



Black Mountain Irrigation Expansion Plan



SUMMARY REPORT

August, 2021



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IRRIGATION EXPANSION PLAN
INTRODUCTION
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1. INTRODUCTION

Agricultural growth in the Kelowna area has been at a standstill for several decades. The production of food has not increased and the return to farmers has remained consistently low. This, combined with the high cost of infrastructure, has resulted in a fruit industry that has been stagnant. With the decline of the fruit cooperatives, and the emerging independent packing and marketing by the large-scale family farms, agriculture is now expanding.

Historically over the past 30 years, BMID has consistently provided water to 4,200 acres of land with water rights. Since 2015 the irrigated land area has grown to over 4,950 acres with several hundred more acres planned. Farmers are looking for water utilities with pro-active policies that support the supply of irrigation water, preferably by gravity, and preferably non-treated to reduce the supply cost. BMID is a water supplier that can meet these criteria.

This report sets out the plan for expanded irrigation in the Kelowna region. This document is prepared in support of a proposed boundary extension of the Black Mountain Irrigation District (BMID) service area. The lands proposed to be included within the BMID boundary includes some 1,885 acres of private and publicly-owned range-land located east of the current BMID boundary. Of this total additional land area, it is estimated that 1,300 acres are arable (can be farmed). The lands are within the City of Kelowna and the Regional District of Central Okanagan. This report is presented in the following sections:

- Section 1 Introduction
- Section 2 Irrigated Lands
- Section 3 Watershed Capacity & Storage
- Section 4 Irrigation Expansion Plan
- Section 5 Financial Considerations
- Section 6 Summary
- Appendix A - Application Forms – Petition to Extend Boundary
- Appendix B - Land Inventory Summary

On a global scale, climate change is impacting the historic food producing regions of the world with floods, drought and forest fires at a much higher frequency than ever seen in the past. For this reason, the expansion of infrastructure to support local agriculture should be a priority for all local water utilities.

In conjunction with this plan, there is the opportunity to increase reservoir storage in upper Mission Creek not only for agriculture, but also to support conservation flows and fish habitat in lower Mission Creek. Currently there is only 660 ML of water storage located in Ideal/Belgo Reservoir that is assigned to conservation. Storage for conservation flows should be increased substantially to provide a target flow of 1.5 m³/s in lower Mission Creek during the summer and fall seasons. BMID has been in discussions with Provincial fisheries staff and Okanagan Nation Alliance regarding partnership opportunities.



There are several important objectives that this plan is set out to meet:

1. The plan is to set out a water supply dedicated to irrigation for agriculture without advanced treatment;
2. The water supply will be by gravity with minimal or no pumping for the irrigation water;
3. The water supply will be set up for the long-term, considering the capacities of the water source, transmission main and land area so they are appropriately sized;
4. The transmission main is required to service the new lands plus have the ability to irrigate existing lands within the BMID service area. This reduces water treatment and pumping costs. The irrigated water supplied through the BMID domestic system would be reduced and water treatment plant expansion could be deferred;
5. Routes and locations for the extension of domestic water service eastward will be set out with right-of-way to, in the future, supply water to the Goudie Road area.
6. This plan must be publicly acceptable, specifically addressing the issues of there being enough water and that BMIDs existing domestic customers are not required to fund any portion of this project;

This report sets out a long-term plan for expanding agriculture onto the benchlands east of the Kelowna City limits. The plan includes an assessment of what is useable land, how much water would be needed to support agriculture on the lands and where that water would come from.

BMID is submitting the boundary extension application to the City of Kelowna and to the Regional District of Central Okanagan for review/approval and then have the information forwarded to the Ministry of Municipal Affairs for final review and approval by the Province. Approval from the Province would result in the Letters Patent for BMID being revised.

The high-level planning documents for the region acknowledge the need to protect agriculture. This plan builds on that and provides a blueprint to expand agriculture in our region. The additional acreage and production will spin off into many construction and support industry jobs for Kelowna.

The plan is to recognize partnership opportunities for maximizing the benefit for not just agriculture but also for overall water management for the region including water storage for multiple purposes.



2. IRRIGATED LANDS

The land inventory for Black Mountain Irrigation District as of June 30, 2021 is as follow:

- Grade A Land 4,951 acres (has water rights and water is being used);
- Grade C Land 1,053 acres (has water rights but is not using water);
- Grade D Land 2,460 acres (dry land without water rights).

There are 25 properties listed in Table 2.1. Of the 25 parcels listed, 5 parcels are completely within BMID boundaries, 8 are partially outside of, and 12 parcels are completely outside of the current BMID boundaries. Twenty (20) parcels of land make up this boundary extension application. Table 2.1 provides a listing of the 25 parcels of land that are proposed to be included in the BMID water service boundaries.

Table 2.1 - Summary of Parcels

I.D.	Address	Owner	Legal	PID No.	Area (Acres)	Add'l Area (Acres)
1	3050 Hwy 33 E	G.P. Sandher Holdings Ltd.	Lot B, Plan KAP 92045, Twnshp 27	028-587-375	62.77	62.77
2	2460 Joe Rich Rd	G.P. Sandher Holdings Ltd.	Lot 9, Plan 1991, Twnshp 27	001-714-996	126.00	126.00
3	Joe Rich Road	G.P. Sandher Holdings Ltd.	Parcel 15, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-850	3.13	3.13
4	Highway 33 E	G.P. Sandher Holdings Ltd.	NE 1/4, of Sec 17, Twnshp 27	001-716-735	160.00	160.00
5	Highway 33 E	G.P. Sandher Holdings Ltd.	Parcel 14, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-841	4.17	4.17
6	Mission Creek	G.P. Sandher Holdings Ltd.	Section 16, Twnshp 27	001-714-325	320.00	320.00
7	Highway 33 E	G.P. Sandher Holdings Ltd.	SE 1/4, of Sec 21, Twnshp 27	001-715-178	160.88	160.88
8	Jack Pine Road	G.P. Sandher Holdings Ltd.	SW 1/4, of Sec 22, Twnshp 27	001-715-135	162.00	162.00
9	Highway 33 E	G.P. Sandher Holdings Ltd.	W 1/2, of Sec 15, Twnshp 27	001-713-957	155.00	155.00
10	4502 Pyman Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-715-089	19.34	19.34
11	Joe Rich Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-713-701	342.60	340.00
12	Highway 33 E	Ministry of Transportation	South E 1/4, of Sec 17, Twnshp 27	006-696-881	134.90	134.90
13	3205 Hwy 33 E	Douglas & Alfred Appel	Lot A Plan KAP20065	009-694-919	5.29	5.29
14	3215 Hwy 33 E	William (Budge) Winter	Lot 9, Plan KAP 32677, Twnshp 27	003-337-651	90.83	0.00
15	Highway 33 E	Unico Mech. Installations Ltd.	Lot 1, Plan KAP 32677, Twnshp 27	003-336-646	130.41	69.78
16	4115 Highway 33 E	Christian Obermeier	Lot 8, Plan KAP 32677, Twnshp 27	003-337-600	21.79	11.18
17	4243 Highway 33 E	Allan Wingenbach	Lot 7, Plan KAP 32677, Twnshp 27	003-337-537	30.59	11.93
18	Highway 33 E	Allan & Marie Wingenbach & Jennifer Matzelle	Lot 6, Plan KAP 32677, Twnshp 27	003-337-430	29.90	5.94
19	Highway 33 E	Allan Wingenbach	Lot 5, Plan KAP 32677, Twnshp 27	003-337-251	32.94	0.04
20	4631 Highway 33 E	McDonald Acres	Lot 2, Plan KAP 32677, Twnshp 27	003-336-824	18.59	0.00
21	Highway 33 E	B. Winter (S. of McDonalds Ac.)	Lot 4, Plan KAP 32677, Twnshp 27	003-337-103	34.72	0.00
22	Highway 33 E	B. Winter (W of Dave's Creek)	Lot 1, Plan KAP 32677, Twnshp 27	003-336-646	45.62	25.92
23	5055 Highway 33 E	Brian Stewart	Lot 3, Plan KAP 32677, Twnshp 27	003-336-948	45.88	0.00
24	Joe Riche Road	BMID - Hadden Reservoir site	Lot 9, Plan KAP 10212B, Twnshp 27	013-582-402	26.30	0.00
25	5105 Hwy 33 E	BMID - WTP & Reservoir site	Parcel A, Plan B10213, Twnshp 27	013-582-640	121.25	106.63
NON-SHADED CELLS DENOTE THAT THE PARCEL IS COMPLETELY OUTSIDE BMID BOUNDARIES				TOTAL AREA	2284.89	1884.89
GRAY SHADING DENOTES LOTS PARTIALLY WITHIN BMID BOUNDARIES						
BLUE SHADING DENOTES LOTS PARTIALLY WITHIN BMID BOUNDARIES						



The total land area of all 25 parcels is summarized as 2,285 acres. The lots are illustrated in Figure 2.1. Of the total land area, approximately 400 acres are currently within the existing BMID boundary. The new land area to be included in BMID, excluding the Highway 33 Right-of-way, is 1,885 acres.

Please note that the total land area is not the same as the irrigable land area. The rugged topography in this area limits the area that could be irrigated and planted. The estimated irrigable land area for all 25 lots is estimated to be 1,330 acres. The approximate irrigable land area for each lot is summarized in Table B-1 in Appendix B where the maximum daily water demand for each lot and the annual volume of water is also provided.

The majority of the parcels are completely within the Agricultural Land Reserve. The land use for the majority of properties within the City of Kelowna boundaries is designation as A-1 (agriculture). For those lands within the Regional District of Central Okanagan (RDCO) the majority of parcels are zoned as LH (Large Holdings). The current land-use zoning designation for each parcel is provided in Appendix A. The proposed land use for agriculture is in conformance with the land-use objectives for the City of Kelowna, the RDCO and the Agricultural Land Commission (Province). See Figure 2.2.

In terms of long-term water management, there has been much discussion to the concept of an *Agricultural Water Reserve*. The intent is to ensure that in the allocation process, there is water held for agriculture. Ideally, when the Agriculture Land Reserve was created, there could have been water allocation issued at that time to ensure that there was sufficient source water for agriculture. This was not done and is another reason that irrigation for agriculture has been slow to develop.

BMID is fortunate that with the capacity of Mission Creek, we are able to identify where there is sufficient water, where and how that water can be stored in upland reservoirs, and how this would integrate into the BMID water system.

Water Demand

The water demand for the proposed 1,300 acres is based on having supply for a watering depth of 600 mm. This annual depth of water is a reasonable average volume for almost all crops, soil types and irrigation sprinkling systems that can be used for this land area. The annual volume of additional water required to irrigate the additional 1,340 acres is in the range of 3,292 ML. The Maximum Daily Demand flow rate is estimated to be 506 L/s.

Although BMID is bringing in the larger parcels, there will be a period of time required for the lands to buy-in to the district. Through BMID's Capital Expenditure Charge (CEC) Bylaw No. 706, there is a charge of \$11,160 per hectare (\$4,516.29/acre) to buy in the water rights for agriculture from BMID. This fee is to cover the costs of transmission and storage expansion. The CEC does not fund water treatment for agriculture.

