**Stantec Consulting Ltd.**
100-300 Hagey Boulevard
Waterloo ON  N2L 0A4

August 15, 2024

Project/File: 160901104.902

**Ondrej Benjik**
**Director, Business Development**
**Aypa Power**
100-8 King Street East
Toronto, ON  M5C 1B5

Dear Ondrej Benjik,

**Reference:  Elora BESS - Conceptual Stormwater Management Report**

This letter brief has been prepared to document the conceptual stormwater management (SWM) design for the Elora Battery Energy Storage System (BESS), located south of the town of Fergus in Centre Wellington, Ontario.  This letter brief summarizes the conceptual water quantity, water quality and erosion and sediment controls for the site to mitigate impacts of surface water runoff to downstream receivers.

# 1 Introduction

The subject site is located southeast of the Town of Fergus and is bounded by 2 Line to the northwest, Grand River Natural Stone to the east and agricultural lands to the south and west.  The proposed development is a 211 MW BESS facility complete with batteries, access road, substation, screening berm and a stormwater management facility.

# 2 Stormwater Management Criteria

Based on pre-consultation with the Ministry of Environment Conservation and Parks (March 14, 2024) and Centre of Wellington (date to be provided by the client), the following stormwater management criteria have been identified.

**Water Quality** – Enhanced level of water quality control (80% TSS Removal).

**Water Quantity** – Control post-development peak flow rates to pre-development flow rates.

**Oil Containment** – Provide sufficient containment for the oil within the transformer and the runoff volume from a 100-year storm.

**Erosion and Sediment Control** – Provide an erosion and sediment control plan to mitigate migration of sediment to downstream receivers during construction

# 3 Existing Conditions

Historically the site has been cultivated with surface water runoff draining overland in a westerly direction towards a tributary of Swan Creek. Figure 1 shows the existing conditions drainage patterns of the site, and is summarized below.

**Catchment 110** – 2.23 ha of cultivated lands draining northwest to the 2 Line Roadside ditch, ultimately discharging to the tributary to Swan Creek west of the site.

**Catchment 120** – 4.25 ha of cultivated lands draining west and southwest to the tributary to Swan Creek via overland flow.

# 4 Proposed Conditions

Under proposed conditions the majority of the site is proposed to be covered in granular material with some landscaped area at the north end of the site. Grassed swales are proposed to convey surface water runoff to an onsite stormwater management facility to provide water quantity and quality controls for the site. Figure 2 shows the proposed conditions drainage patterns for the site, and is summarized below.

Catchment 210 – 5.34 ha of landscaped berm, access roads, BESS facility, grassed swale and cultivated lands draining to proposed stormwater management facility out letting northwesterly to the 2 Line Roadside ditch and ultimately the tributary to Swan Creek west of the site.

Catchment 220 – 1.13 ha of substation area draining overland to the tributary of Swan Creek west of the site.

It is noted that external flows that may be intercepted by the site will be diverted around the site through either berming or a swale to mitigate external flows from entering the sites SWM system. These diversions will be further detailed as the site progresses through detailed design.

# 5 Hydrologic Modeling

Hydrologic modeling was completed using the Rational Method and Modified Rational Method to model the response of the site to rainfall, establish target discharge rates and develop a stormwater management strategy for the site. The following summarizes inputs required for hydrologic modeling:

- Runoff coefficients for catchments were determined using the *Ministry of Transportation Ontario (MTO) Design Chart 1.07* from the *MTO Drainage Management Manual* (MTO, 1997).
- Soils information was derived from the *Soil Map of Wellington County Ontario, Soil Survey Report No. 35* (Soil Research Institute, Research Branch, Canada Department of Agriculture, 1962).
- Intensity-Duration-Frequency parameters for rainfall data were provided in the *Centre Wellington Development Manual* (Centre Wellington, 2024).
- Time of concentrations for catchment areas were calculated using the Airport method, which is an acceptable method for areas under 100 ha:
    - In cases where the calculated time of concentration was less than 10 min, a minimum time of concentration of 10 min was used, consistent with the Centre Wellington Design Manual.

