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**MEMORANDUM**

Thursday, August 11, 2022

TO: Rav Soomal, Vice President of Operations, Ridge North America
FROM: David Sonmor, P.Eng, Civil Engineer, Lawson Engineering Ltd.

**SUBJECT: Okanagan Gondola Site Servicing (Water Servicing & Fire Protection)**

Dear Mr. Rav Soomal,

The following memo is meant to provide preliminary level calculations and recommendations based on current site conditions and proposed build-out as they relate to water servicing requirements for the Okanagan Gondola Development located on lot PID# 013-561-235 off Highway 97 in Vernon, BC. This memo is meant to address comments provided by the Regional District of the North Okanagan (RDNO) as they relate to water servicing and fire protection.

The following reference material has been used in the production of this memo:

- "*Water Supply Feasibility Assessment Okanagan Gondola Development, Vernon, B.C.*" produced by Western Water Associates and dated March 15 2022;
- "*Okanagan Gondola Conceptual Master Plan*" dated September 10, 2021;
- "*Sewerage System Standard Practice Manual Version 3*" Produced by the Ministry of Health and dated September, 2014;
- "*Water Supply for Public Fire Protection*" Produced by Fire Underwriters Survey and dated 1999.

1) Maximum Daily Demand (MDD):

a. MDD Calculation

MDD for the site at full buildout was calculated using the Sewerage System Standard Practice Manual Version 3 (SSSPMv3) with assumed layout based on the Okanagan Gondola 2021.09.10 Conceptual Master Plan. Table 1.1 below outlines proposed gondola development infrastructure and flows required as they relate to the SSSPMv3 non residential flow rate guide (table III-11 SSSPMv3). LEL note that at the conceptual planning stage, sanitary flow rates were used to estimate water servicing requirements as it allows for a detailed review of water use which takes into account not only population but proposed commercial application as well.

| | POPULATION | FLOW REQUIRED (L/Day/Unit) | UNITS | TOTAL FLOW REQUIRED (L/Day) |
|---|---|---|---|---|
| **BASE CAMP** | | | | |
| Rental & Ticketing | 1,000 | 20 | Person | 20,000 |
| Café | 25 | 400 | Seat | 10,000 |
| Base Gondola | | | | |
| Tree Forts | | | | |
| Parking | 1,000 | | | |
| Day Staff | 6 | 65 | Person | 390 |
| **BASE CAMP TOTAL** | | | | **30,390** |
| **MID STATION** | | | | |
| Gondola | | | | |
| Restaurant | 200 | 90 | Seat | 18,000 |

| | | | | |
|---|---|---|---|---|
| Event Venue | 200 | 15 | Person | 3,000 |
| Playground | | | | |
| Lookout Platform | | | | |
| Vista Tower | | | | |
| Amphitheater | 200 | 15 | Person | 3,000 |
| Day Staff | 12 | 65 | Person | 780 |
| **MID STATION TOTAL** | | | | **24,780** |
| **SUMMIT STATION** | | | | |
| Gondola | | | | |
| Restaurant | 200 | 90 | Seat | 18,000 |
| Event Venue | 200 | 15 | Person | 3,000 |
| Vista Tower | | | | |
| Day Staff | 10 | 65 | Person | 650 |
| **SUMMIT STATION TOTAL** | | | | **21,650** |
| **TOTAL MDD (L/Day)** | | | | **76,820** |
| **TOTAL MDD (L/Sec)** | | | | **0.89** |

Table 1.1 – Estimated Water Servicing Maximum Daily Demand
* Total population of 1,000 was estimated based on proposed parking facilities
** Event Venue and Amphitheater water demand was based on SSSPMv3 "Assembly Hall" use classification
*** Rental & Ticketing water demand was based on SSSPMv3 "Visitor Center or Day use Site with Flush Toilets" use classification

b. Assumed Well Yield & Well Requirements

Western Water's Water Feasibility Assessment reviewed well yields for aquafer 471 as a whole, as well as well yields for wells located in bedrock within 2 kilometers of site. Well 70266 was identified as the closest bedrock well to the subject property with a yield of 6 US Gallons per Minute (USGPM) while Aquafer 471 was identified as having a median well yield of 3 USGPM. The Western Water report goes on to suggest that well yields should be anticipated to be less than 5 USGPM. For the purposes of this memo, LEL have assumed a sustainable flow rate of 4 USGPM per well, or approximately 0.25 L/sec. It is anticipated that each of the three development areas (base camp, mid station, and summit station) will require between one (1) and two (2) wells at the above noted sustainable yield in order to support the proposed development with the summit station likely requiring a single well, and both the mid station and base camp likely requiring a total of two (2) wells each in order to meet MDD requirements.

c. Projected Storage Requirements

Due to fluctuation in the assumed water demand for the proposed development, it is anticipated that potable water storage will be required to meet Peak Hourly Demand (PHD). PHD was calculated using an assumed population of 1,000 and a Harmon Peaking Factor of 3.8. Balancing storage was calculated as 25% of MDD for each development area and has been summarized in Table 1.2 below.