Those property owners that intend to connect to this BMID irrigation water system will pay the CEC charge for reservoir storage and conveyance. They would not be paying for domestic water or water treatment. Should BMID be successful in extending the transmission main down to service existing agricultural areas, the capacity of the water treatment plant will be renewed by taking these demands off of the BMID domestic water system.

P:\Projects-2019\19105-10 - Black Mountain Sta Y - CAD SKETCHES\19105-10-SK-03-BMD Boundary Extension.dwg August 6, 2021 Lucas Thayer

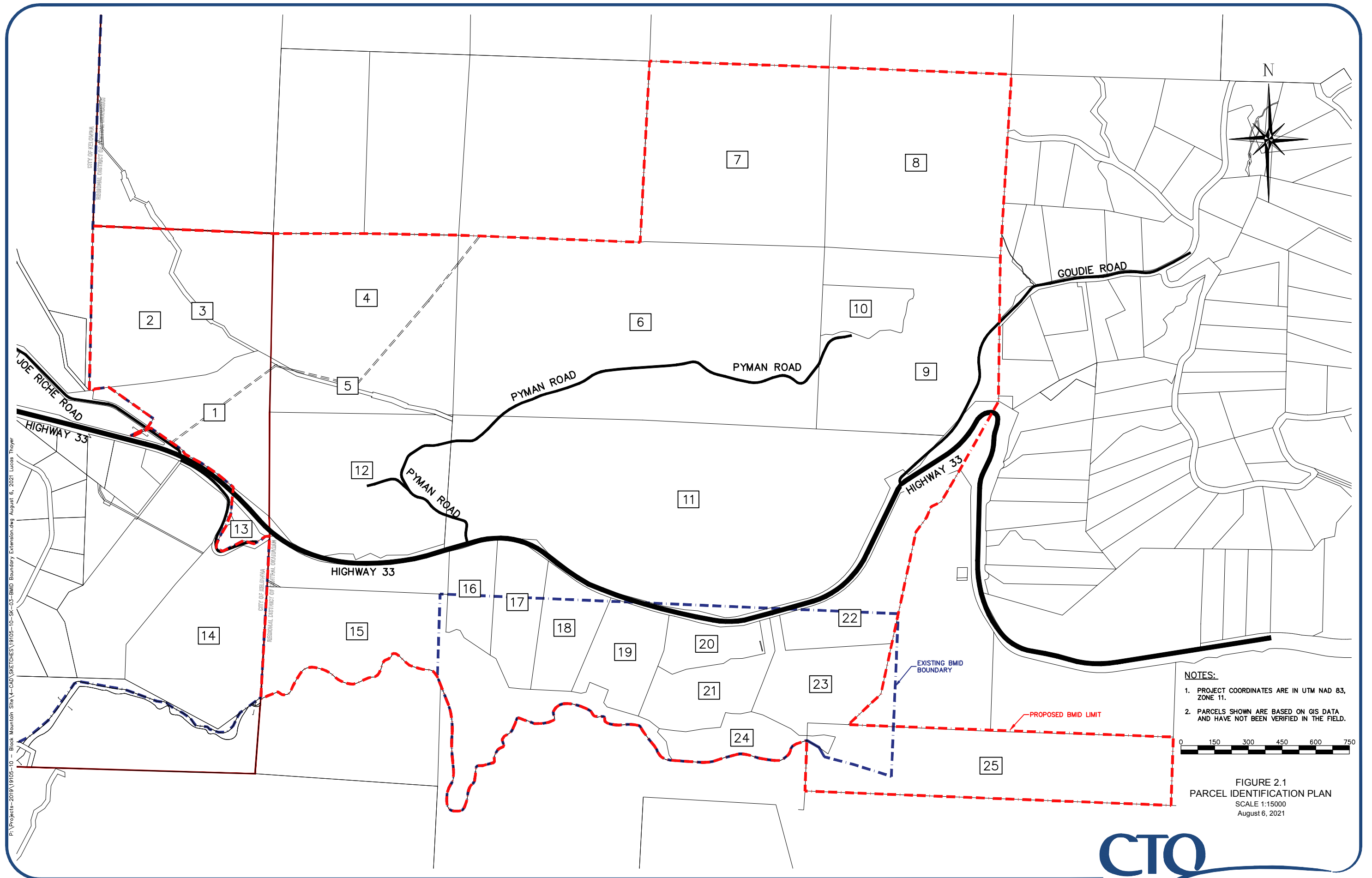
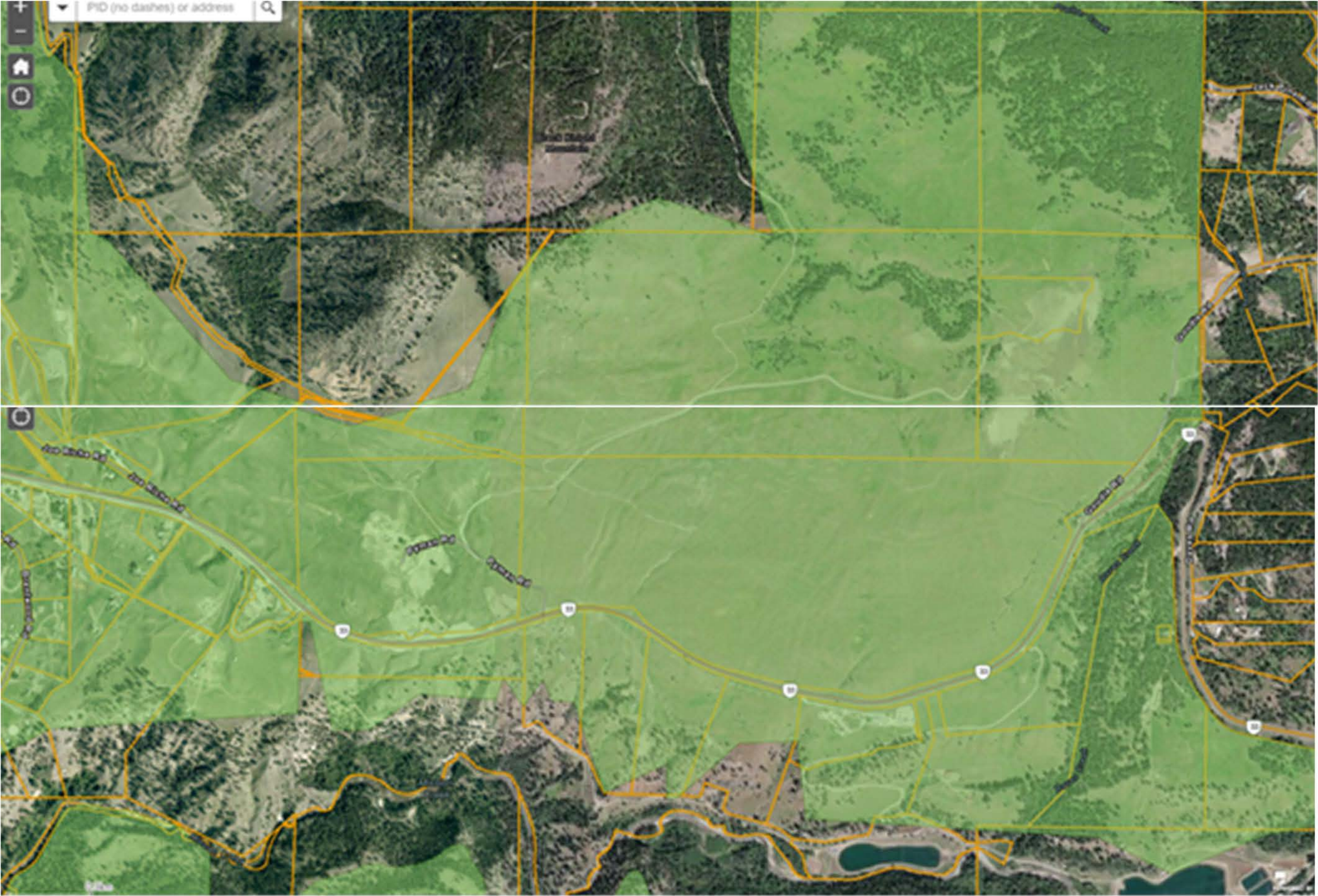


Figure 2.2 - Agriculture Land Reserve – (Green)

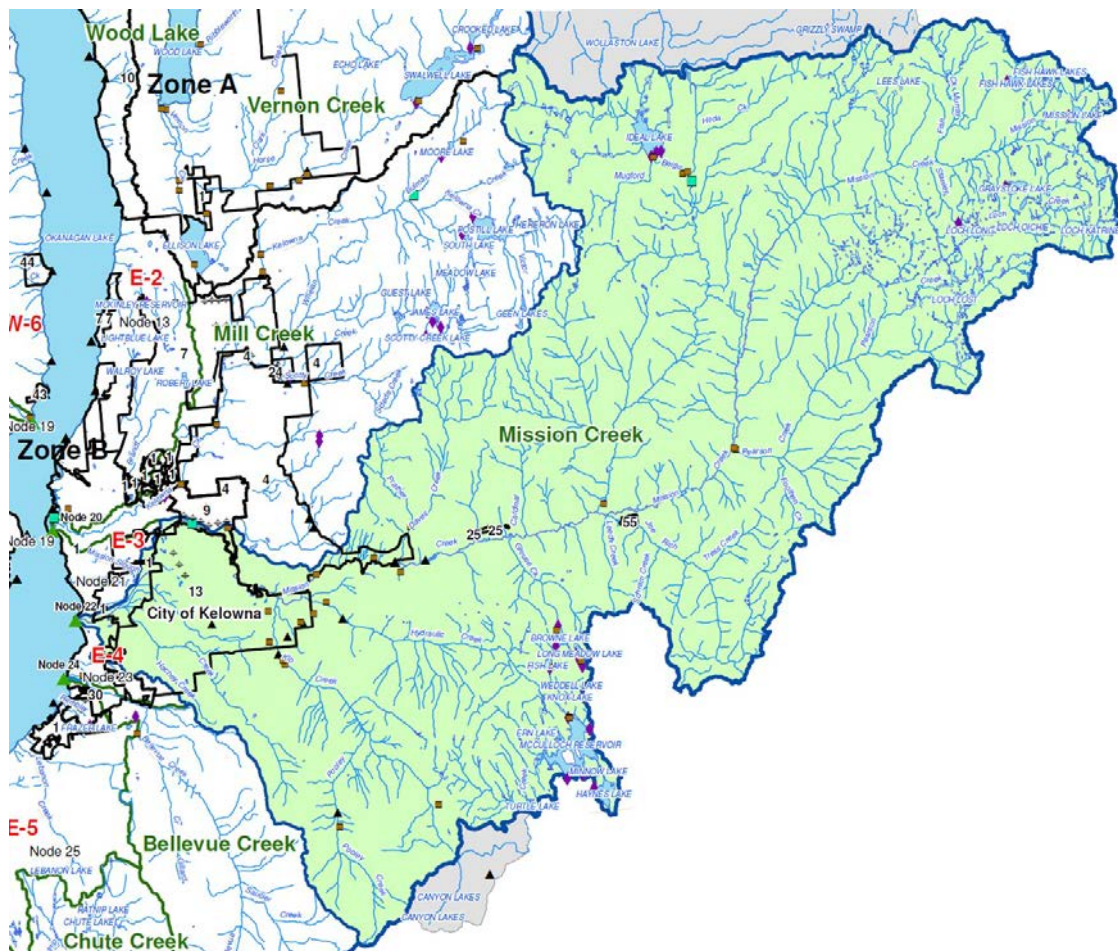


3. WATERSHED CAPACITY AND STORAGE

BMID's objective for watershed operations is to use appropriate quality water for appropriate end use. The importance of the Mission Creek as a long-term domestic and irrigation supply for Kelowna cannot be overstated. The creek is the most reliable water source in the region, supplying approximately 1/3 of the total annual inflow to Okanagan Lake. It is the highest elevation source and most reliable in times of drought. The watershed supplies critical flows to support fish habitat in the lower reaches of the creek.