# 6 Stormwater Management Strategy

The proposed SWM strategy has been designed to meet the SWM objectives outlined by reviewing agencies and relevant technical guidelines. The proceeding sections demonstrate the functionality and effectiveness of the SWM strategy to mitigate impacts to the downstream systems. The SWM strategy includes the following components:

- Grassed swale to convey stormwater runoff to a proposed end-of-pipe stormwater management facility.
- End-of-pipe dry stormwater management facility.
- Transformer containment pit.
- An erosion and sediment control strategy from initiation of site grading to site stabilization to mitigate erosion potential and mitigate the risk of sediment laden water entering downstream receivers.
- A monitoring and maintenance program for the site SWMF to ensure continued design operation.

## 6.1 Grassed Swale

A grassed swale runs along the southwest edge of the site and has been designed to collect overland runoff from the site and convey to the on-site stormwater management facility. The swale will be detailed in concert with detailed grading design of the site and will be sized to convey the 100-year storm event with additional freeboard.

## 6.2 Stormwater Management Facility

The SWM facility has been conceptually sized to reduce peak runoff rates under proposed conditions to pre-development rates for the 100-year event. As detailed design of the site progresses, the pond outlet will be designed to meet target flow rates for all storm events from the 2- to 100-year design storm events inclusive.

The proposed facility is 23 m long by 23 m wide. The bottom of the pond is sloped 0.5% towards the outlet to mitigate long term standing water within the facility. The facility has sufficient volume to contain the required 755 $m^3$ of storage to meet discharge targets. A freeboard of 0.3 m has been provided above the 100-year storage volume.

The proposed facility will outlet to the 2 Line roadside ditch prior to the ultimate discharge location of the tributary to Swan Creek west of the site. Detailed design of the outlet structure will be completed in concert with the detailed grading design of the site.

## 6.3 Transformer Containment Pit

The transformer containment pit has been sized to contain the volume of oil within the transformer and the runoff volume of a 100-year storm event. After a rainfall event, the containment pit will be pumped to the grassed swale and SWM facility. If deleterious substances are observed or measured within containment pit discharges, the water will be retained within the pit and treated as necessary prior to discharge.

## 6.4 Water Quantity Controls

As described above and summarized in the table below, the proposed SWM strategy provides the necessary controls to meet the target discharge rates.

| Outlet | Catchment | Discharge Rate ($m^3/s$) |
|---|---|---|
| 2 Line Existing | 110 | 0.264 |
| 2 Line Proposed | 210 | 0.264 |
| Swan Creek Existing | 120 | 0.452 |
| Swan Creek Proposed | 220 | 0.430 |

## 6.5 Water Quality Controls

Water quality controls will be provided by the dry stormwater management facility and grassed swale. Per the *Ministry of Environment Conservation and Parks Stormwater Management Planning and Design*

*Manual, 2003* dry stormwater management facilities only provide 60% TSS removal, which does not meet the site target of 80% TSS removal. However, no additional formal SWM water quality controls are proposed for the following reasons:

- Additional filtration of sediments will be provided in vegetated conveyance swales.
- Site traffic and use will be limited to maintenance and routine inspections, which minimize the opportunity for sediment build-up and wash off cycles.
- The conversion of lands from agricultural land with repeatedly disturbed soil, to a BESS yard stabilized by granular materials will improve the site's ability to mitigate erosion and retain site soils in-situ.
- The containment pit for the transformer will mitigate the potential for oil to migrate to downstream receivers.

Based on the points above, the intent for the provision of water quality controls will be met by the proposed stormwater management strategy.

## 6.6 Design Considerations

The following design considerations were made during the development of the SWM design.

### 6.6.1 Legal Outlet

The legal outlet for the site is the 2 Line Roadside ditch.

Due to grading constraints, the southwest portion of the Site (Catchment 220) cannot be conveyed to the 2 Line Roadside ditch. A reduction in flows to the southwest is expected and will discharge to adjacent lands as shallow overland flow.

### 6.6.2 Conceptual Level of Design

This report is a conceptual level of design based on conceptual grading plans and high level background geotechnical information. As detailed design of the site progresses, the proposed SWM strategy may be revised to provide more appropriate controls for the site. Some potential revisions include, but are not limited to:

- Provision of low-impact-development SWM controls to manage runoff at-source.
- Provision of an outlet channel to the tributary to Swan Creek as opposed to ditching to the 2 Line roadside ditch.