| DEVELOPMENT AREA | MDD (L/Day) | MDD (L/Sec) | PHD (L/Sec) | BALANCING STORAGE REQUIRED (L) |
|---|---|---|---|---|
| Base Camp | 30,390 | 0.35 | 1.33 | 7,600 |
| Mid Station | 24,780 | 0.29 | 1.10 | 6,200 |
| Summit Station | 21,650 | 0.25 | 0.95 | 5,400 |

Table 1.2 – Estimated Water Servicing Storage Requirement
* Total population of 1,000 was estimated based on proposed parking facilities
** Balancing Storage calculated as 25% MDD
*** PHD calculated using a Harmon Peaking Factor of 3.8

2) Fire Protection

a. Fire Storage Calculation

Fire Underwritter Survey (FUS) fire storage requirements were calculated for multiple structures in each development area. The resulting fire flow, duration, and storage for each governing structure has been summarized in Table 2.1 below. LEL would like to note that no reduction for sprinkler use has been applied to any of the below calculations and that storage requirements could be further reduced in the event that installation of an NFPA approved sprinkler system is deemed feasible. Assumptions made in calculating fire flow requirements are as follows:

- Base Camp:
  - Governing structure – Retail and Ticketing;
  - C value of 1.5 representing wood framed construction;
  - 25% Hazard Allowance reduction due to low risk of commercial and retail facilities;
  - 0% sprinkler allowance reduction;
  - 0% Exposure charge assumes a minimum of 45m separation from the nearest adjacent structure;

- Mid Station:
  - Governing structure - Amphitheater
  - C value of 0.8 representing non-combustible construction;
  - 25% Hazard Allowance reduction due to low risk use of assembly facilities;
  - 0% sprinkler allowance reduction;
  - 0% exposure charge assumes a minimum of 45m separation from the nearest adjacent structure;

- Summit Station:
  - Governing structure –Event Venue;
  - C value of 1.0 representing ordinary construction consisting of brick or masonry walls with combustible floor and interior;
  - 25% Hazard Allowance reduction due to low risk use of assembly facilities;
  - 0% sprinkler allowance reduction;
  - 0% exposure charge assumes a minimum of 45m separation from the nearest adjacent structure;

| DEVELOPMENT AREA | FIRE FLOW (L/Sec) | FLOW DURATION (Hrs) | STORAGE REQUIRED ($m^3$) |
|---|---|---|---|
| Base Camp | 67 | 1.50 | 360 |
| Mid Station | 67 | 1.50 | 360 |
| Summit Station | 50 | 1.25 | 225 |

Table 2.1 – Fire Underwriter Survey flow requirements

b. Storage Recharge

It is anticipated that each development area will require one (1) additional well dedicated to refilling storage for the purposes of fire protection. This dedicated well at the assumed production rate of 0.25 L/sec will have the capacity to completely recharge base camp and mid station fire storage in approximately 17 days with the summit station requiring approximately 11 days. Due to the large catchment area onsite, potential exists to supplement well flows with storm water. At a total area of approximately 115 hectares and a minimum average monthly precipitation of approximately 25mm (see "Water Supply Feasibility Assessment Okanagan Gondola Development, Vernon, B.C. produced by Western Water Associates Ltd.) the site has the potential to produce close to 1,000$m^3$ of precipitation per day, exceeding the total fire storage requirement. Storm water storage for the purposes of fire protection could take the form of ponds constructed in locations of low infiltration serving the purpose of both storm water detention and fire storage. Further investigation and modelling will be required to accurately determine catchment areas, infiltration, anticipated runoff, and storm water detention requirements, however, at the conceptual stage, it appears that stormwater capture may prove to be a viable supplementary source of water for the purpose of fire protection. It is the clients intention to provide road access to all 3 sites. With adequate road infrastructure in place, there is the possibility of supplementing fire recharge rates with a reliable offsite water supply. At a storage capacity of 360$m^3$, total recharge of the base camp and/or mid station fire storage could be completed using exclusively offsite sources in approximately 25 round trips assuming a 4,000 US gallon capacity water truck. This would likely equate to approximately a 2 day recharge rate using offsite sources only. with a lower storage requirement, the summit station is anticipated to require 15 round trips under similar conditions.

3) Closure

It is currently anticipated that a total of five (5) wells should yield sufficient water to support the MDD generated from the proposed development. Three (3) additional wells, when combined with potential supplementary sources of water such as storm water runoff and supply from offsite sources, could feasibly provide sufficient flows to adequately

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recharge fire storage after a significant fire event. All three (3) development areas are likely to require high flow pumps to sustain the required fire flow rates. Irrigation requirements were unknown at the time of this memo and were therefore excluded from all calculations.

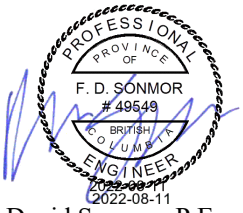
This memorandum is intended to provide preliminary detail on the intent for site servicing at an initial concept level only. LEL notes that further studies and detailed review will be required to develop the final site servicing concepts as design progresses. All calculated values contained within this memo have been based on assumptions made by LEL given the available information to date and are subject to change based on site conditions, design requirements, and proposed structural characteristics such as building use and area.

If you have any questions or concerns, please feel free to contact the undersigned.

Best Regards,

Lawson Engineering Ltd.
Permit Number: 1001279

Prepared by:

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