The raw water quality from Mission Creek is very high, with limited activities by man that pollute the source. A key objective of water management is to control pollution at its source and not let it spread through to the streams and lakes. Mission Creek is not polluted by human activities that could compromise its long-term water quality. Pollutants such as micro-plastics, personal-care-products, and most recently Forever Chemicals (PFAS), which bioaccumulate in the environment are all at low levels or non-existent in upper Mission Creek. BMID has tested for some of these substances with excellent results.

Figure 3.1 - Mission Creek Watershed



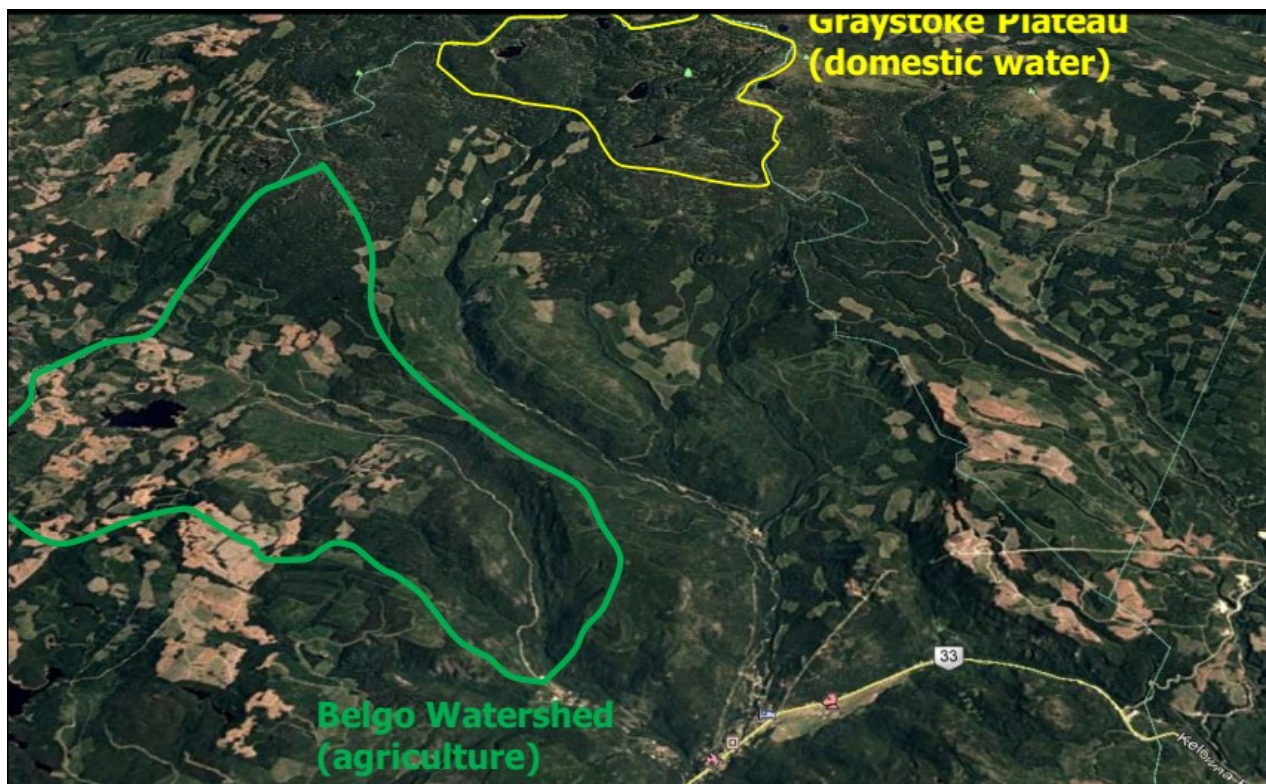
Mission Creek area above BMID intake is 600 km² of the 910 km² total watershed area

The community's reliance on the Mission Creek water source is increasing. In the development of this source, an understanding of the water quality in the various streams in the watershed is key to managing the water. BMID has carried out extensive monitoring since 2005 on the upper watershed reservoirs and has an excellent baseline of the annual quality of water produced in the watersheds above our reservoirs.

The raw water in the watershed varies at elevation. There are two larger sub-catchment areas, Belgo Creek and Upper Mission Creek. Belgo Creek is at a lower elevation with Ideal (Belgo) Reservoir and dams situated at the 1,300m elevation. This water has low turbidity but high colour and high organic content making treatment for colour and organics removal necessary. The water is ideally suited for irrigation and the provision of conservation flows to lower Mission Creek.

The upper Mission Creek area at the 1,800m elevation, has clearer water with low organic content. The upper watershed sees more precipitation. The water requires less treatment and, at times, can be directly supplied to the customer with only UV disinfection and chlorination. Figure 3.2 shows the watershed areas where BMID is able to store and/or capture the water.

Figure 3.2 - Graystoke & Ideal/Belgo Watersheds



The intent for the proposed plan is to maximize the supply of irrigation water from Belgo Creek to the expansion area by gravity. The plan also considers extension of the transmission main further to the west to service agricultural lands already within the BMID service area.



BMID WATER LICENSES

Licensing totals held by BMID are listed in Table 3.1.

Table 3.1 - Existing Water Licenses

WATERSHED	DOMESTIC	IRRIGATION	STORAGE	CONSTRUCTED STORAGE
Scotty Creek Watershed	0 ML	2,744 ML	1,826 ML	1,775 ML
Mission Creek Watershed	5,010 ML	20,024 ML	20,159 ML	13,725 ML
TOTALS	5,010 ML	22,768 ML	21,985 ML	15,500 ML

BMID operates reservoir storage for the Ministry of Environment for conservation flows. BMID releases 660 ML of storage water annually held in Ideal/Belgo Reservoir for conservation flows that go to lower Mission Creek. The license for this water is held by the Ministry of Environment. The volume stored for the Ministry is not included in the above constructed storage numbers.

BMID supplies an average of 12,350 ML of water per year to all customer groups. In an exceptionally dry year such as 2021, that amount can reach 15,000 ML. The existing storage available for BMID is operated with the objective to leave 20% of the volume of the reservoir in place for the following year to reduce the impact of a multi-year drought. BMID operates with a target of using a maximum of 8,200 ML of storage water per year for its current users. This allows for 20% remaining in storage at year-end. It also provides for supplemental flows to lower Mission Creek. A significant flow from BMID storage is used to maintain a base flow of 1.00m³/s to support fish habitat in lower Mission Creek through the summer and late fall each year.

BMID has been recording total flow past each of our upper watershed reservoirs since 2007. The data collected is the measurement of flows from the outlet and spillway, also accounting for evaporation, precipitation and groundwater seepage past the dams. The results of the data collection are a high confidence in the watershed capacity at each of our dam sites.

BMID also closely monitors releases at our reservoir sites, flows in Pearson Creek, Mission Creek in several locations, and withdrawals at our Water Treatment plant. The monitoring is providing BMID with excellent information to address the following two issues:

1. Storage volumes that are needed to support conservation flows in Lower Mission Creek;
2. Where watershed capacity is available to support additional storage for both irrigation and for conservation flows.

As per Table 3.1, BMID has adequate irrigation licenses for the expansion, however additional storage licensing will have to be applied for storage expansion at a site acceptable to all of the stakeholder agencies including the Province Water Management, BC Parks, and ONA / Westbank First Nations.



IDEAL/BELGO RESERVOIR WATERSHED CAPACITY

The licenses for Ideal/Belgo reservoir are included in Table 3.1. The Ideal/Belgo watershed catchment area, including diversions of Hilda Creek, Diamond Dyck Creek and Mugford Creek, is 53.0 km². These areas supply an average annual runoff to the reservoir of 13,900 ML. This is the recorded flow from outlet releases during the summers and water that flows over the reservoir spillway each spring. BMID has recorded spillway flows from 2007 to 2020.

Ideal /Belgo Reservoir Catchment Area	53.0 km ²
Average Annual Runoff	13,897 ML/yr.
Annual Average Runoff Depth	262mm per yr.
MOE Licensed storage	660 ML
BMID Licensed storage	<u>6,155 ML</u>
Total Storage Volume in Reservoir	6,815 ML

Annual Runoff Frequency Table for Return Period Droughts

1:1 yr.	100%	13,897 ML
1:10 yr.	57%	7,921 ML
1:25 yr.	44%	6,115 ML
1:50 yr.	36%	5,002 ML
1:100 yr.	30%	4,169 ML

Ideal/Belgo Reservoir Irrigation Supply Capacity

To maintain a reasonable supply of water through a multi-year drought, BMID targets a year-end storage volume of 20% of full pool or 6,815 ML x 20% = 1,363 ML remaining in storage.

The released safe volume of useable storage is 5,452 ML

There is 660 ML of water in Ideal/Belgo Reservoir that is licensed to the Province for conservation flows for lower Mission Creek.

The available volume of storage for BMID irrigation is 4,792 ML.

At an annual irrigation depth of 533mm (1.75 ft) required after freshet), this storage is sufficient to provide irrigation for a total of 2,221 acres. A large portion of the water is presently utilized by existing BMID customers.

Raising the three dams at the reservoir site will be extremely costly as the old-style concrete core for the higher two dams is no longer an approved method for construction of new dams. The three dams would have to be completely reconstructed from below their bases to the dam crest.

It is the intention that any storage water that is utilized by new users from Ideal/Belgo Reservoir would have to be offset with new storage constructed in the upper Mission Creek watershed.



4. INFRASTRUCTURE COMPONENTS

INTRODUCTION

The infrastructure to supply water from Belgo Creek to Kelowna is a not a new concept. In 1912, the Belgo Fruit and Land Company constructed a 14-kilometre-long ditch from Belgo Creek to Kelowna. The water was conveyed through the earthen ditch. The ditch leaked, sometimes washed out, and would lose water through evaporation along the way to Kelowna. In that time, BMID employed ditch-walkers who would, each day, inspect and ensure the ditch was intact. The ditch served Kelowna from 1912 to 1945. BMID is planning to use the same gravity concept for the long-term irrigation supply. Improvements will include no evaporation or leakage losses, automated controls for the inlet on the creek and reinstatement of a gravity supply for irrigation to the higher elevation lands.

