characteristics were assessed according to the *Canadian System of Soil Classification* (Soil Classification Working Group 1998).

Water Quality

Tetra Tech sampled surface water at one location in the wetland. Samples were preserved, then sent to and analyzed by a certified environmental testing laboratory (Maxxam Analytics). Parameters selected for analysis were determined in accordance with the Guidelines (Alberta Environment 2000), and included: metals (34 parameters), biological oxygen demand, bacteria (E.coli, total coliforms, and fecal coliforms), phosphorus, nitrogen, pesticides, total organic carbon, turbidity, and total suspended solids. A total of 85 parameters were analyzed as part of the combined laboratory processes.

Tetra Tech evaluated the lab results against surface water quality guidelines identified by the *Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)* (Canadian Council of Ministers of the Environment [CCME] 1999) and *Environmental Quality Guidelines for Alberta Surface Waters – Surface water quality guidelines for the protection of freshwater aquatic life* (Government of Alberta 2014b).

5.0 RESULTS

5.1 WETLAND AND HYDROLOGY

The desktop review indicates that there are no permanent watercourses or previously identified fish habitat present near the Site. Review of the available historical satellite imagery revealed that the wetland has remained relatively unchanged since 2002 (earliest available satellite imagery), which was before residential development was present at this location. Some minor changes to shape, size, and composition appear to have occurred throughout the years, likely as a result to seasonal changes in water regimes and development of surrounding land.

The wetland is classified as an Isolated Basin Marsh (National Wetlands Working Group 1997), Class V (Stewart and Kantrud 1971) wetland, and is approximately 1.74 hectares (ha) in size (Figure 1; Photo 1). The east portion of the wetland drains west through a drainage into the central, larger portion of the wetland. An ephemeral drainage is also present at the southwest portion of the wetland, which likely only contains water during high precipitation events or spring melt; it drains to adjacent, undeveloped lands. No flow or standing water was observed in either of the drainages at the time of the site visit. A historical overflow area was present north of the wetland prior to construction of the permanent road; it now appears to be an isolated wetland and is approximately 0.56 ha in size (Figure 1). No culverts were observed at the time of the site visit. Permanent open water is present in some of the central areas of the wetland (Figure 1), with aquatic vegetation covering some areas of the open water at the time of the site visit. Vegetation and hydrological zones of the wetland display a characteristic Class V gradient from low-prairie to permanent open water.

Photo 1: Overview of the east portion of the wetland facing south.

5.2 VEGETATION AND TERRAIN

The results of the desktop review indicate that no historical occurrences of vegetation elements of management concern have been recorded within 1,000 m of the Site. Furthermore, no protected areas or ESAs were identified within 1,000 m of the Site. There are 64 vegetation elements of management concern – including 21 ecological communities and 43 plant species – that have been historically documented in the Central Parkland Natural Subregion and have the potential to occur near the Site (Appendix C); none of these elements were observed during the site visit. There were no observed microsites or features that would indicate the likely presence of any of these species or ecological communities at the Site.

During the site visit, Tetra Tech recorded a total of 20 plant species (Appendix D). The dominant species in the wetland include: common cattail (*Typha latifolia*), water sedge (*Carex aquatilis*), and small bottle sedge (*Carex utriculata*). Vegetation zones of the wetland display a characteristic Class V gradient from low-prairie to permanent open-water. Aquatic vegetation (e.g., turion duckweed [*Lemna turionifera*]) covered some of the open water during the time of the site visit; however, there was no evidence of eutrophic or problematic conditions. Of the plant species that were recorded, none are considered vegetation elements of management concern. Two species observed during the site visit are listed as Noxious weeds under the Alberta *Weed Control Act* (Province of Alberta 2008): perennial sow-thistle (*Sonchus arvensis*) and creeping thistle (*Cirsium arvense*) (Photo 2).

Photo 2: View of noxious weeds present at the Site. Photo taken east of wetland, facing west.

5.3 WILDLIFE

No historical wildlife occurrences within 1,000 m of the Site have been documented in the FWIMT database. The species range search identified 17 wildlife species of management concern with potential range within the Site: one amphibian, 12 birds, and three mammals (Appendix E). None of these species were observed during the site visit. Two species, or signs thereof, were observed during the site visit: deer (*Odocoileus* sp. [tracks]) and Mallard (*Anas platyrhynchos*). Neither of these species are considered species of management concern; however active nests (of any migratory birds) are protected under federal and provincial legislation.

5.4 SOILS

Tetra Tech excavated one soil pit on-site (Figure 1). The soils at this pit are mineral soils with characteristics that are consistent with water modified conditions. The mineral Ah horizon texture is silty-loam, colour is 2/2 10YR (i.e., dark brown), there is visible gleying and mottling, and soil structure is subangular blocky. The soils are wet and slightly sticky, site drainage is imperfect, and site topography is hummocky. Groundwater did not recharge the test pit during the assessment.

5.5 WATER QUALITY

Five of the 85 tested parameters exceeded surface water quality guidelines: dissolved phosphorous, total phosphorous, sulphide, aluminium, and iron (Appendix F). Expected effluent water quality is available for four parameters. All effluent water quality parameters are expected to be near or below the existing conditions in the wetland (Appendix F; SD Consulting Group – Canada, Inc. 2014).

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 WETLAND AND HYDROLOGY

Tetra Tech anticipates that the wetland has the capacity to hold the discharged wastewater given its size and estimated hydraulic loads. No changes or impacts to the wetland or wetland boundary are anticipated due to the construction of the system or discharge of treated wastewater. Therefore, compensation requirements under the Alberta *Water Act* (Province of Alberta 2000c) are not anticipated. Consultation with AEP is recommended to confirm that an Approval under the Alberta *Water Act* is not required. Tetra Tech recommends that measures be taken to avoid hydrologically impounding the wetland (i.e., blocking existing drainages), and to minimize the potential for inundation, backup, or ice build-up at the proposed discharge point.