- Reduction in SWM facility footprint by using void space within site granular material to provide water quantity storage

# 7 Erosion and Sediment Control

Construction activities required to develop the site include excavation, grading, infrastructure installation and general construction traffic. These activities will result in disturbance of surface soils, exposure of underlying soils and the potential for erosion and sediment transport. In all instances where the potential for erosion is identified, a series of control measures should be implemented, including, but not limited to:

- Prior to commencing site grading activities, erect silt fences downslope of the area to be graded to protect downstream areas from potential sediment transport caused by entrainment in overland flows.
- A construction entrance feature provided at the site entrance at 2 Line to minimize the offsite transport of sediment via construction vehicles.
- Direct runoff through swales and erosion control berms (where necessary) to sediment control measures, ensuring that no untreated runoff is discharged from the site.
- Install temporary rock check dams, sediment traps, straw bale barriers and/or filter cloth barriers in swales (where appropriate) to help attenuate flows, reduce erosive velocities, and encourage sediment deposition.
- Stockpile materials in designated areas.
- Stabilize all disturbed areas not subject to construction activities within 30 days, per Ontario Provincial Standard Specification 804.

In order to ensure the effectiveness of the various erosion and sediment control measures, a routine program should be implemented which includes the inspection of the erosion and sediment controls after each significant rainfall event or weekly, whichever is more frequent, and immediate repair of any deficiencies.

A detailed erosion and sediment control plan including notes, details and monitoring/maintenance requirements will be developed concurrently with the detailed grading design of the site.

# 8 Operational Monitoring

A robust monitoring and maintenance program is essential to the long-term effectiveness of the stormwater management strategy. Inspection, operational, and maintenance activities can be generally limited to:

- Routine observations as to the presence of trash/debris within the swale that could be conveyed downstream and/or affect the conveyance capacity of the system and removal of same as needed.
- A semi-annual walking inspection should be completed to identify areas of bare soil and/or the formation of erosive gullies within or downstream of site facilities. Remediative efforts would typically involve re-grading the area and/or re-vegetating with sod or appropriate seed mix, with fertilizer and water applied as necessary to ensure germination and stabilization.
- Concurrent with the walking inspections, a visual assessment of any areas of isolated ponding or sediment build-up should be identified. Minor areas of ponding can be resolved with re-grading / re-stabilization if the magnitude of associated nuisance warrants such action. From a stormwater management perspective, there are no functional concerns associated with ponding and, therefore, remediation is not strictly required. Excessive sedimentation is an issue requiring attention if it remains in a non-vegetated condition and is, therefore, prone to re-suspension and transport downstream, if it creates an isolated ponding area as described above, or if it occurs to an extent that it impacts on the conveyance capacity of the swale or retention volumes in the pond (reduction of 10% of pond volume). If any such condition occurs, the sediment should be removed and the area re-stabilized.
- Vegetation management is not a strict requirement in that excess growth will serve to improve water quality treatment benefits. If the density of vegetation reaches a level where conveyance capacity is impacted, a cutting operation should be undertaken. A minimum vegetation height of 0.15 m (6”) should be maintained.
- Regular visual inspection for damage to facility structures including headwalls, pipes, berms, maintenance accesses, etc. Maintenance requirements in this regard should be performed on an as-required basis.

# 9 Conclusion

The preceding report documents the conceptual stormwater management controls for the Elora BESS facility. Based on the information provided, the following conclusions can be made:

- Water quantity controls will be provided through an end-of-pipe dry stormwater management facility

**Reference: Elora BESS - Conceptual Stormwater Management Report**

- Water quality controls will be provided through a combination of the proposed dry facility and grassed conveyance swales within the site
- Erosion and sediment controls will be provided during construction to mitigate migration of sediments offsite during construction
- A containment pit will be provided to prevent any oil discharge from the transformer to the downstream systems.