The infrastructure components for irrigation supply will require the combined efforts of the large fruit grower, G.P. Sandher Holdings Ltd., BMID, and the Province of BC. The plan consists of the development of the following components:

- 4.1 **Water Intake:** Located on Belgo Creek, BMID would reinstate the original water intake on BMID owned land. The site is 4 km north of Highway 33 at the confluence of Darley Creek and Belgo Creek;
- 4.2 **Transmission Main:** The agricultural grower would install the 14 km transmission main, sized between 900mm & 1050mm diameter from Belgo Creek intake to their site. Opportunities for cost sharing, government support and in Latecomers' recovery will be part of the financial strategy to spread out the costs to construct this watermain;
- 4.3 **Upper Watershed Storage:** Construction of additional upland reservoir storage, either through expansion of an existing BMID reservoir on the Graystoke plateau, or through construction at a new site;
- 4.4 **Extension of Transmission Main to Additional Lands:** Extension of the water transmission main west into the existing service area of BMID will be planned in order to reduce long-term pumping costs and water demand on the BMID water treatment plant;
- 4.5 **Domestic Extension:** Extension of the Domestic water system is expected to be required to provide potable water to workers housing. A project of this magnitude will require hundreds of farm workers. Accommodation is expected to be permitted on these lands. Extension of the potable system further to the east is desired by the residents along Goudie and Huckleberry Roads in the Regional District.

4.1 BELGO CREEK WATER INTAKE

BMID owns a 30-acre parcel of land where the creek intake was used in the early 20th century. The land is 30.3 acres in size and is identified as PID 011-737-859. It has been owned by BMID since inception of the District on November 3, 1920. Figure 4.1 in this section sets out the concept for the water intake at Belgo Creek. BMID held an existing Point of Diversion license at this location under water license CL 023071, and that license was superseded by current license CL 126346.

Figure 4.1 - Water Intake on Belgo / Darley Creek _ Prepared by CTQ Consultants Ltd.



The intake will require an automated gate at the creek with instrumentation of creek turbidity, withdrawal capability/diversion off of Belgo Creek or Darley Creek, pipe works to the settling pond where the heavier sands and silts would fall out and fish screens with return routing for the fish to the creek. Also installed would be features such as a pigging (cleaning) port prior to where the transmission main starts.

Road access and power are required. It is expected that the intake pond will be constructed into the ground as a dugout. It will not be a dam or require dam safety approvals.

An additional Point of Diversion will be requested from the Province for allowing an intake on Darley Creek. This would provide for flexibility in supply in the event of poorer water quality on either creek.



FIGURE 4.2
EAST TRANSMISSION MAIN ROUTE
SCALE 1:15000
August 6, 2021

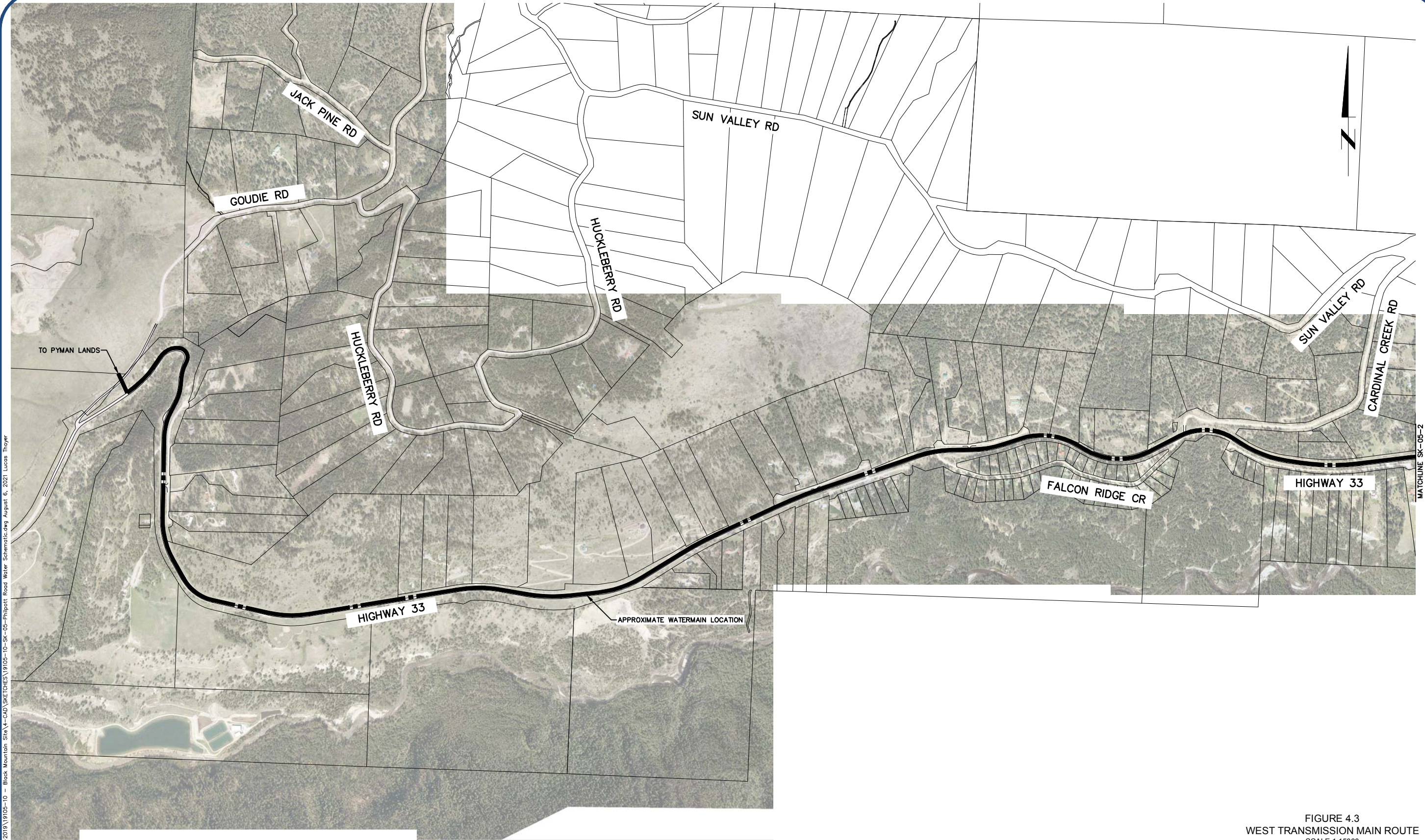


FIGURE 4.3
WEST TRANSMISSION MAIN ROUTE
SCALE 1:15000
August 6, 2021



4.2 WATER TRANSMISSION MAIN

A water transmission main is required to convey water from Belgo Creek to the lands to be irrigated. To provide a long-term cost-effective supply, the water will be supplied by gravity and will not be treated. The main will generally be sized to match the size of the available water source.

The transmission main is expected to begin at elevation 880 metres and it will be sized to flow by gravity to the G.P. Sandher Holdings Ltd. lands at elevation 855 metres. The route would match the old flume line grades. Where the old statutory right-of-way no longer exists, the transmission main would be located along the Highway 33 right-of-way.

The pipe is expected to be either 900mm or 1050mm diameter. It would be either HDPE or PVC pipe, or steel that is cathodically protected. The transmission main would have pigging ports and would have a means in which BMID could maintain the cleanliness of the inside walls of the main.

Figures 4.2 and 4.3 provide the preliminary routing of the water transmission main from Belgo Creek intake to the limit of the GP Sandher Holdings Ltd. lands.

There is the opportunity to provide hydrants along the way to support fire protection efforts in the Joe Rich area.



4.3 UPPER WATERSHED STORAGE

As the project will require stored water from Ideal (Belgo) Reservoir, the volume of water accessed will have to be constructed so that the supply capacity of the greater BMID water system is not diminished.

To meet the initial water demand requirements for the development of agriculture, the GP Sandher Holdings land will require upper watershed storage of 2,600 ML. With the discussion of storage for agriculture, the opportunity for increasing storage water for conservation flows to lower Mission Creek will be discussed with the appropriate agencies. The opportunities for benefits to agriculture and environment are available within the scope of this project.

BMID has begun discussions with the various agencies including the Ministry of Environment, BC Parks, and Westbank First Nations. The intention is to garner support from multiple agencies for improved water management for Mission Creek. Having more water available at the critical times of year would be invaluable.

Water storage expansion is proposed in the upper Mission Creek watershed. The coloured water from Belgo watershed is ideal for irrigation supply and conservation flows for fish. With an irrigation and conservation storage system functioning, future reservoir expansion by BMID is proposed at the higher elevations for the following reasons:

1. Most reliable quantity of water is at the high elevations;
2. Raw water quality is the highest at elevations above 5,000 feet;
3. Less public access routes are available to access the highest plateau;
4. There is a reduced fire risk at higher elevation as the ground moisture levels are typically higher;
5. There is protection from logging/industry as much of the upper watershed is within Graystoke Provincial Park.

For expanded storage, the current industry consensus is to develop and raise existing sites rather than to build reservoirs at completely new sites. The environmental impact is lower and more complete hydrometric data is available. BMID has good hydrometric information available at all of our reservoir sites. BMID reservoir releases and spillway overflows are recorded on the three reservoirs that exist on the Graystoke plateau.

BMID is considering water storage expansion options on the following pages. These are being discussed with BC Parks to determine the best way to meet the water supply objectives and maintain the natural integrity of the Graystoke Provincial Park.



The location of the six options presented is illustrated in Figure 4.4.

Option 1 – Raise Fish Hawk Dam with Diversion

Largest capacity option is based on raising Fish Hawk Dam to a level where the maximum amount of water can be diverted, collected and stored at a single Dam site.

Collection area = 7.10 km²

Collection area with Diversion = 16.33 km²

Runoff available with diversion is sufficient to increase existing storage from 1850 ML to 7371 ML.

Dam height to be raised. Increase water level from elevation 1805m to 1814m (raise 9m)

Annual runoff depth per area. Estimated at 450mm depth

ADDITIONAL WATER AVAILABLE 5,521 ML

TOTAL WATER STORED 7,371 ML

BC Parks does not support a large height increase or the significant impact of the diversion ditch.

Option 2 – Raise Fish Hawk Dam without Diversion

This option has a much lower footprint and is based on raising Fish Hawk Dam to a level where it stores the average annual volume of water that runs off from the existing watershed.

Collection area = 7.10 km²

Runoff available is sufficient to increase existing storage from 1850 ML to 2730 ML. (880 ML)

Dam height to be raised. Increase water level from elevation 1805.0 m to 1806.5 m (1.5m raise)

Annual runoff depth per area = 385mm depth. Raise and rebuild spillway and access across dam

ADDITIONAL WATER AVAILABLE = 880 ML

TOTAL WATER STORED = 2,730 ML

This may be an option that BC Parks may consider as it has a low impact and no required diversion.

Option 3 – Re-build Breached Dam at Mission Lake

BMID has licensing in place for this reservoir.

The dam is breached until such time that BMID needs water

Collection area = 4.01 km²

Original storage was for 563 ML with HWL at 107 ft (local datum).

Runoff available is estimated to be 1804 ML or HWL of 117 ft.