6.2 VEGETATION AND TERRAIN

The vegetation at the time of the site visit was characteristic of a healthy wetland system. The two Noxious weeds (creeping thistle and perennial sow-thistle) that were observed should be controlled according to the Alberta *Weed Control Act* (Province of Alberta 2008); this can be achieved by application of chemical herbicides for these species. If weeds are near or within the wetland boundary, hand-pulling or mowing is recommended in order to prevent introduction of chemical herbicides into the water system; mechanical removal may be required for multiple years to achieve successful eradication. In order to prevent the spread (or introduction) of Noxious weeds on-site, Tetra Tech recommends that all equipment and personnel arrive and leave the Site clean and free of soil and vegetation debris.

Clearing vegetation on the Site should be avoided to the greatest extent feasible, since this can negatively affect the hydrology, soils, water quality, vegetation zones, wildlife, and other organisms (e.g., invertebrates) within the wetland. Tetra Tech recommends that vegetation within and surrounding the wetland be monitored annually for the initial years of operation to ensure no major changes or impacts are incurred as a result of the Project.

6.3 WILDLIFE

Based on species ranges, several wildlife species of management concern have the potential to be found near the Site. These species are not anticipated to be impacted, as construction of the Project is expected to be low-impact. Tetra Tech recommends including a wildlife component to the monitoring program to ensure wildlife species are not being negatively impacted. If clearing of trees, densely vegetated areas, or other potential wildlife habitat (e.g., many waterfowl species nest on wetland shores) are required, clearing activities should not occur during the bird breeding season (March 1 to August 31). Unpermitted disturbance of active nests and dens of wildlife contravenes the Alberta *Wildlife Act* and the federal *Migratory Birds Convention Act, 1994* (Government of Canada 1994). If active nests, dens, or individuals of species of management concern are observed during construction, all activity should cease immediately and specific mitigation plans should be developed and adhered to under advisement of a Professional Biologist and AEP. If construction is required during the bird breeding season (March 1 to August 31), appropriate permits will be required, and Tetra Tech recommends a nest sweep and wildlife habitat survey be conducted by a Professional Biologist immediately prior to construction.

6.4 SOILS

Disposal of treated wastewater into the wetland is not expected to have negative impacts on soils. It is recommended that any required construction activities occur when the ground is frozen in order to reduce potential impacts to the soils such as soil compaction, rutting, erosion, and sediment releases. Tetra Tech recommends use of equipment with specialized tires or tracks and/or rigmats, and sediment control measures if required. Where stripping or removal of soil is required, the soil should be retained on-site and stored for replacement once construction is complete; this will help reduce impacts to soils and the biological communities they support.

6.5 WATER QUALITY

The water quality samples exceeded surface water quality guidelines for five of the 85 tested parameters. It is unknown whether these exceedances are due to natural water and soil chemistry, or if they are related to nearby agriculture, development, and/or disturbances. These parameters can fluctuate seasonally depending on the amount and nature of nearby activity and surface runoff. As there was precipitation at the site five out of the seven days prior to the site visit, increased runoff into the wetland may have resulted in elevated levels of some of these parameters. The field crew did not note any visible indicators of vegetation or wetland distress that may be caused by elevated parameters (e.g., overproduction of aquatic vegetation, vegetation die-off). These water quality results should be used as background information for monitoring of water quality in the wetland over the duration of the Project.

Given that the expected effluent water quality for four parameters are expected to be near or below the existing conditions in the wetland, it is not expected that the Project will increase concentrations or negatively affect the water quality of the wetland. SD Consulting has developed nutrient modeling calculations that indicate that the wetland has the capacity to remove excess nutrients; therefore, excess nutrients are not anticipated to have negative impacts on the wetland. Tetra Tech recommends monitoring water quality in the wetland to ensure the Project is not negatively impacting the wetland. If the six parameters continue to be elevated, additional mitigation measures may be required (e.g., modifying the system design, adding different substrates to the wetland, introducing specific vegetation species) to help lower the specific parameters identified. Tetra Tech can assist in the design and implementation of the monitoring program and, if required, additional mitigation measures.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.

