



Stantec NAWÉ

Memo

To: *Fawn Meadows Development, Inc.*

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Reference: **Fawn Meadows Water Management Strategy**

Introduction

The purpose of this memo is to provide an integrated water management plan for the Fawn Meadows Development. The ultimate goal of this plan is to present a framework for water reuse and conservation within the development with regards to fire protection and lawn irrigation. Also considered within this report are:

- Water needs and availability
- Proposed site conditions
- Precipitation Data
- Fire protection
- Collection and storage of roof runoff for fire protection and irrigation needs

By identifying these variables and their quantities, water conservation methods have been determined, and deficits and opportunities are addressed.

Water Needs and Availability

Water needs at Fawn Meadows can be divided into three categories: domestic, fire protection, and irrigation. Based on preliminary design work done on the potable water and wastewater systems, this water is available through three sources: wells, stormwater runoff, and wastewater reuse.

1. **Wastewater:** The wastewater collected and treated at Fawn Meadows is proposed to be disposed of through infiltration beds utilizing onsite soils to provide groundwater recharge. Wastewater reuse is not considered a viable water source as it will require advanced treatment for potential human contact and the Alberta Plumbing Codes are not setup to handle reuse water. With the current proposal, the treated wastewater will be discharged into the soil and recharge the local surgical aquifer, which is considered a significant water benefit according to Alberta's *Water for Life*.
2. **Groundwater Wells:** A community water system with two wells will be used to supply domestic needs at Fawn Meadows. The water system will operate on a trickle flow. Cisterns will be located at each unit (large cisterns proposed for Stage 3) and each unit will be allotted a certain amount of water each day. Due to the amount of available

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groundwater and the sensitivity of the local groundwater aquifer, it is not feasible to provide for lawn irrigation and fire protection water with groundwater supplies. Therefore, alternative options, such as the collection and storage of roof runoff are evaluated in this report.

Proposed Site Conditions

Before evaluating the quantity of stormwater available for irrigation and fire protection, a general review of development information was necessary. Table 1 outlines the development specific information important to this analysis.

Table 1: Development Information

Land Use	Units	Building Area	Total Land Area
Single Family Residential	35	2,000 ft ²	16.88 Ac (6.83 Ha)
Semi Detached Villas	38	1,500 ft ²	19.27 Ac (7.80 Ha)
Supportive Living	140	500 ft ²	2.64 Ac (1.07 Ha)
Commercial/Public Use	-	-	4.99 Ac (2.02 Ha)
Roads	-	-	13.47 Ac (5.45 Ha)
Common Lands	-	-	68.92 Ac (27.89 Ha)
Gross Area	-	-	126.26 Ac (51.10 Ha)

Precipitation Information

Based on information from Environment Canada's climate database, the average annual precipitation at Fawn Meadows consists of 415 millimeters of rainfall and 1710 millimeters of snowfall. This results in an annual total of approximately 586 millimeters (23 inches) per year of precipitation.

Fire Protection

Fire protection in any community requires access to large volumes of water, either from high capacity wells or stored water reserves. Rural and suburban areas often lack an organized system of water mains and hydrants for fire fighting and do not have the development densities and resultant tax revenues to pay for system costs. In most cases, fire protection water is supplied by tankers. In contrast, high-density urban communities can afford to oversize potable water distribution piping, storage and sources in order to provide the water volume and flow rate necessary for adequate fire protection.

According to the International Organization for Standardization's (ISO) Fire Code, developments such as the Fawn Meadows development need a water source capable of providing 1,000 gallons per minute (gpm) for a period of 2-hours, with a resulting minimum system pressure of 20 pounds per square inch (psi). There are generally two options for providing this fire flow volume. The first option is to construct wells that are adequate to produce 1,000 gpm for a period of 2-hours. The second option is to construct a water storage reservoir that is capable of providing the necessary volume of water. This volume would be 120,000 gallons. The distribution system piping must be sized to meet the minimum system pressure requirement of 20 psi.

Individual fire sprinkler systems were also evaluated for the Fawn Meadows development. Residential fire sprinklers discharge approximately 95 liters (25 gallons) per minute. Where stored water is the sole source of fire sprinkler supply, the minimum quantity of water required is the sprinkler discharge rate for a ten minute period, or a total of 950 liters (250 gallons). Some fire sprinkler designs include two sprinklers equating to a discharge of about 190 liters (50 gallons) per minute. When designing for two sprinklers, the minimum quantity of water required is the sprinkler discharge rate for a seven minute period, or 1,330 liters (350 gallons). These systems are only designed for single story residences less than 2,000 square feet in size. Each water supply source must be equipped with an automatically operated pump system to provide adequate pressure for the sprinkler system.