Dam height to be raised is approximately 3.0 m

Annual runoff depth per area = 550mm depth

ADDITIONAL WATER AVAILABLE 1,652 ML

TOTAL WATER STORED 2,205 ML

Other factors. This is inside Graystoke Provincial Park. The access road will be an issue with BC Parks

Option 4 – Raise Loch Long Reservoir

This reservoir and its 3 dams are outside of Graystoke Park.

This is a high-elevation site at 1,890 m elevation.

Collection area = 2.86 km²

Runoff available with diversion is sufficient to increase existing storage from 625 ML to 2640 ML.

Dam height to be raised. Increase High Water Level from elevation 111 ft to 131 ft

Annual runoff depth per area = 923mm depth

ADDITIONAL WATER AVAILABLE 2,015 ML

TOTAL WATER STORED 2,640 ML

The existing dams would have to be completely reconstructed along with a spillway.



Option 5 – Raise Loch Long Reservoir with Diversion

The reservoir is located outside of Graystoke Park and there would be a very localized diversion that would be within the park Boundary at an elevation of 1930m. The diversion would add significant water catchment area to Loch Long Reservoir.

Collection area = $2.86 \text{ km}^2 + 1.92 \text{ km}^2$ (diverted area) = 4.78 km^2

Runoff available with diversion is sufficient to increase existing storage from 625 ML to 4,412 ML.

Dam height to be raised. Increase High Water Level from elevation 111 ft to 145 ft (10.7 m raise)

Annual runoff depth from catchment area = 923mm depth

There is a limitation to the raising of Loch Long as it involves containing the water on the north side of the reservoir. The ridge is the limiting topographic feature and may not be of sufficient height to permit a 10m raise in water level.

The diversion is from within Graystoke Park and would divert water that would otherwise go into Graystoke Reservoir which has excess capacity to fill each spring.

ADDITIONAL WATER AVAILABLE 3,787 ML

TOTAL STORED WATER 4,412 ML

Option 6 – Raise Graystoke Reservoir

This reservoir is on the perimeter of Graystoke Park. It is a high elevation site at 1,805 m

Collection area = 14 km^2

Runoff available with diversion is sufficient to increase existing storage by double however dam is 17m high already. It is not desirable to increase the risk of this already very high consequence dam.

Raising this dam is not recommended.

Option 6 – Raise Ideal/Belgo Reservoir

BMID has licensing in place for this reservoir to 6115 ML

Collection area = $53. \text{ km}^2$

Current storage is 6815 ML with HWL at 131.6 ft.

Runoff available is estimated to be 13,898 ML which would require HWL of 143.6 ft.

Dam height to be raised is approximately 3.66 m

Annual runoff depth per area = 262mm depth

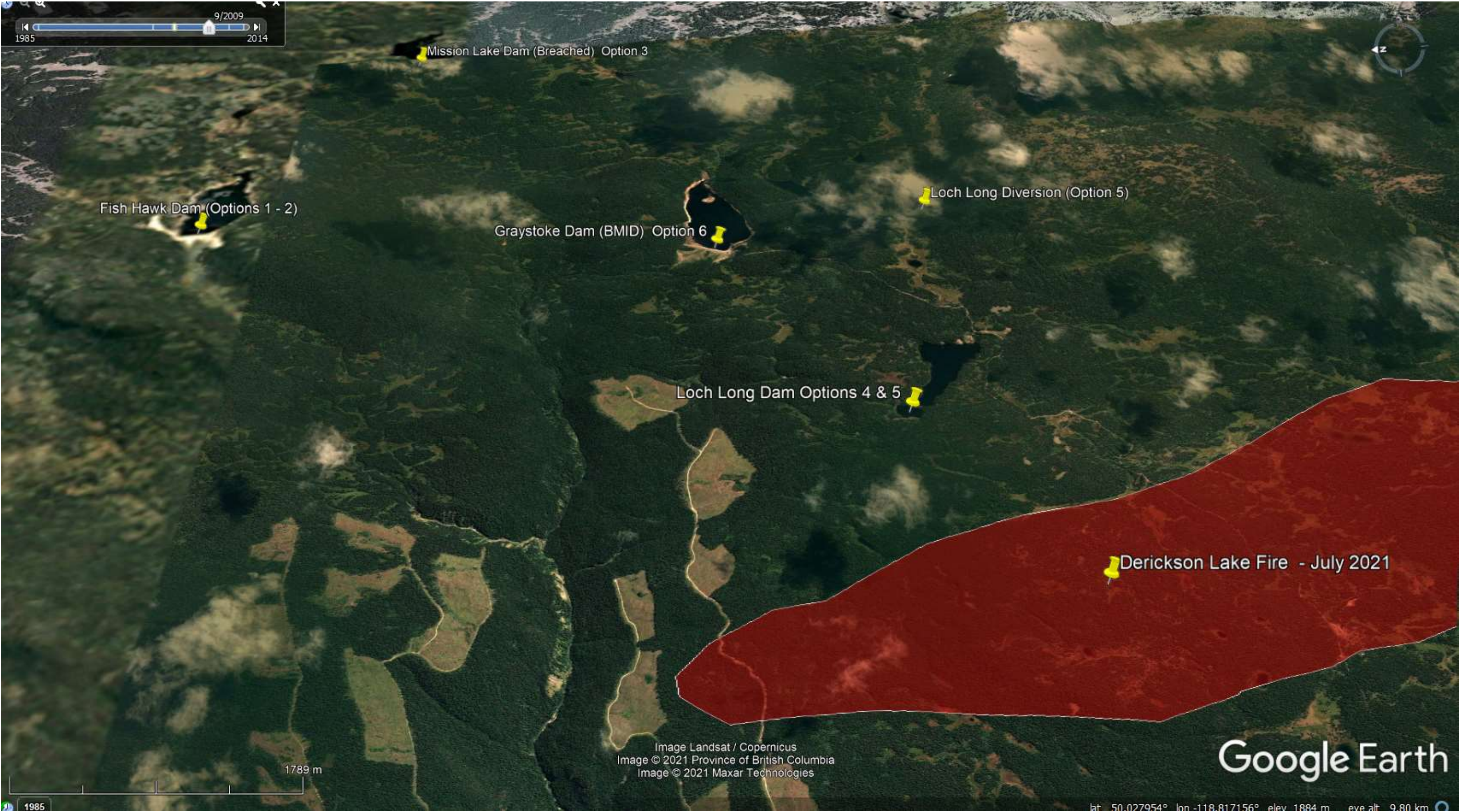
ADDITIONAL WATER AVAILABLE 7,083 ML

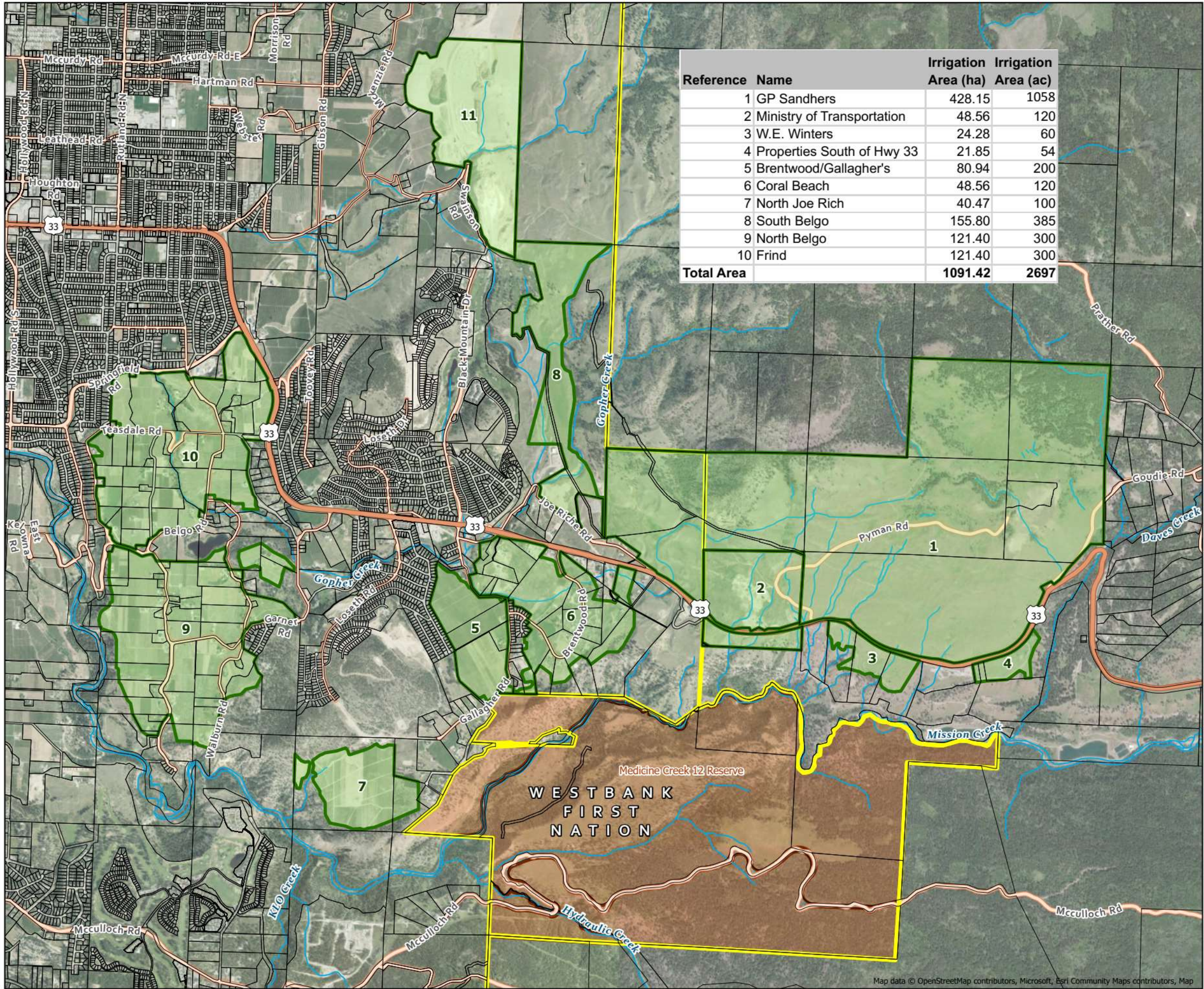
TOTAL WATER STORED 13,898 ML

This work would be completed located on BMID property. Should BMID receive grant monies for storage for water for conservation flows, that storage volume could be considered at this storage site.

From the list of options, the preliminary indications are that raising Loch Long with diversion (Option 5), then raising Fish Hawk Reservoir without diversion (Option 2) are the two most viable options for expanded storage on the Graystoke plateau.