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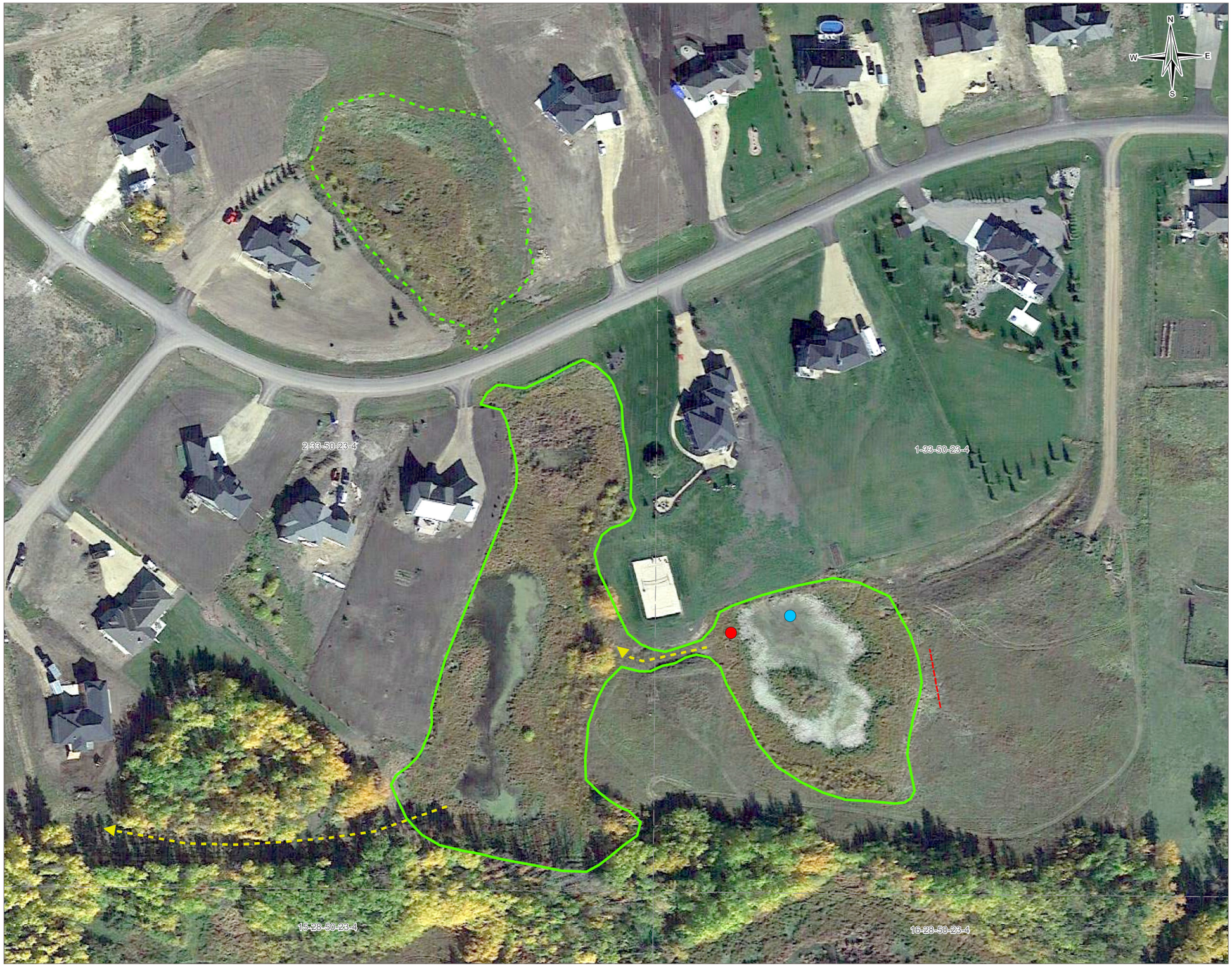
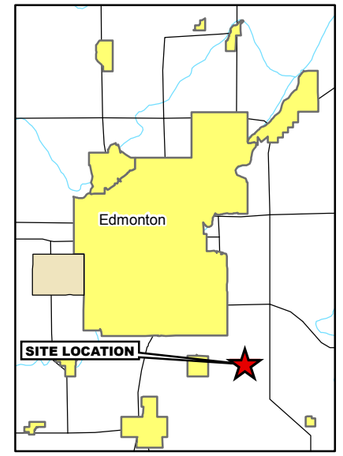
FIGURES



LEGEND

- Drainage
- Approximate Location of Discharge Dispersal Trench
- Soil Assessment
- Water Sample
- Historical Overflow Boundary
- Wetland Boundary



NOTES
Imagery: ESRI Imagery Service, 2013

STATUS
ISSUED FOR USE

VANTAGE POINTE WETLAND ASSESSMENT
SE-33-050-23 W4

Site Overview

PROJECTION UTM Zone 12		**DATUM** NAD83			**CLIENT** Quarry Land Developments
Scale: 1:1,500 20 10 0 20 40 Meters					TETRA TECH
FILE NO. ENVIND03640-01_FIG1_2016.mxd					
PROJECT NO. TBD	**DWN** RG	**CKD** MS	**APVD** TC	**REV** 0	**Figure 1**
OFFICE Tt EBA-CAL	**DATE** September 29, 2014				

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APPENDIX A

TETRA TECH'S GENERAL CONDITIONS

GENERAL CONDITIONS

NATURAL SCIENCES

This report incorporates and is subject to these “General Conditions”.

1.1 USE OF REPORTS AND OWNERSHIP

This report pertains to a specific site, a specific development or activity, and/or a specific scope of work. The report may include plans, drawings, profiles and other supporting documents that collectively constitute the report (the “Report”).

The Report is intended for the sole use of TETRA TECH’s Client (the “Client”) as specifically identified in the TETRA TECH Services Agreement or other Contract entered into with the Client (either of which is termed the “Services Agreement” herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Report when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Report is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Report.

Where TETRA TECH has expressly authorized the use of the Report by a third party (an “Authorized Party”), consideration for such authorization is the Authorized Party’s acceptance of these General Conditions as well as any limitations on liability contained in the Services Agreement with the Client (all of which is collectively termed the “Limitations on Liability”). The Authorized Party should carefully review both these General Conditions and the Services Agreement prior to making any use of the Report. Any use made of the Report by an Authorized Party constitutes the Authorized Party’s express acceptance of, and agreement to, the Limitations on Liability.

The Report and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH ’s professional work product and shall remain the copyright property of TETRA TECH.

The Report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Report, if required, may be obtained upon request.

1.2 ALTERNATIVE REPORT FORMAT

Where TETRA TECH submits both electronic file and hard copy versions of the Report or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH ’s “Instruments of Professional Service”), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive the original signed and/or sealed version for a maximum period of 10 years.

Both electronic file and hard copy versions of TETRA TECH ’s Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH ’s Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Report have been conducted in accordance with the Services Agreement, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Report.

TETRA TECH professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by TETRA TECH of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

1.5 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Services Agreement, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.6 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Report, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.7 GENERAL LIMITATIONS OF REPORT

This Report is based solely on the conditions present and the data available to TETRA TECH at the time the data were collected in the field or gathered from publically available databases.

The Client, and any Authorized Party, acknowledges that the Report is based on limited data and that the conclusions, opinions, and recommendations contained in the Report are the result of the application of professional judgment to such limited data.

The Report is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present at or the development proposed as of the date of the Report requires a supplementary investigation and assessment.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

The Client acknowledges that TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of property, the decisions on which are the sole responsibility of the Client.

1.8 JOB SITE SAFETY

TETRA TECH is only responsible for the activities of its employees on the job site and was not and will not be responsible for the supervision of any other persons whatsoever. The presence of TETRA TECH personnel on site shall not be construed in any way to relieve the Client or any other persons on site from their responsibility for job site safety.