We trust this meets your needs at this time. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Regards,

**STANTEC CONSULTING LTD.**

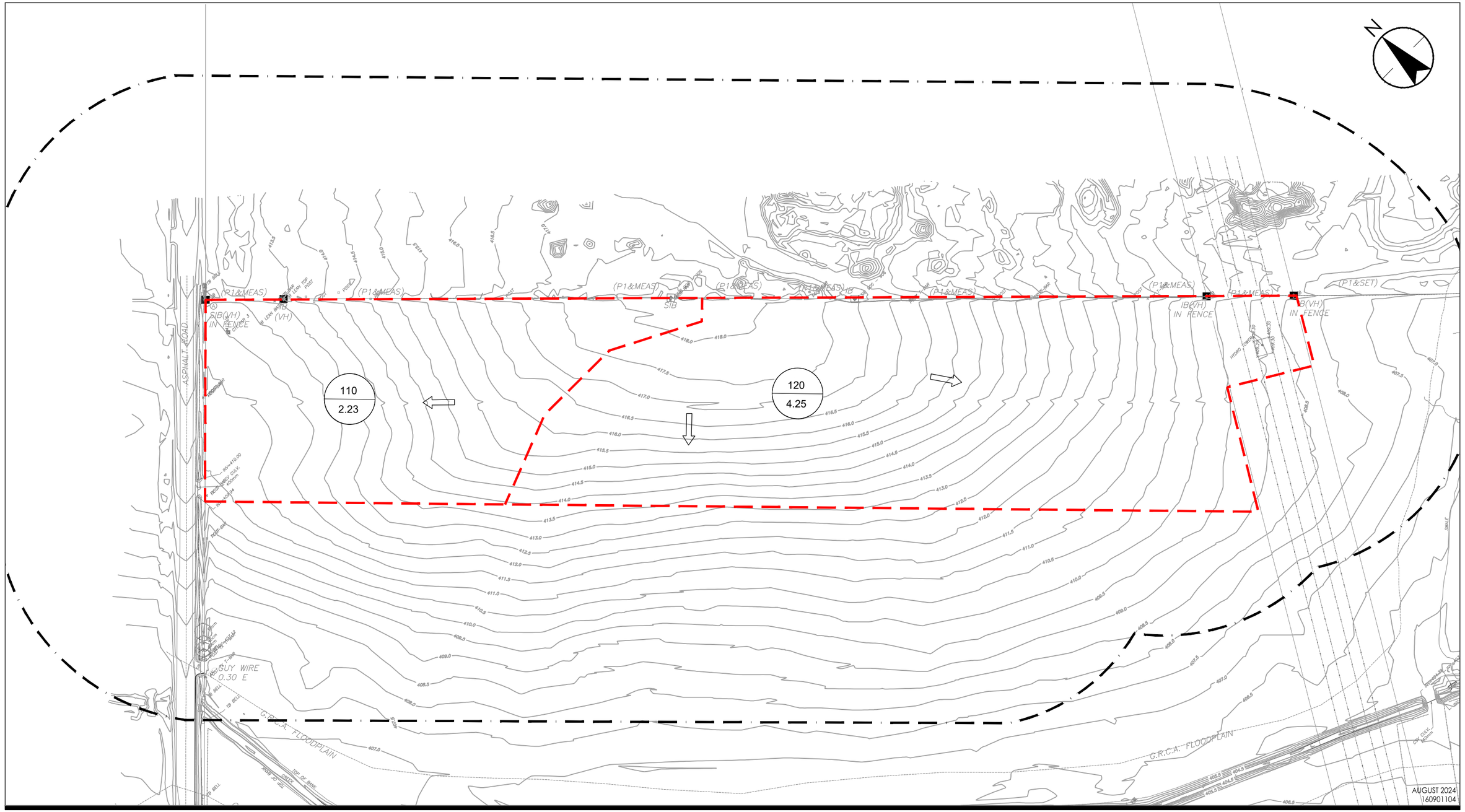
2024.08.15
16:46:10 -04'00'

**Dave Williams** P.Eng.
Senior Associate, Surface Water Team Lead
Phone: (519) 585-7320
Mobile: (519) 860-2682
david.williams@stantec.com

**Caitlin Olinski** B.Eng.
Civil Engineering Graduate
Phone: (807) 700-7050
Mobile: (807) 629-9310
caitlin.olinski@stantec.com

Attachment: Figure 1 – Elora BESS Conceptual Stormwater Management Plan – Existing Conditions
Figure 2 – Elora BESS Conceptual Stormwater Management Plan – Proposed Conditions
Hydrologic Modeling Calculations