Figure 4.4 - Water Storage Option Sites - Graystoke Plateau

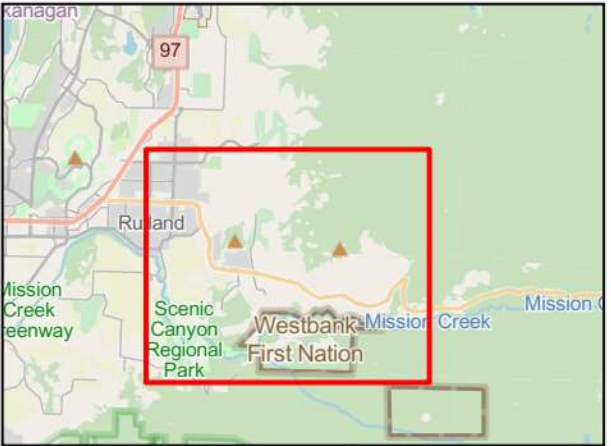




Reference	Name	Irrigation Area (ha)	Irrigation Area (ac)
1	GP Sandhers	428.15	1058
2	Ministry of Transportation	48.56	120
3	W.E. Winters	24.28	60
4	Properties South of Hwy 33	21.85	54
5	Brentwood/Gallagher's	80.94	200
6	Coral Beach	48.56	120
7	North Joe Rich	40.47	100
8	South Belgo	155.80	385
9	North Belgo	121.40	300
10	Frind	121.40	300
Total Area		1091.42	2697

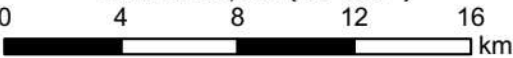


Figure 4.5
BMID Irrigation Areas



Reference Map

Scale 1:250,000 (11" x 17")



Legend

- Streams
- Jurisdictional Boundary
- Service Areas
- First Nation Reserve
- Parcels



Scale 1:30,000 (11" x 17")



Date Published: 2021-08-06
 Drawn By: DG
 Projection: NAD 1983 UTM Zone 11N





4.4 EXTENSION OF TRANSMISSION TO ADDITIONAL LANDS

The works to extend the gravity-supplied irrigation water to existing BMID customers is explained in this section. In time, extending the water transmission main further into BMID would allow for recovery for a portion of the transmission main costs and would set up the BMID water system to have lower long-term operating costs. With the large agriculture project proposed by G.P. Sandher Holdings Ltd, the opportunity exists to provide significant long-term community-wide benefits.

The intention of BMID is to build more than what is needed for GP Sandher Holdings, and match the infrastructure for the long-term to the natural supply capacity of the Belgo Creek source. Also extending the system and increasing the number of contributors, and by slightly upsizing the transmission main, there is the opportunity to supply additional lands that are already serviced by BMID. It is BMID's intention to transfer this irrigation demand off of the combined domestic system and free-up capacity of the BMID water treatment plant. The freed-up capacity would be used by new development and the costs for treatment could be assigned to extending the irrigation main to more agricultural land.

Figure 4.5 illustrates those land parcels to where irrigation water can be supplied to through the proposed plan. Table 4.1 provides a listing of the subject lands to where irrigation can be extended. Within the next 15 years, it is realistic that the five areas listed in Table 4.1 could be serviced.

Table 4.1 - Lands to be Irrigated

No.	LAND PARCEL	IRRIGATED ACRES	CUMULATIVE ACRES	NEW ACREAGE	EXISTING ACREAGE	CUMULATIVE REQ'D STORAGE (ML)
1	GP SANDHERS	1058	1058	1058	0	2493
2	MINISTRY OF TRANSPORTATION	120	1178	120	0	2776
3	W.E. WINTERS	60	1238	60	0	2917
4	PROPERTIES SOUTH OF HWY 33	54	1292	54	0	3044
5	BRENTWOOD / GALLAGHERS	200	1492	80	120	3516
6	CORAL BEACH	120	1612	0	120	3798
7	NORTH JOE RICH ROAD	100	1712	75	25	4034
8	SOUTH BELGO	385	2097	0	385	4941
9	NORTH BELGO	300	2397	0	300	5648
10	FRIND	300	2697	0	300	6355
		2697		1447	1250	
COMMENTS						
SHADED PARCELS ARE SUPPLIED THROUGH EXISTING BMID SYSTEM THROUGH WTP						

As listed in Table 4.1, there is the potential to develop a gravity supply for up to 2697 acres. The storage required for this, based on 525mm depth is 5,776 ML. The current BMID development charge (CEC-Capital Expenditure Charge) is \$5,580 for a dry land single family average sized lot. The portion of this amount that could be assigned to water treatment is in the range of one third of the cost or \$1,860 per SF lot.



4.5 EXTENSION OF DOMESTIC WATER

The size of the project will likely result in the need for domestic water supply to be extended to the area. Potable water will be needed for farm-worker housing that would support a large agriculture operation. Several hundred workers would be expected to be housed to service 1,000 acres of intensive agriculture.

In addition, there are also pressures by the residents in the Goudie Road – Huckleberry Road area to have access to a domestic water supply. The existing wells are low-producing and the groundwater capacity in the area is limited. The current 2021 drought is reducing the groundwater supply.

As part of this project, BMID will require statutory rights-of-way (SRWs) for future domestic water supply to the proposed future eastern boundary of BMID. The long-term domestic water demands have not yet been determined. Therefore, the size for the domestic water main has not yet been determined. The opportunities for servicing the lands could be administered through an expansion of the water boundaries of BMID or through a bulk-water sale from BMID to the Regional District of Central Okanagan.

Land right-of-way decisions are possible at this early stage and will be a requirement in the Water Servicing Agreement between G.P. Sandher Holdings Ltd. and BMID.



5. FINANCIAL CONSIDERATIONS

5.1 INTRODUCTION

This section of the document is to provide insight to the cost components of this project. The costs are high and the benefits are substantial. Several aspects of the project are discussed including:

1. General strategy for how the project will be funded and how BMID plans to see the project administered.
2. The security of water supply. There is a substantial value in the agricultural product and agricultural investment within the boundaries of BMID. Having several sources and means of conveyance improves the security of supply. Information providing an estimate of the loss of supply is provided in Section 5.2;
3. A comparative revenue evaluation of local fruit crops in comparison with prairie grain crops is provided. These numbers are to highlight the value of investment in local agriculture in comparison with investment in irrigation in other parts of the Western Canada;

5.2 PROJECT ADMINISTRATION

Black Mountain Irrigation District operates as an Improvement District under Part 17 of the Local Government Act, R.S.B.C.2015, C.1, to supply water for domestic and irrigation purposes to BMID customers. BMID is authorized to regulate and distribute water in conformance with its bylaws. The bylaws also authorize BMID to charge for water and development of water infrastructure. BMID can collect tolls for the use of water, taxes for renewal and administration of water and can administer Capital Expenditure Charges (CECs) to fund projects to recover the water system capacity used by new development.

With the proposed boundary extension, BMID can structure and assess the costs for works in accordance with their bylaws and can assess costs to projects and users in a fair and equitable manner. In 2019, GP Sandher Holdings Ltd. approached BMID in regards to water supply. BMID provided clear direction on what would be required for the servicing of the subject lands including where there was water available and how the supply of irrigation water would have to be set up to meet regulator and public approvals. Subsequently BMID has entered into a Memorandum of Understanding (MOU) with GP Sandher and is working with the land owner to set up an expanded irrigation water supply.

The MOU sets out the general rules for the development of water supply. BMID will be leading the applications with water set out and allocated to GP Sandher Holdings sufficient for irrigation of their lands. Once more detailed information becomes available and if the boundary extension is approved, BMID will enter into a Water Servicing Agreement with GP Sandher Holdings Ltd.



The two largest off-site components of water supply works are:

1. Expanded Upland Reservoir storage in the amount of 2600 ML. to be constructed at an existing site of either Loch Long and/or Fish Hawk Reservoir
2. The 14 km Transmission main complete with intake works.

As per the Memorandum of Understanding that is in place between BMID and GP Sandher Holdings Ltd, the upland reservoir capacity will be funded through the payment of Capital Expenditure Charges. The charges are set within existing BMID Bylaw 706. The CEC payment is to allow BMID to compensate for the erosion of storage capacity that is required for the agricultural lands.

The transmission main will be built to BMID standards and is to be owned and operated by BMID. The supply and installation of the main will be funded by GP Sandher Holdings Ltd. The main will be oversized to allow for the recovery of costs (Latecomer's Fees) from future properties that may benefit from water supplied from this water main.



5.3 WATER SUPPLY SECURITY

In 2018, BMID's main conduit from Mission Creek to the water distribution system was compromised due to an unstable slope. High groundwater levels and a leak in the conduit caused the ground to be saturated and the slope moved 250mm over the summer. Stabilization works and contingency plans were put in place in the event that the slope failed.

The costs for loss of supply are substantial. An economic loss estimate was developed to understand the impact on the agricultural community. The estimate included the replanting costs, lost revenue including those years in development when the crop produced would only be a percentage of a fully developed orchard.

Table 5.1 provides a summary of impact if BMID were to lose the water supply to the extent that the agricultural crops would have to start over again.

Table 5.1 - Economic Impact of Water Loss

LOSS OF COMMUNITY WATER SUPPLY - AGRICULTURAL IMPACT															Description / Comments
Groupings	Acres	Revenue / Acre	Replant Cost / ac.	Gross cost / yr	TOTAL LOSS	Replant Cost/ac	2019	2020	2021	2022	2023	2024	2025	2026	
Cherry	538.40	\$ 45,000	\$ 15,000	\$ 24,228,000	\$ 158,289,600	\$ 8,076,000	\$ 24,228,000	\$ 24,228,000	\$ 24,228,000	\$ 24,228,000	\$ 24,228,000	\$ 16,232,760	\$ 7,995,240	\$ 4,845,600	
Sour Cherry	37.23	\$ 20,000	\$ 15,000	\$ 744,513	\$ 5,174,363	\$ 558,384	\$ 744,513	\$ 744,513	\$ 744,513	\$ 744,513	\$ 744,513	\$ 498,823	\$ 245,689	\$ 148,903	
Apple HD	537.69	\$ 25,000	\$ 36,136	\$ 13,442,208	\$ 75,887,177	\$ 19,429,905	\$ 13,442,208	\$ 13,442,208	\$ 13,442,208	\$ 9,006,279	\$ 4,435,929	\$ 2,688,442			\$350bin x 90 bins / acre
Apple MD	163.79	\$ 10,000	\$ 36,136	\$ 1,637,912	\$ 12,797,989	\$ 5,918,759	\$ 1,637,912	\$ 1,637,912	\$ 1,637,912	\$ 1,097,401	\$ 540,511	\$ 327,582			\$350bin x 60 bins / acre
Apple LD	197.61	\$ 5,000	\$ 36,136	\$ 988,040	\$ 11,290,530	\$ 7,140,763	\$ 988,040	\$ 988,040	\$ 988,040	\$ 661,987	\$ 326,053	\$ 197,608			\$350bin x 45 bins / acre
Soft Fruit Apricot/Peach/Pear/Plum	37.46	\$ 15,000	\$ 15,000	\$ 561,951	\$ 2,922,143	\$ 561,951	\$ 561,951	\$ 561,951	\$ 561,951	\$ 561,951	\$ 376,507	\$ 185,444	\$ 112,390		Est
Berry Crop (rasp, strawberry, berry)	29.16	\$ 30,000	\$ 15,000	\$ 874,877	\$ 4,111,920	\$ 437,438	\$ 874,877	\$ 874,877	\$ 874,877	\$ 586,167	\$ 288,709	\$ 174,975			
Grape - Vineyard	80.95	\$ 20,000	\$ 15,000	\$ 1,618,908	\$ 8,013,594	\$ 1,214,181	\$ 1,618,908	\$ 1,618,908	\$ 1,618,908	\$ 1,084,668	\$ 534,240	\$ 323,782			
Floriculture (flowers)	0.29	\$ 50,000	\$ 20,000	\$ 14,500	\$ 63,800	\$ 5,800	\$ 14,500	\$ 14,500	\$ 14,500	\$ 14,500					
Cash-Crop-Garden (corn, veget...)	65.56	\$ 15,000	\$ 4,000	\$ 983,348	\$ 2,750,097	\$ 262,226	\$ 983,348	\$ 983,348	\$ 324,505	\$ 196,670					
Turf farm	57.91	\$ 20,000	\$ 2,500	\$ 1,158,203	\$ 3,075,030	\$ 144,775	\$ 1,158,203	\$ 1,158,203	\$ 382,207	\$ 231,641					
Forage / Pasture / Grass	439.74	\$ 2,000	\$ 500	\$ 879,476	\$ 2,444,943	\$ 219,869	\$ 879,476	\$ 879,476	\$ 290,227	\$ 175,895					200 days/yr. feed livestockhorses 0.5 bales/day/livestock x 2 livestock/acre
Alfalfa	99.75	\$ 2,250	\$ 500	\$ 224,441	\$ 617,713	\$ 49,876	\$ 224,441	\$ 224,441	\$ 74,066	\$ 44,888					90 square bales/acre x 10.00/bale x 2.5 cuts/year
Greenhouse / nursery	44.67	\$ 100,000	\$ 25,000	\$ 4,466,894	\$ 10,050,511	\$ 1,116,723	\$ 4,466,894	\$ 4,466,894							
TOTAL	2330.20 acres				\$ 297,489,411	\$ 45,136,650	\$ 51,823,270	Order trees, two years	replant						
2019 Complete Loss Year						Replant	Year of failure								
2020-22 Order trees, new stock															
Designates Replant Year															
0 First year after replant year															
0.33 Designates reduced production 33%															
0.67 Designates reduced production 67%															
0.80 Designates reduced production 80%															
Value added services				33%	\$ 98,171,506										
Vegetation on Single family lots	6000 lots	\$3000 per lot			\$ 18,000,000										
Sports fields, schools, Parks	300 acres	intangible amount													
				Subtotal	\$ 413,660,917										
ORDER OF MAGNITUDE COMMUNITY IMPACT					\$ 400,000,000										