APPENDIX B

VANTAGE POINTE WASTEWATER SYSTEM DESIGN BASIS

APPENDIX C

RARE PLANTS AND RARE ECOLOGICAL COMMUNITIES KNOWN TO OCCUR WITHIN THE CENTRAL PARKLAND NATURAL SUBREGION

Appendix C: Rare Plants and Rare Ecological Communities Known to Occur within the Central Parkland Natural Subregion

Scientific Name	Common Name	Subnational Rank[1]	National Rank[1]	Global Rank[1]	GSAWS[2]	SARA[3]	Habitat[4,5]
Communities							
Acer negundo / Prunus virginiana	Manitoba maple / choke cherry	S1/S2	NNR	G3	N/A	N/A	-
Betula neoalaskana - Picea glauca / Salix discolor / Equisetum arvense swamp forest community	Alaska birch - white spruce / pussy willow / common horsetail swamp forest community	S1/S2	NNR	GNR	N/A	N/A	Forest/Woodland
Calamovilfa longifolia - Sporobolus cryptandrus	sand grass - sand dropseed	S2/S3	NNR	GNR	N/A	N/A	Herbaceous
Calamovilfa longifolia - Stipa comata grassland	sand grass - needle-and-thread grassland	S3	NNR	G3	N/A	N/A	Herbaceous
Distichlis stricta - Pascopyrum smithii	salt grass - western wheat grass	S2	NNR	GNR	N/A	N/A	Herbaceous
Festuca hallii - Calamovilfa longifolia	plains rough fescue - sand grass	S1	NNR	GNR	N/A	N/A	Herbaceous
Festuca hallii - Hesperostipa curtiseta grassland	plains rough fescue - western porcupine grass grassland	S2/S3	NNR	GNR	N/A	N/A	-
Festuca hallii - Koeleria macrantha / Juniperus horizontalis / forbs	plains rough fescue - June grass / juniper / forbs	S2	NNR	GNR	N/A	N/A	Herbaceous
Festuca hallii grassland	plains rough fescue grassland	S1	NNR	GNR	N/A	N/A	Herbaceous
Juniperus horizontalis / (Koeleria macrantha) / Cladina mitis	creeping juniper / (June grass) / green reindeer lichen	S1/S2	NNR	GNR	N/A	N/A	Sparsely Vegetated
Larix laricina - Picea mariana / Cornus stolonifera - Rubus idaeus	tamarack - black spruce / red-osier dogwood - wild red raspberry	S1/S2	NNR	GNR	N/A	N/A	Forest/Woodland
Picea mariana / Cornus stolonifera / feathermoss	black spruce / red-osier dogwood / feathermoss	S1/S2	NNR	GNR	N/A	N/A	Forest/Woodland
Populus balsamifera / Viburnum opulus / Matteuccia struthiopteris	balsam poplar / high-bush cranberry / ostrich fern	S1/S2	NNR	GNR	N/A	N/A	Forest/Woodland
Populus tremuloides / Juniperus horizontalis / Carex siccata woodland	aspen / creeping juniper / hay sedge woodland	S2/S3	NNR	GNR	N/A	N/A	Forest/Woodland
Puccinellia nuttalliana community	Nuttall's salt-meadow grass community	S3?	NNR	G3?	N/A	N/A	Herbaceous
Salicornia rubra emergent marsh	samphire emergent marsh	S2	NNR	G2G3	N/A	N/A	Sparsely Vegetated
Schizachyrium scoparium - Calamovilfa longifolia	little bluestem - sand grass	S2	NNR	GNR	N/A	N/A	Herbaceous
Scirpus nevadensis - (Triglochin maritima)	Nevada bulrush - (seaside arrow-grass)	S2/S3	NNR	GNR	N/A	N/A	Sparsely Vegetated
Spartina gracilis - (Pascopyrum smithii)	alkali cord grass - (western wheat grass)	S2/S3	NNR	GNR	N/A	N/A	Sparsely Vegetated
Sporobolus cryptandrus semi-active dune	sand dropseed semi-active dune	S2	NNR	GNR	N/A	N/A	Sparsely Vegetated
Triglochin maritima emergent marsh	seaside arrow-grass emergent marsh	S2?	NNR	GNR	N/A	N/A	Sparsely Vegetated
Species							
Almutaster pauciflorus	few-flowered aster	S2/S3	NNR	G4	Sensitive	-	-
Bolboschoenus fluviatilis	river bulrush	S1	N5	G5	May Be At Risk	-	Margins of ponds, lakes and rivers
Botrychium campestre	field grape fern	S1	N2	G3G4	May Be At Risk	-	grassy fields and ditches
Botrychium simplex	dwarf grape fern	S2	N4	G5	May Be At Risk	-	moist meadows and shores
Botrychium spathulatum	spatulate grape fern	S2	N2N3	G3	May Be At Risk	-	fields and grassy openings
Bromus latiglumis	Canada brome	S1	NNR	G5	May Be At Risk	-	moist streambanks
Carex aperta	open sedge	S2	NNR	G4	Sensitive	-	-
Carex crawei	Crawe's sedge	S2	NNR	G5	May Be At Risk	-	calcareous meadows
Carex hystericina	porcupine sedge	S1	N5	G5	May be At Risk	-	shade, mucky soils
Carex vulpinoidea	fox sedge	S2	N5	G5	May be At Risk	-	swamps and wet meadows
Chenopodium atrovirens	goosefoot	S1	N1N2	G5	May Be At Risk	-	open, disturbed areas
Chenopodium fremontii	Fremont's goosefoot	S2	N5	G5	Secure	-	-
Corispermum pallasii	Pallas' bugseed	S2	N3N4	G4?	Undetermined	-	-
Cryptantha kelseyana	Kelsey's cat's eye	S1	N2	G4	May Be At Risk	-	dry soils
Cynoglossum virginianum var. boreale	wild comfrey	S1	N4	G5T4T5	May Be At Risk	-	dry woods
Dichanthelium leibergii	Leiberg's millet	S1	NNR	G5	May Be At Risk	-	-
Dichanthelium wilcoxianum	Wilcox's panicgrass	S2	N2	G5	May Be At Risk	-	-
Doellingeria umbellata var. pubens	flat-topped white aster	S2	N5	G5T5	May be At Risk	-	Moist soils, clearings, thickets, margins of forests and near streams, prairies
Echinochloa muricata var. microstachya	rough barnyard grass	S1	N5	G5T5	Exotic	-	-
Eleocharis ovata	ovate spikerush	S1	N5	G5	Undetermined	-	-
Gentiana fremontii	marsh gentian	S2	N2N3	G4	May Be At Risk	-	moist grassy meadows
Gratiola neglecta	clammy hedge-hyssop	S2	NNR	G5	Sensitive	-	wet, muddy sites, often shallow water
Houstonia longifolia	long-leaved bluets	S3	NNR	G4G5	May Be At Risk	-	-
Juncus nevadensis	Nevada rush	S1	NNR	G5	May Be At Risk	-	shorelines; wet sites
Lactuca biennis	tall blue lettuce	S2	N5	G5	May be At Risk	-	moist woods and clearings
Lysimachia hybrida	lance-leaved loosestrife	S2	NNR	G5	May Be At Risk	-	moist meadows and shores
Malaxis paludosa	bog adder's-mouth	S1	N3	G4	May be At Risk	-	mossy ground in bogs and fens
Marsilea vestita	hairy pepperwort	S2	N2N3	G5	May Be At Risk	-	shallow water of ponds, ditches and depressions
Mimulus glabratus	smooth monkeyflower	S1	N2	G5	May Be At Risk	-	wet places
Munroa squarrosa	false buffalo grass	S2	N2	G5	May Be At Risk	-	disturbed dry plains and slopes
Najas flexilis	slender naiad	S2	N5	G5	May Be At Risk	-	ponds and streams
Oenothera serrulata	shrubby evening-primrose	S3	N5	G5	May Be At Risk	-	-
Osmorhiza longistylis	smooth sweet cicely	S3	N5	G5	May Be At Risk	-	-
Piptatherum canadense	Canadian rice grass	S2	N4N5	G5	Undetermined	-	-
Potentilla lasiodonta	sandhills cinquefoil	S3	N2N4	G2G4Q	May Be At Risk	-	-
Potentilla plattensis	low cinquefoil	S1/S2	N2	G4	May Be At Risk	-	coulees and dry flats in prairie grassland
Ranunculus flabellaris	yellow water-crowfoot	S1	NNR	G5	Not Assessed	-	-
Rhynchospora capillacea	slender beak-rush	S1	NNR	G4	May be At Risk	-	fens, meadows, swamps.
Rorippa curvipes	yellow cress	SU	NNR	G5	May Be At Risk	-	moist ground
Ruppia cirrhosa	widgeon-grass	S1	N4	G5	Sensitive	-	saline and alkaline lakes, ponds, and ditches
Shinnersoseris rostrata	annual skeletonweed	S2	N2N3	G5?	May Be At Risk	-	sandy banks and dunes with loose sand
Viola pedatifida	crowfoot violet	S2	N4	G5	May Be At Risk	-	dry gravelly hills and exposed banks
Wolffia columbiana	watermeal	S2	NNR	G5	Sensitive	-	beaver ponds in hummocky moraines.