# ATTACHMENTS




\\cd1004-f01\01609\active\160901104\05_report_deliv\Elora Alta Survey\SWM\160901104_swm_drainage_plan.dwg
2024-8-7 8:23 AM by: Olinski, Caitlin

Stantec

400-1305 RIVERBEND ROAD
London ON N6K 0J5
Tel. 519-645-2007

Legend

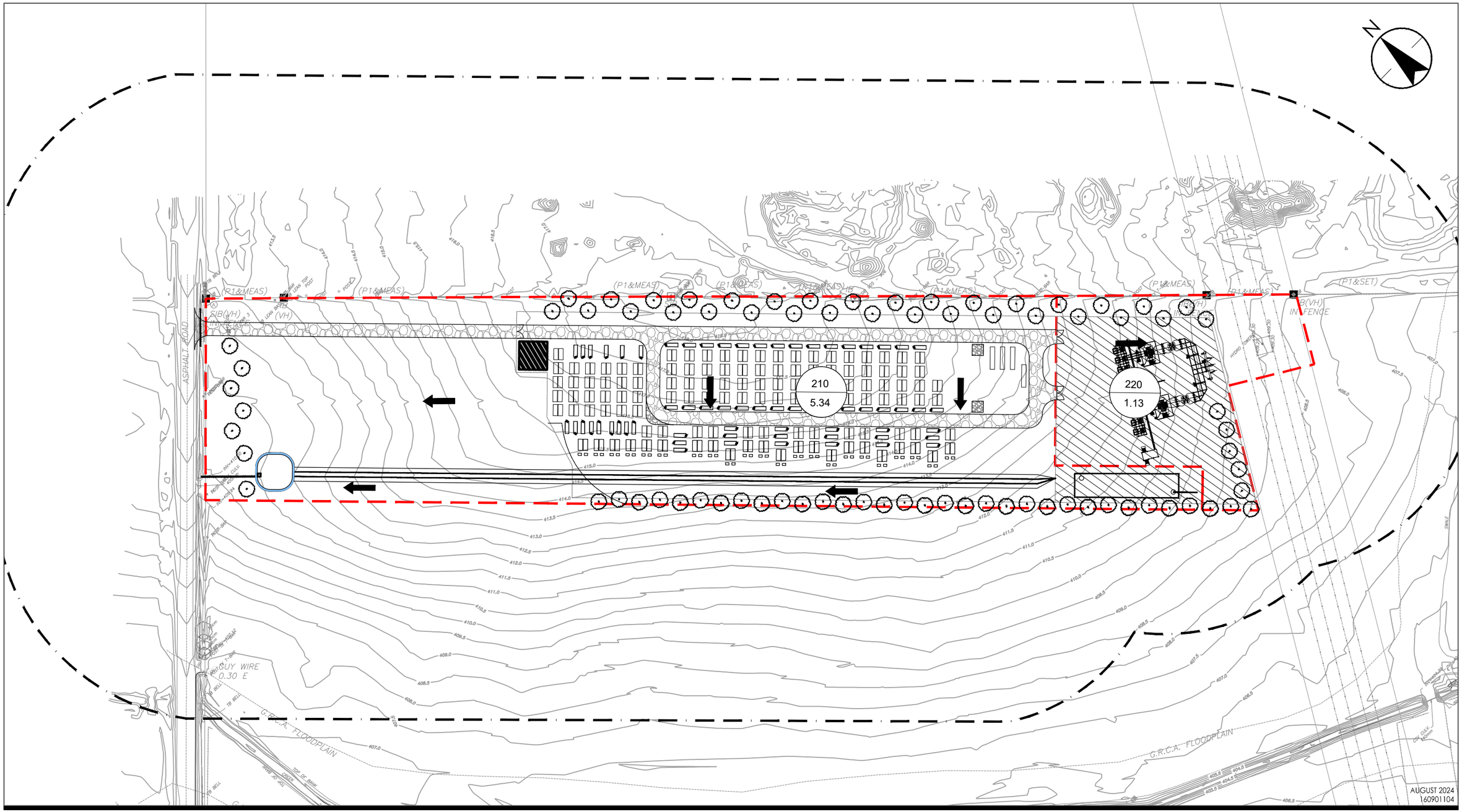
- STUDY AREA
- DRAINAGE BOUNDARY
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- 100 / 0.25 — CATCHEMENT ID / AREA (ha)