Economic analysis provides the cost of impact should the existing BMID water supply be completely lost in mid-summer. Having two large sources of water for agriculture will help to reduce this risk.

BMID is in discussions with the other Kelowna water utilities to upgrade the interconnection capacity between the four large water utilities. Even with maximizing those interconnections, the supply to BMID cannot be provided any one or two neighbouring utilities.



5.4 COMPARATIVE COST ASSESSMENT

With the potential for Federal funding to agriculture, the scope and size of this project should be worthy of consideration by the Provincial and Federal Governments. The project provides many jobs and high gross revenues for the amount of infrastructure that is required.

A comparative cost assessment is provided comparing fruit crop revenues versus grain crops grown on the Prairies. Budget numbers are provided for the revenue per acre that can be grown for various grains and orchard crops. Current grain prices may be higher than shown, but the revenues provided are based on minimum expected prices. The per-acre values for grains should be considered to be conservative revenues.

Table 5.2 - Grain Crop Revenues

Grain Crop	Price / Bushel	Yield per Acre	Annual Gross Revenue / ac.
Canola	\$ 13.00	45	\$ 585
Oats	\$ 4.25	120	\$ 510
Barley	\$ 5.20	75	\$ 390
Peas	\$ 9.00	45	\$ 405
Wheat	\$ 7.25	70	\$ 508

Table 5.3 - Orchard Crop Revenues

Orchard Crop	Annual Gross Revenue per Acre
Cherries	\$ 30,000
Apples – High Density	\$ 15,000
Apples – Medium Density	\$ 10,000
Apples - Low Density	\$ 5,000
Grapes	\$ 20,000

For supporting water infrastructure for agriculture in the Okanagan, there are three factors that should be considered:

1. Revenue generated per acre;
2. Labour , i.e., number of persons employed;
3. Less infrastructure due to the density of plantings
(water does not have to be conveyed as far to get to the crop).



Comparative Acreage Review – Orchard vs Grain Farm

BMID has a watershed and transmission main planned to service 1,600 acres of new agriculture (1,000 of which is for G.P.Sandher Holdings Ltd.).

We expect the majority of revenue will be generated from two crops, of which $\frac{3}{4}$ of the land will be cherry plantings and $\frac{1}{4}$ apples

The annual revenue generated for this for the 1,600 acres in question is:

1,200 acres cherries @ \$ 30,000/acre	=	\$ 36,000,000
400 acres apples @ \$ 15,000/acre	=	\$ 6,000,000
TOTAL REVENUE	=	\$ 42,000,000

To generate \$42,000,000 in gross revenue, the equivalent area of wheat to be harvested is 82,677 acres.

The revenue ratio for Orchard revenue per acre vs Grain revenue per acre = 51 to 1

Number of Persons Employed per Acre

For grain farming per acre

Regular time for 9.5 months, two persons full time (8 hrs/day, 23 days / mo.) = $9.5 \times 23 \times 8 \text{ hr} \times 2 = 3,496$ hours

During harvest period for 2.5 months, 6 person full time (12 hr / day) = $2.5 \times 23 \times 12 \times 6 = 4,140$ hours

Total labour is 7,636 hours divide by 6000 acres = 1.76 labour hours worked/ acre X \$25.00 / hr = \$ 44.00 / acre

For cherry crop - per acre

Through harvest season, most intensive -

For 2-month period - $0.75 \times$ for picking/pruning crop, $0.25 \times$ for sorting/packing = 1.0 person-days per acre

Harvest hours calculate out to 1.0 person / acre x 2 months x 8 hr/day x 23 days / mo. = 368 hours

For remaining 10 months of the year - 0.15 person-days per acre x 10 mo. x 22 days/mo x 8 hr / day = 264 hours

Total Labour per acre = 632 hours / acre (at \$15 / hr - amount is \$9,480.00)

The labour ratio for Orchard labour /acre vs Grains Labour / acre is 215 to 1

Conveyance lengths:

The infrastructure BMID requires to supply 1,600 acres is in the range of 20 km of water main.

The length of conveyance main or ditch for the grain crops of 82,677 acres is 206 km of conveyance ditch or watermain (based on 1.6 km conveyance per 640 acres).

The ratio for the conveyance cost/acre for Grains to Orchard is 10.3 to 1.

Because of the higher density, there is a significant benefit to investing in agricultural infrastructure in the Okanagan.

The points raised highlight the benefits for why senior government should consider support to the Okanagan water suppliers for irrigation.



6. SUMMARY

6.1 DESCRIPTION

The Black Mountain Irrigation Expansion Plan is the evolution of a water system in reaction to climate change and the shifting of agriculture northwards. In 2021, due to the western North America drought, the water supplies to the western US states and the Pacific Northwest are under significant stress. All-time low levels were reached for major water reservoirs in the western United States. Our dependency on food supply from California and the western states is highlighted with rising food prices.

The first step in expanding local agriculture is to ensure there is sufficient infrastructure and water supply available for growing food. The Black Mountain Irrigation Expansion plan is a significant step forward in this regard.

Also, in consideration with climate change, water suppliers are facing increased intensities of drought and flood events. As this project will require additional water storage, the opportunity exists for BMID to partner with other agencies to facilitate increased storage for benefits other than agriculture, particularly environmental flows for fish habitat in lower Mission Creek. This is a real opportunity and will require the participation of several key stakeholders.

The following points summarize this report:

- This report is provided to inform the local elected officials and government agencies on the plans to expand agriculture in the Kelowna region. The first step is to expand the BMID boundaries to include the lands to be serviced. The lands fall within the City of Kelowna and within the Regional District of Central Okanagan;
- This plan represents the largest most significant investment in local agriculture in recent history. BMID believes that with community, stakeholder, and political support, it is achievable;
- Included with this report in Appendix A are the petitions to include 20 additional properties fully within the boundaries of BMID. There are 25 parcels of land listed on Table 2.1 of which 5 are fully within the District, but are not serviced. They are identified as they may require irrigation water at some time in the future;
- The 25 properties listed in Table 2.1 cover an area of 2,285 acres. Of that area, 1,885 acres are proposed to be added to the Black Mountain Irrigation District and it is estimated that there are 1,300 acres of arable land (can be farmed);
- The boundary extension application is set out primarily to accommodate one large fruit grower, GP Sandher Holdings Ltd., however the servicing would be set up to accommodate the entire benchland area;
- GP Sandher Holdings Ltd. has plans to plant 650,000 trees on 1,050 acres of land in this area for cherry and apple orchard;



- All property owners within the area have been contacted and are aware of the boundary extension. All land owners within the proposed amended boundary are included;
- The plan for water supply to service the GP Sandher Holding lands is to increase storage in the watershed by 2,600 ML and to install a 14 km transmission main from Belgo Creek near the previous intake location near Darley Creek to their site;
- The opportunity exists to develop additional upper watershed storage to support conservation flows for lower Mission Creek. Multiple agency support will be required to support this initiative;
- The costs for the investment of this work are significant and will have regional benefits;
- The reservoir expansion will be handled through Capital Expenditure Charge payments;
- The cost for the transmission main is to be funded by GP Sandher Holdings Ltd., however BMID can support the project through Latecomer's Bylaw and cost recovery. BMID will also support the project in presenting it and support it when dealing with senior governments at the Provincial and Federal levels and First Nations;
- BMID is working with BC Parks to manage and protect the upper watershed and Graystoke Provincial Park. The long-term development of additional storage on the Graystoke plateau is being discussed and the upper watershed storage options being discussed are provided in Section 4.3;
- The components of the project are discussed in Section 4
- Financial items to be considered are presented in Section 5.



APPENDIX A - PETITION TO EXTEND BOUNDARY FORMS

Following is a list of the Boundary Petition forms signed by the representatives of the properties.
The signatories for 20 parcels are as follows:

- ☐ GP Sandher Holdings Ltd. - 11 parcels
- ☐ Ministry of Transportation and Infrastructure - 1 parcel
- ☐ Al Wingenbach and Jennifer Matzelle - 3 parcels
- ☐ E.W. Winters - 2 parcels
- ☐ Christian Obermeier - 1 parcel
- ☐ Black Mountain Irrigation District - 1 parcel
- ☐ A.G. Appel - 1 parcel

SECTION B – Improvement District Administration

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the Black Mountain Irrigation District District under Section 734 of the *Local Government Act* to include my (our) tract of land legally described as:

PER 11 PARCELS LISTED ON THE ATTACHED SHEET B.S.S.

GP Sandhers Holdings Ltd.

Registered Owner(s) - (PLEASE PRINT)

B.S. Sandher
Signature(s)

December 03, 2020

Date:

The trustees of the Black Mountain Irrigation District District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the BLACK MOUNTAIN IRRIGATION District to include the above noted land within its boundary.

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

Dated the 15th day of JULY, 20 21.