Notes:
[1]Government of Alberta 2015b - ACIMS Tracked Elements Listed by Natural Subregions - July 2015
[2]Government of Alberta 2012 - General Status of Alberta Wild Species (GSAWS)
[3]Government of Canada 2002 - Species at Risk Act (SARA).
[4]Kershaw et al. 2001. Rare Vascular Plants of Alberta.
[5]Moss. 1959. Flora of Alberta.

ACIMS Definitions:

Rank	Frequency/Distribution	Concerns/Comments
S1/N1/G1	5 or fewer occurrences or only a few remaining individuals	May be especially vulnerable to extirpation because of some factor of its biology
S2/N2/G2	6-20 or fewer occurrences or with many individuals in fewer locations	May be especially vulnerable to extirpation because of some factor of its biology
S3/N3/G3	21-100 occurrences, may be rare and local throughout it's range, or in a restricted range (may be abundant in some locations)	May be susceptible to extirpation because of large scale disturbances (such as restricted range), relatively small population sizes, or other factors
S4/N4/G4	Typically >100 occurrences	Apparently secure. Taxon is uncommon but not rare. Potentially some cause for long term concern due to declines or other factors.
S5/N5/G5	Typically >100 occurrences	Demonstrably secure. Taxon is common, widespread, and abundant.
?	Not yet ranked in Alberta or rank tentatively assigned	
SNR/NNR/GNR	Not ranked Conservation status not yet assessed	
SNA/NNA/GNA	Not applicable. A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities. Example - introduced species	

APPENDIX D

VANTAGE POINTE VEGETATION INVENTORY

Appendix D: Vantage Pointe Wetland Vegetation Inventory

Scientific Name	Common Name	Subnational Rank[1]	Global Rank[1]	Origin[1]	Tracked[1]
Trees and Shrubs					
Salix spp.	willow	-	-	-	-
Forbs					
Aster borealis	marsh aster	S5	Native	G5	-
*Cirsium arvense**	creeping thistle	SNA	Exotic	GNR	-
Epilobium ciliatum	northern willowherb	S5	G5	Native	-
Galeopsis tetrahit	hemp-nettle	SNA	GNR	Exotic	-
Hippuris vulgaris	common mare's-tail	S5	Native	G5	-
Lemna turionifera	turion duckweed	S5	Native	G5	-
Mentha arvensis	wild mint	S5	G5	Native	-
Petasites frigidus var. sagittatus	arrow-leaved coltsfoot	S5	Native	G5	-
Rumex occidentalis	western dock	S5	G5	Native	-
Sium suave	water parsnip	S5	G5	Native	-
*Sonchus arvensis**	perennial sow-thistle	SNA	GNR	Exotic	-
Typha latifolia	common cattail	S5	Native	G5	-
Grasses, Sedges, and Rushes					
Agrostis scabra	rough hair grass	S5	Native	G5	-
Carex aquatilis	water sedge	S5	G5	Native	-
Carex utriculata	small bottle sedge	S5	G5	Native	-
Glyceria grandis	common tall manna grass	S5	G5	Native	-
Phalaris arundinacea	reed canary grass	S5	G5	Native	-
Phleum pratense	timothy	SNA	Exotic	GNR	-
Schoenoplectus tabernaemontani	common great bulrush	S5	G5	Native	-