Single Family Residential Units

35 single family residential units are proposed at Fawn Meadows and each lot is about one-fifth of a hectare in size (0.5 Acres). It is assumed each residential unit has about 186 square meters (2,000 square feet) of roof area available to collect precipitation drainage for domestic irrigation and fire protection use. Assuming all of the precipitation that lands on each roof is collected, each residential unit is capable of capturing 28,730 gallons of runoff per year.

If 50 percent of the lot area, or 930 square meters (10,000 square feet), is proposed for irrigation, the average irrigation demand will be 25,000 gallons per month during the growing season. This would require an irrigation collection, storage and distribution system with a 22,500 gallon tank for storage. This is an unlikely scenario due to the large tank size and an alternative source of water would be necessary to supplement the roof runoff and meet the irrigation demands. As discussed previously, alternative sources of water are not available due to the sensitivity of the groundwater aquifer.

For the single family lots, the sustainable irrigable area is based on the quantity of roof runoff during an average year. With this scenario, the amount of irrigable land is equal to the square footage of the roof, or 2,000 square feet per lot. A tank volume of 10,000 gallons will be necessary to support the runoff volume. This tank will also have the capability for fire protection as a minimum of 250 gallons of dead storage will be always be available in the tanks for the fire sprinkler supply.

Semi Detached Villa Units

38 duplex (townhome style) units are proposed at Fawn Meadows. Each double lot is about the size of the single family residential units or about one-fifth of a hectare (0.5 Acres). It is assumed each residential unit has about 139 square meters (1,500 square feet) or a total of 278 square meters (3,000 square feet) of roof area available to collect precipitation drainage for domestic irrigation and fire protection use. Assuming all of the precipitation that lands on each double roof is collected, each residential unit is capable of capturing 43,100 gallons of runoff per year.

If 50 percent of the lot area, or 930 square meters (10,000 square feet), is proposed for irrigation, the average irrigation demand will be 25,000 gallons per month during the growing season. This would require an irrigation collection, storage and distribution system consisting of 25,000 gallon tank storage system. As stated previously, this is an unlikely scenario due to the lack of supplemental water and the large tank sizes.

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For the duplexes, the sustainable irrigable area is based on the quantity of roof runoff during an average year. With this scenario, the amount of irrigable land is equal to the square footage of the roof, or 1,500 square feet per duplex. A tank volume of 15,000 gallons will be necessary to support the runoff volume. This tank will also have the capability for fire protection as a minimum of 500 gallons (providing for two units) of dead storage will always be available in the tanks for the fire sprinkler supply.

Supportive Living Unit

140 supportive living units housed in a two story structure on a 1.07 hectares (2.64 acres) lot are proposed at Fawn Meadows. It is assumed the structure has about 3,250 square meters (35,000 square feet) of roof area available to collect precipitation drainage for domestic irrigation and fire protection use. This is based upon 500 square feet units and a two story structure. Assuming all of the precipitation that lands on the roof is collected, the supportive living unit is capable of capturing approximately 500,000 gallons of runoff per year.

Roof runoff will provide an average irrigation supply of 87,000 gallons per month during the growing season, which is enough to supply one inch of water per week over 35,000 ft². A tank volume of 22,000 gallons will be necessary to store the runoff water.

During the building design of the supportive living units structure, a certified fire suppression consultant will need to design the fire system. At that time, the fire system should be reviewed further to ensure adequate fire volumes are always available for this type of structure and this may result in a large tank size, or separate tanks for irrigation and domestic water. The irrigable areas discussed in the last three sections are summarized in Table 2.

Table 2: Summary of Irrigable Land Areas and Tank Requirements

Unit Type	Tank Size (Gallons)	Irrigable Area (ft ²)	Amount of Lot Area (ft ²)
Single Family Residential	22,500	10,000	50%
	10,000	2,000	10%
Semi Detached Villas	25,000	10,000	50%
	15,000	3,000	10%
Supportive Living	22,000	35,000	44%

Summary

Limiting the irrigated areas to the same size as the roof area ensures that no additional water will be required to meet the irrigation quantity and fire protection demands. If the area to be irrigated is greater than the roof area, an additional water source will be required.

In the remaining areas where it is not feasible to irrigate, low water use landscaping designs are recommended. Innovative water management strategies such as community gardens irrigated

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by stormwater runoff (from roads) may compliment these villa type properties. Community gardens should be located in an area that stormwater can be collected from roadway runoff and as such, should be located in front yards, adjacent to roadways and driveways. This will allow for management of this source of water and also provide another irrigation water source.

If you have any questions regarding the information above, please contact Shane Sparks at _____, and I would be happy to assist you.