1:2000 0 20 60 100m

Client/Project
AYPA POWER CANADA DEVELOPMENT LP
LT1 BESS ENVIRONMENTAL SUPPORT
GUELPH, ON CANADA

Figure No.
1

Title
ELORA BESS CONCEPTUAL STORMWATER MANAGEMENT PLAN - EXISTING CONDITIONS




\\cd1004-f01\01609\active\160901104\05_report_deliv\Elora Alfa Survey\SWM\160901104_swm_drainage_plan.dwg
2024-8-7 8:22 AM by: Olinski, Caitlin


Stantec

400-1305 RIVERBEND ROAD
London ON N6K 0J5
Tel. 519-645-2007


Legend

- STUDY AREA
- DRAINAGE BOUNDARY
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- 100 / 0.26 — CATCHEMENT ID / AREA (ha)

1:2000 0 20 60 100m

Client/Project
AYPA POWER CANADA DEVELOPMENT LP
LT1 BESS ENVIRONMENTAL SUPPORT
GUELPH, ON CANADA

Figure No.
2

Title
ELORA BESS CONCEPTUAL STORMWATER MANAGEMENT PLAN - PROPSOED CONDITIONS

**Subject:** Existing Condition Peak Discharges
**Project:** LT1 Bess Environmental Support
**Project No.:** 160901104
**Client:** Aypa Power Canada
**Date:** 8/15/2024

**Catchment 110**

| | | |
|---|---|---|
| **Time of Concentration** | | 18 min |
| **Runoff Coefficient** | (MTO Design Chart 1.07 (pg.7) - Cultivated Silty Loam) | 0.35 |
| **Area** | | 2.23 ha |
| **Length** | | 122 m |
| **Slope** | | 3.5 % |

| Event | A | B | Rainfall Intensity (mm/hr) | Peak Discharge (cms) |
|---|---|---|---|---|
| 2-year | 25.39 | -0.682 | 57.7 | 0.125 |
| 5-year | 32.79 | -0.686 | 74.9 | 0.163 |
| 10-year | 37.71 | -0.687 | 86.2 | 0.187 |
| 25-year | 43.85 | -0.69 | 100.6 | 0.218 |
| 50-year | 48.46 | -0.691 | 111.4 | 0.242 |
| 100-year | 52.97 | -0.691 | 121.7 | 0.264 |

**Catchment 120**

| | | |
|---|---|---|
| **Time of Concentration** | | 21 min |
| **Runoff Coefficient** | (MTO Design Chart 1.07 (pg.7) - Cultivated Silty Loam) | 0.35 |
| **Area** | | 4.25 ha |
| **Length** | | 168 m |
| **Slope** | | 3.5 % |

| Event | A | B | Rainfall Intensity (mm/hr) | Peak Discharge (cms) |
|---|---|---|---|---|
| 2-year | 25.39 | -0.682 | 52.0 | 0.215 |
| 5-year | 32.79 | -0.686 | 67.4 | 0.279 |
| 10-year | 37.71 | -0.687 | 77.6 | 0.321 |
| 25-year | 43.85 | -0.69 | 90.5 | 0.374 |
| 50-year | 48.46 | -0.691 | 100.1 | 0.414 |
| 100-year | 52.97 | -0.691 | 109.4 | 0.452 |

**Time of Concentration (Tc) - Airport Method**

$Tc = [\ 3.26\ (1.1-C)\ L^{0.5}\ ]\ /\ S^{0.33}$

*Where:*
*C = Runoff Coefficient = 0.2 for undeveloped areas*
*L = Length of Overland Flow (m)*
*= (Area/1.5)^0.5*
*S = Slope (%)*

**Rainfall Intensity**

$I=A*Tc^{B}$

where:
*I=rainall intensity (mm/hr)*
*Tc=time of concentration (hr)*
*A,B=coefficents*

**Peak discharge**

Q=2.78CIA/1000

where:
*Q=peak dischagre (cms)*
*C=runoff coefficient*
*I=rainfall intensity (mm/hr)*
*A=area(ha)*