Notes:

*Noxious weed (Province of Alberta 2008)

[1]Government of Alberta. 2015b. List of all Vascular Plant Taxa Confirmed for Alberta as recorded in the ACIMS Database – October 15 2015.

ACIMS Definitions:

Rank	Frequency/Distribution	Concerns/Comments
S1/G1	5 or fewer occurrences or only a few remaining individuals	May be especially vulnerable to extirpation because of some factor of its biology
S2/G2	6-20 or fewer occurrences or with many individuals in fewer locations	May be especially vulnerable to extirpation because of some factor of its biology
S3/G3	21-100 occurrences, may be rare and local throughout it's range, or in a restricted range (may be abundant in some locations)	May be susceptible to extirpation because of large scale disturbances (such as restricted range), relatively small population sizes, or other factors
S4/G4	Typically >100 occurrences	Apparently secure. Taxon is uncommon but not rare. Potentially some cause for long term concern due to declines or other factors.
S5/G5	Typically >100 occurrences	Demonstrably secure. Taxon is common, widespread, and abundant.
?	Not yet ranked in Alberta or rank tentatively assigned	
SNR/GNR	Not ranked	
SNA/GNA	Not applicable	

APPENDIX E

WILDLIFE SPECIES OF MANAGEMENT CONCERN WITH POTENTIAL TO BE FOUND AT THE SITE

Appendix E: Wildlife Species of Management Concern with Potential to be Found at the Site[1]

Common Name	Scientific Name	GSAWS[2]	ESCC[3]	AWA[4]	COSEWIC[5]	SARA[6]	AEP Recommended Setback[7]			CWS Recommended Setback[8]		
							Distance (m)	Time of Year	Feature	Distance (m)	Time of Year	Feature
Amphibians												
Canadian Toad	*Anaxyrus hemiophrys*	May be at Risk	Data Deficient	-	Not at Risk	-	-	-	-	-	-	-
Birds												
American White Pelican	*Pelecanus erythrorhynchos*	Sensitive	-	-	Not at Risk	-	1000	Year-round	Nesting Site	-	-	-
Baird's Sparrow	*Ammodramus bairdii*	Sensitive	-	-	Special Concern							
Burrowing Owl	*Athene cunicularia*	At Risk	-	-	Endangered	Endangered	500	Year-round	Nesting Site	500	Apr 1-Aug 15	Nest and Roost
Forster's Tern	*Sterna forsteri*	Sensitive	-	-	Data Deficient							
Great Grey Owl	*Strix nebulosa*	Sensitive	-	-	Not at Risk	-	-	-	-	-	-	-
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive	-	-	Threatened	Threatened						
Prairie Falcon	*Falco mexicanus*	Sensitive	-	-	Not at Risk		1000	Year-round	Nesting Site			
Sprague's Pipit	*Anthus spragueii*	Sensitive	-	-	Threatened	Threatened	100	Apr 1-Jul 15	Active Nest and Surrounding Habitat	1000	May 1-Aug 31	Nest
Swainson's Hawk	*Buteo swainsoni*	Sensitive	-	-						-	-	-
Western Grebe	*Aechmophorus occidentalis*	Sensitive	Threatened	-	-	-	1000	Year-round	Nesting Site	-	-	-
Western Tanager	*Piranga ludoviciana*	Sensitive	-	-	-	-	-	-	-	-	-	-
Western Wood-Pewee	*Contopus sordidulus*	Sensitive	-	-	-	-	-	-	-	-	-	-
Mammals												
American Badger	*Taxidea taxus*	Sensitive	-	-	Endangered	-	-	-	-	-	-	-
Cougar	*Puma concolor*	Sensitive	-	-	Data Deficient	-	-	-	-	-	-	-
Long-tailed Weasel	*Mustela frenata*	May Be At Risk	-	-	-	-	-	-	-	-	-	-

Notes:

[1]Federation of Alberta Naturalists 2007; Government of Alberta 2014a; International Union for Conservation of Nature 2010 and 2012.

[2]Status under the General Status of Alberta Wild Species (GSAWS) (Government of Alberta 2012).

[3]Status under the Endangered Species Conservation Committee (ESCC) (Government of Alberta 2014c).

[4]Status under the *Alberta Wildlife Act* (AWA) (Province of Alberta 2000b).

[5]Status under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2014)

[6]Status under the *Species At Risk Act* (SARA) (Government of Canada 2002).

[7]Alberta Environment and Parks (AEP); assumes a high level of disturbance (Government of Alberta 2011).

[8]Canadian Wildlife Service (CWS); assumes a high level of disturbance (Enviroment Canada 2009).

APPENDIX F

SURFACE WATER ANALYTICAL RESULTS

Appendix F: Surface Water Analytical Results

Parameter	Unit	RDL	CCME - AW[1]	Guidelines for Alberta Surface Waters[2]	Expected Effluent Water Quality[9]	VPW01
						13-Sep-14
Routine						
pH	pH Units	N/A	6.5-9	NG	-	7.77
Electrical Conductivity (EC)	uS/cm	1.0	NG	NG	-	580
Total Suspended Solids (TSS)	mg/L	1.0	NG	NG	<15	94
Total Dissolved Solids (TDS)	mg/L	10	NG	NG	-	340
Hardness as $CaCO_3$	mg/L	0.50	NG	NG	-	270
Alkalinity (total as $CaCO_3$)	mg/L	0.50	NG	NG	-	270
Alkalinity (pp as $CaCO_3$)	mg/L	0.50	NG	NG	-	<0.50
Bicarbonate	mg/L	0.50	NG	NG	-	330
Carbonate	mg/L	0.50	NG	NG	-	<0.50
Hydroxide	mg/L	0.50	NG	NG	-	<0.50
Calcium	mg/L	0.30	NG	NG	-	71
Magnesium	mg/L	0.20	NG	NG	-	22
Potassium	mg/L	0.30	NG	NG	-	17
Sodium	mg/L	0.50	NG	NG	-	19
Chloride	mg/L	1.0	120	120	-	15
Sulphate	mg/L	1.0	NG	429 [8]	-	34
Turbidity	NTU	0.10	NG	*	-	2.2
Redox Potential	mV	N/A	NG	NG	-	72
Anions Total	meq/L	N/A	NG	NG	-	6.6
Cations Total	meq/L	N/A	NG	NG	-	6.7
Ionic Balance	N/A	0.010	NG	NG	-	1.0
Nutrients						
Ammonia	mg/L	0.050	0.256 [4]	0.404 [4]	-	0.083
Nitrate (as N)	mg/L	0.010	13	3	-	<0.010
Nitrite (as N)	mg/L	0.010	0.06	0.20 [5]	-	<0.010
Nitrate and Nitrite (as N)	mg/L	0.010	NG	NG	<20	<0.010
Total Kjeldahl Nitrogen (TKN)	mg/L	0.25	NG	NG	-	6.5
Dissolved Phosphorus	mg/L	0.0030	0.004 [6]	NG	-	**0.15**
Total Phosphorous	mg/L	0.0030	0.004 [6]	NG	-	**0.90**
Total Phosphorus	mg/L	0.0030	0.004 [6]	NG	-	**1.5**
Hydrogen Sulphide (H_2S)	mg/L	0.0020	NG	NG	-	0.42
Sulphide	mg/L	0.0019	NG	0.0019	-	0.39
Carbon						
Total Organic Carbon (TOC)	mg/L	2.5	NG	NG	-	30
Biological						
Total Coliforms	MPN/100mL	1.0	NG	NG	-	>2400
Fecal Coliforms	CFU/100mL	100	NG	NG	<200	200
E. Coli	MPN/100mL	1.0	NG	NG	-	820
Demand Parameters						
Biochemical Oxygen Demand (BOD)	mg/L	2.0	NG	NG	<15	14
Dissolved Metals						
Iron	mg/L	0.060	0.3	0.3	-	0.12
Manganese	mg/L	0.0040	NG	NG	-	0.90
Total Metals						
Aluminium	mg/L	0.0030	0.1 [7]	0.05 [7]	-	**0.16**
Antimony	mg/L	0.00060	NG	NG	-	<0.00060
Arsenic	mg/L	0.00020	0.005	0.005	-	0.0044
Barium	mg/L	0.010	NG	NG	-	0.13
Beryllium	mg/L	0.0010	NG	NG	-	<0.0010
Boron	mg/L	0.020	1.5	1.5	-	0.022
Cadmium	mg/L	0.000020	0.00009	0.00037 [8]	-	<0.000020
Calcium	mg/L	0.30	NG	NG	-	74
Chromium	mg/L	0.0010	NG	0.001	-	<0.0010
Cobalt	mg/L	0.00030	NG	0.0025	-	0.00082
Copper	mg/L	0.00020	0.004 [8]	0.007	-	0.0011
Iron	mg/L	0.060	0.3	0.3	-	**0.46**
Lead	mg/L	0.00020	0.007 [8]	0.007 [8]	-	0.00045
Lithium	mg/L	0.020	NG	NG	-	<0.020
Magnesium	mg/L	0.20	NG	NG	-	22
Manganese	mg/L	0.0040	NG	NG	-	1.0
Molybdenum	mg/L	0.00020	0.073	0.073	-	<0.00020
Nickel	mg/L	0.00050	0.150 [8]	0.120 [8]	-	0.0023
Potassium	mg/L	0.30	NG	NG	-	18
Selenium	mg/L	0.00020	0.001	0.001	-	<0.00020
Silicon	mg/L	0.10	NG	NG	-	4.0
Silver	mg/L	0.00010	0.0001	0.0001	-	<0.00010
Sodium	mg/L	0.50	NG	NG	-	19
Strontium	mg/L	0.020	NG	NG	-	0.36
Sulphur	mg/L	0.20	NG	NG	-	11
Thallium	mg/L	0.00020	0.0008	0.0008	-	<0.00020
Tin	mg/L	0.0010	NG	NG	-	<0.0010
Titanium	mg/L	0.0010	NG	NG	-	0.0045
Uranium	mg/L	0.00010	0.015	0.015	-	0.00018
Vanadium	mg/L	0.0010	NG	NG	-	0.0018
Zinc	mg/L	0.0030	0.03	0.03	-	0.0075
Pesticides / Herbicides						
3,5-Dichlorobenzoic acid	mg/L	0.000080	NG	NG	-	<0.000080
Dicamba	mg/L	0.0000050	0.01	0.01	-	<0.0000050
MCPP	mg/L	0.000080	NG	0.013	-	<0.000080
MCPA	mg/L	0.000063	0.026	0.0026	-	<0.000063
Dichlorprop	mg/L	0.000080	NG	NG	-	<0.000080
Bromoxynil	mg/L	0.000020	0.005	0.005	-	<0.000020
2,4-D	mg/L	0.000050	0.004	0.004	-	0.000051
Pentachlorophenol	mg/L	0.000080	0.0005	0.0005	-	<0.000080
2,4,5-TP	mg/L	0.000080	NG	NG	-	<0.000080
2,4,5-T	mg/L	0.000080	NG	NG	-	<0.000080
Chloramben	mg/L	0.000080	NG	NG	-	<0.000080
Dinoseb	mg/L	0.000020	0.00005	0.00005	-	<0.000020
Bentazon	mg/L	0.000080	NG	NG	-	<0.000080
2,4-DB	mg/L	0.000080	NG	0.025	-	<0.000080
Picloram	mg/L	0.000080	0.029	0.029	-	<0.000080
Diclofop-methyl	mg/L	0.000080	0.0061	0.0061	-	<0.000080
Laboratory Workorder Number						B481339
Laboratory Identification Number						KP1074