**Subject:** Proposed Condition Peak Discharges
**Project:** LT1 Bess Environmental Support
**Project No.:** 160901104
**Client:** Aypa Power Canada
**Date:** 8/15/2024

**Uncontrolled 220**

| | | |
|---|---|---|
| **Time of Concentration** | | 10 min |
| **Runoff Coefficient** | Substation - Gravel Cover | 0.75 |
| **Area** | | 1.13 ha |
| **Length** | | 87 m |
| **Slope** | | 3.5 % |

| Event | A | B | Rainfall Intensity (mm/hr) | Peak Discharge (cms) |
|---|---|---|---|---|
| 2-year | 25.39 | -0.682 | 86.2 | 0.203 |
| 5-year | 32.79 | -0.686 | 112.1 | 0.264 |
| 10-year | 37.71 | -0.687 | 129.1 | 0.304 |
| 25-year | 43.85 | -0.69 | 151.0 | 0.356 |
| 50-year | 48.46 | -0.691 | 167.1 | 0.394 |
| 100-year | 52.97 | -0.691 | 182.7 | 0.430 |

**Time of Concentration (Tc) - Airport Method**

$Tc = [\ 3.26\ (1.1-C)\ L^{0.5}\ ]\ /\ S^{0.33}$

*Where:*
*C = Runoff Coefficient = 0.2 for undeveloped areas*
*L = Length of Overland Flow (m)*
*= (Area/1.5)^0.5*
*S = Slope (%)*

**Rainfall Intensity**

$I=A*Tc^{B}$

where:
*I=rainall intensity (mm/hr)*
*Tc=time of concentration (hr)*
*A,B=coefficents*

**Peak discharge**

Q=2.78CIA/1000

where:
*Q=peak dischagre (cms)*
*C=runoff coefficient*
*I=rainfall intensity (mm/hr)*
*A=area(ha)*

**Subject:** Modified Rational Method Calculation
**Project:** LT1 Bess Environmental Support
**Project No.:** 160901104
**Client:** Aypa Power Canada
**Date:** 8/15/2024

## Drainage Area - Catchment 210

**Total Drainage Area:** 5.34 ha

| | Area (ha) | Runoff Coefficient | CA |
|---|---|---|---|
| **Access Road** | 0.56 | 0.9 | 0.50 |
| **Gravel** | 1.65 | 0.75 | 1.24 |
| **Pervious Land** | 3.14 | 0.35 | 1.10 |

**Composite Runoff Coefficient:** 0.53

## Rainfall Intensity

Use Township of Centre Wellington 100-Year Design Storm
A 52.97
B -0.691

## Storage Calculation

**Release Rate:** 0.264 cms

| Time (min.) | Rainfall Intensity (mm/hr) | Peak Runoff Rate (cms) | Incremental Runoff Volume (cu. m) | Incremental Outflow Volume (cu. m) | Storage Volume (cu. m) | |
|---|---|---|---|---|---|---|
| 5 | 294.947 | 2.329 | 699 | 79 | 619 | |
| 10 | 182.697 | 1.443 | 866 | 158 | 707 | |
| 15 | 138.055 | 1.090 | 981 | 238 | 743 | |
| 20 | 113.167 | 0.894 | 1072 | 317 | 755 | <= Maximum Storage |
| 25 | 96.996 | 0.766 | 1149 | 396 | 753 | |
| 30 | 85.515 | 0.675 | 1215 | 475 | 740 | |
| 35 | 76.874 | 0.607 | 1275 | 555 | 720 | |
| 40 | 70.099 | 0.554 | 1328 | 634 | 695 | |
| 45 | 64.619 | 0.510 | 1378 | 713 | 665 | |
| 50 | 60.082 | 0.474 | 1423 | 792 | 631 | |
| 55 | 56.253 | 0.444 | 1466 | 872 | 594 | |
| 60 | 52.970 | 0.418 | 1506 | 951 | 555 | |
| 65 | 50.120 | 0.396 | 1544 | 1030 | 514 | |
| 70 | 47.618 | 0.376 | 1579 | 1109 | 470 | |
| 75 | 45.401 | 0.359 | 1613 | 1188 | 425 | |
| 80 | 43.421 | 0.343 | 1646 | 1268 | 378 | |
| 85 | 41.639 | 0.329 | 1677 | 1347 | 330 | |