Notes:

[1] Canadian Council of Ministers of the Environment (CCME) (1999). Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)

[2] Alberta Environment and Sustainable Resource Development (ESRD). Environmental Quality Guidelines for Alberta Surface Waters. 2014. Table 1 Surface water quality guidelines for the protection of freshwater aquatic life (PAL). Most conservative values applied (chronic or acute).

[4] Guideline for ammonia varies with pH and temperature. With no temperature data present, most conservative value applied based off pH.

[5] Guideline is chloride dependent.

[6] Guideline is for ultra-oligotrophic

[7] Guideline is pH dependent.

[8] Guideline is hardness dependent.

[9] Expected effluent water quality calculated using average measured water quality in May 2008, December 2008, February 2009, March 2009, April 2009 (Bionest Technologies Inc. 2009)

*Narrative. See Table 1. Surface water quality guidelines for the protection of freshwater aquatic life (PAL) in Environmental Quality Guidelines for Alberta Surface Waters

RDL - Reportable detection limit

NG - No guideline.

BOLD AND UNDERLINE- Exceeds CCME guideline.

Shaded - Exceeds Surface Water Quality guideline.

Attachment G

Letter of Understanding

VANTAGE POINTE

50516 RR 233

LEDUC COUNTY

September 2016

RE: Proposed Wastewater Treatment and Dispersal System

Vantage Pointe is currently serviced by a wastewater system that collects and treats the wastewater generated within the development. The system consists of a collection system that includes a settling tank and pumps on each lot, and a main collection line to transport the liquid to the treatment system. The solids from the wastewater settle in the settling tank, and the liquid portion of the wastewater is pumped through the common collection line to a holding tank.

As you are aware, for the past several years, the Vantage Pointe Developer, Bob Thiessen, has been working with Alberta Environment and Sustainable Resource Development (AESRD) to add a disposal component to the wastewater system, which would eliminate the need to haul treated wastewater to the County facility for disposal. This disposal option would include discharging the treated wastewater to the existing wetland at a point adjacent to the system location. In addition to the disposal system improvements and a new secondary treatment system, additional wastewater treatment in the form of UV disinfection would also be installed to disinfect the wastewater prior to discharge to the wetland. SD Consulting Group has prepared the design of the system improvements, and is currently assisting with the approval process for the project.

Although the wastewater will be treated to standards set by AEP prior to discharger to the wetland, it is likely that the discharged treated wastewater will contain some level on nutrients such as nitrogen and phosphorus that are common in human wastewater. These nutrients will be utilized by the plants in the wetland, and over time, it's possible that the quantity of plants in the wetland will increase. The discharge of the treated wastewater into the wetland will result in an additional source of water to the wetland. Assuming that the current water usage within the development continues, at full build-out this discharge volume will be approximately 10 m^3 or 2 200 imperial gallons per day. While it is possible that this added volume could increase the water level in the wetland, it is unlikely to have a significant impact on the water

level due to the small volume of treated wastewater relative to the volume of the wetland. In addition, the wetland is currently, and will continue to be utilized as a storm water management system for the development, so it includes an outlet that discharges when the wetland reaches a certain elevation.

As part of the review and approval process, AEP is requiring that each homeowner sign a statement to confirm their understanding of the scope of this project and to express their commitment to following the associated contingency and monitoring plans required by the *Environmental Protection and Enhancement Act*. In order to satisfy this requirement, we have prepared this letter for your review and signature. Please acknowledge your understanding and acceptance of the proposed wastewater system improvements by signing below.

Printed Name	Signature	Address
BENOIT SOUCY		#210 -50516 Leduc County
RAYMOND GATES		#1050 50516 Leduc County
Sarah Vinus		#230 50516 LEDUC COUNTY
Mardel Mitchell	M. Mitchell	# 260 50516 Leduc County
B Zaramella	RENZO ZARAMELLA	#1030 50516 LEDUC COUNTY.
Corey Belyea		#1080 50516 Leduc County.
Jessica Clinkhite	Jessica Clinkhite	#290 50516 RR233 Leduc Cou
Jodie Schultz	Jodie Schultz	#310 50516 RR233 Leduc County
Andrew MacDougall		#330 50516 RR 233 Leduc, County
Pamela Verge	Pamela Verge	#350 505116 RR233 Leduc County
Mon Sucrier		#320 50516 - RR233 LEDUC COUNTY.
Nadene Selewich		#1300 50516- RR 233 Leduc County

Printed Name	Signature	Address
Tiffany Wood	Tiffany Wood	180 50516 Rr 233
Caroline Plourde	Caroline Plourde	160 50516 Rr 233
DARREN HANSEN		130 50516 RR 233
Angela Bendfeld	Bendfeld	140 50516 RR 233
WAYNE KWICIK	Waynekwicik	120 50516 RR 233
Kelly Wark	KWark	40 50516 RR 233
BRIAN DEREWYNKA	B. Derewynka	10-50516 RR 233
Nathan LAW	Nathan Law	50-50516 RR 233
Kevin Holday		30-50516 RR 233
Cheryl Robbins	Cheryl Robbins	110 50516 RGE RD 233
HAROLD BUSBY	Harold Busby	60-50516-RNG RD 233