(G.P. SANDHER)
11 PARCELS

No.	Address	Owner	Legal	PID No.	Area (Acres)
1	3050 Hwy 33 E	G.P. Sandher Holdings Ltd.	Lot B, Plan KAP 92045, Twnshp 27	028-587-375	62.765
2	2460 Joe Rich Rd	G.P. Sandher Holdings Ltd.	Lot 9, Plan 1991, Twnshp 27	001-714-996	126.000
2a	Joe Rich Road	G.P. Sandher Holdings Ltd.	Parcel 15, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-850	3.130
3	Highway 33 E	G.P. Sandher Holdings Ltd.	NE 1/4, of Sec 17, Twnshp 27	001-716-735	160.000
3a	Highway 33 E	G.P. Sandher Holdings Ltd.	Parcel 14, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-841	4.165
4	Mission Creek	G.P. Sandher Holdings Ltd.	Section 16, Twnshp 27	001-714-325	320.000
5	Highway 33 E	G.P. Sandher Holdings Ltd.	SE 1/4, of Sec 21, Twnshp 27	001-715-178	160.880
6	Jack Pine Road	G.P. Sandher Holdings Ltd.	SW 1/4, of Sec 22, Twnshp 27	001-715-135	162.000
7	Highway 33 E	G.P. Sandher Holdings Ltd.	W 1/2, of Sec 15, Twnshp 27	001-713-957	155.000
8*	Joe Rich Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-713-701	342.600
9	4502 Pyman Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-715-089	19.340

* Land is partially within BMID service area boundary

TOTAL

1515.880

12.55

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the *Local Government Act* to include my (our) tract of land legally described as:

3 LOTS → LOT 5, 6 & 7 P.I.D. 003 337 251
PLAN KAP 32677 003 337 430
TOWNSHIP 27 003 337 537

Registered Owner(s) - (PLEASE PRINT) ALLAN WINGENBACH

[Signature] ALLAN WINGENBACH, MARCH 1, 2021
 Signature(s) Date:

[Signature] JENNIFER MATZELS

The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the _____ District to include the above noted land within its boundary.

[Signature]
 Trustee

[Signature]
 Trustee

[Signature]
 Trustee

[Signature]
 Trustee

[Signature]
 Trustee

Dated the 15th day of JULY, 20 21.

SECTION B - Improvement District Administration

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the Local Government Act to include my (our) tract of land legally described as:

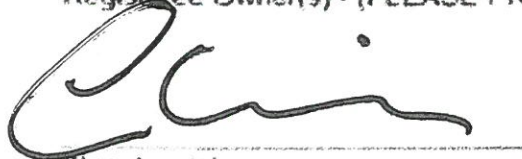
4115 HIGHWAY 33 EAST

PID 603-337-600

LOT 8, PLAN KAP 32677, TOWNSHIP 27

CHRISTIAN OBERMEIER

Registered Owner(s) - (PLEASE PRINT)

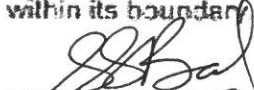


Signature(s)

JULY 12 2021

Date:

The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the _____ District to include the above noted land within its boundary



Trustee



Trustee



Trustee



Trustee



Trustee

Dated the 15th day of JULY 20 21

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the *Local Government Act* to include my (our) tract of land legally described as:

P.I.D.

LOT 1, PLAN KAP 32677, TWP 27 003-336-646

LOT 3, PLAN KAP 32677, TWP 27 003-337-651

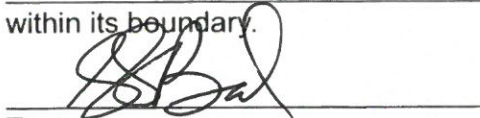
W. E. WINTER

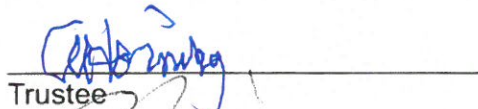
Registered Owner(s) - (PLEASE PRINT)


Signature(s)

MARCH 5, 2021
Date:

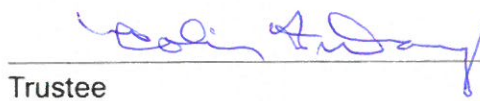
The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the _____ District to include the above noted land within its boundary.


Trustee


Trustee


Trustee


Trustee


Trustee

Dated the 15th day of JULY, 20 21.

Attn:
Robert Hrasko (DUC)
250 765 5169

SECTION B - Improvement District Administration

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the Local Government Act to include my (our) tract of land legally described as:

3205 HIGHWAY 33 EAST,

LOT A, PLAN KAP 71010 PID 009-634-919

DOUGLAS & ALFRED APPEL

Registered Owner(s) - (PLEASE PRINT)

[Signature]
Signature(s)

7/19/21
Date

The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the BLACK MOUNTAIN IRRIGATION District to include the above noted land within its boundary.

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

[Signature]
Trustee

Dated the 20th day of JULY, 20 21.

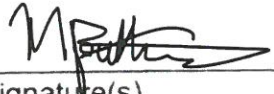
Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the *Local Government Act* to include my (our) tract of land legally described as:

SOUTH EAST 1/4 OF SECTION 17, TOWNSHIP 27

P.I.D 006-696-881

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF B.C. AS REPRESENTED
Registered Owner(s) - (PLEASE PRINT) BY THE MINISTRY OF TRANSPORTATION
AND HIGHWAYS.



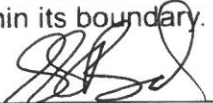
Signature(s)

July 12th, 2021

Date:

Matthew Butterfield, Senior Manager - Land Operations

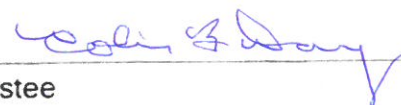
The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the BLACK MOUNTAIN IRRIGATION District to include the above noted land within its boundary.



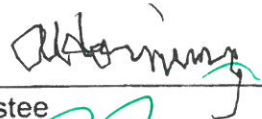
Trustee



Trustee



Trustee



Trustee



Trustee

Dated the 15th day of JULY, 20 21

Petition to Extend a Boundary

I (we), the undersigned owner(s) of land more particularly described below, hereby petition the Lieutenant Governor in Council on the matter of extending the boundary of the BLACK MOUNTAIN IRRIGATION District under Section 734 of the *Local Government Act* to include my (our) tract of land legally described as:

PARCEL A,

PLAN KAP 10213 B, SECTION 10, TOWNSHIP 27

P.I.D. 013-582-640

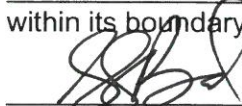
Registered Owner(s) - (PLEASE PRINT)

BLACK MOUNTAIN IRRIGATION DISTRICT

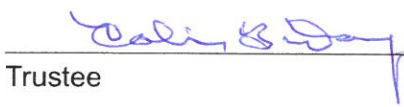

Signature(s) SIGNATURE

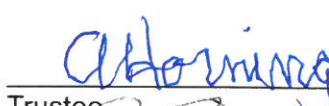
JULY 15, 2021
Date:

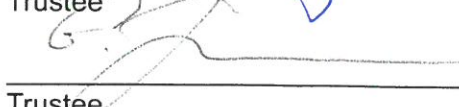
The trustees of the BLACK MOUNTAIN IRRIGATION District hereby agree to request the Lieutenant Governor in Council amend the Letters Patent for the BLACK MOUNTAIN IRRIGATION District to include the above noted land within its boundary.


Trustee


Trustee


Trustee


Trustee


Trustee

Dated the 15th day of JULY, 20 21.



APPENDIX B - LAND INVENTORY SUMMARY

Table B-1 - Summary of 25 Parcels

I.D.	Address	Owner	Legal	PID No.	Area (Acres)	Add'l Area (Acres)	Arable Area (Acres)	City/ RDCO	Zoning	Non- Arable (acres)	Acres within BMID	Flow (L/s)	Storage (ML)
1	3050 Hwy 33 E	G.P. Sandher Holdings Ltd.	Lot B, Plan KAP 92045, Twnshp 27	028-587-375	62.77	62.77	28.76	City	A-1	34.01	0.00	10.9	70.7
2	2460 Joe Rich Rd	G.P. Sandher Holdings Ltd.	Lot 9, Plan 1991, Twnshp 27	001-714-996	126.00	126.00	52.00	City	A-1	74.00	0	19.7	127.8
3	Joe Rich Road	G.P. Sandher Holdings Ltd.	Parcel 15, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-850	3.13	3.13	3.13	City	A-1	0.00	0	1.2	7.7
4	Highway 33 E	G.P. Sandher Holdings Ltd.	NE 1/4, of Sec 17, Twnshp 27	001-716-735	160.00	160.00	85.00	RDCO	LH	75	0	32.1	208.8
5	Highway 33 E	G.P. Sandher Holdings Ltd.	Parcel 14, Plan KAP237A, Part 1, NW Section 17, Township 27	001-713-841	4.17	4.17	4.17	RDCO	LH	0	0	1.6	10.2
6	Mission Creek	G.P. Sandher Holdings Ltd.	Section 16, Twnshp 27	001-714-325	320.00	320.00	250.00	RDCO	LH	70	0	94.5	614.3
7	Highway 33 E	G.P. Sandher Holdings Ltd.	SE 1/4, of Sec 21, Twnshp 27	001-715-178	160.88	160.88	127.00	RDCO	LH	33.88	0	48.0	312.0
8	Jack Pine Road	G.P. Sandher Holdings Ltd.	SW 1/4, of Sec 22, Twnshp 27	001-715-135	162.00	162.00	128.00	RDCO	LH	34	0	48.4	314.5
9	Highway 33 E	G.P. Sandher Holdings Ltd.	W 1/2, of Sec 15, Twnshp 27	001-713-957	155.00	155.00	105.00	RDCO	LH	50	0	39.7	258.0
10	4502 Pyman Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-715-089	19.34	19.34	13.80	RDCO	LH	5.54	0	5.2	33.9
11	Joe Rich Road	G.P. Sandher Holdings Ltd.	Lot 2, Plan 22827, Twnshp 27	001-713-701	342.60	340.00	264.03	RDCO	LH	78.57	2.6	99.8	648.7
12	Highway 33 E	Ministry of Transportation	South E 1/4, of Sec 17, Twnshp 27	006-696-881	134.90	134.90	106.00	RDCO	LH	28.9	0	40.1	260.4
13	3205 Hwy 33 E	Douglas & Alfred Appel	Lot A Plan KAP20065	009-694-919	5.29	5.29	2.10	City	I-2	3.19	0	0.8	5.2
14	3215 Hwy 33 E	William (Budge) Winter	Lot 9, Plan KAP 32677, Twnshp 27	003-337-651	90.83	0.00	66.10	City	A-1	24.73	90.83	25.0	162.4
15	Highway 33 E	Unico Mech. Installations Ltd.	Lot 1, Plan KAP 32677, Twnshp 27	003-336-646	130.41	69.78	10.32	RDCO	LH	120.09	60.63	3.9	25.4
16	4115 Highway 33 E	Christian Obermeier	Lot 8, Plan KAP 32677, Twnshp 27	003-337-600	21.79	11.18	7.00	RDCO	LH	14.79	10.61	2.6	17.2
17	4243 Highway 33 E	Allan Wingenbach	Lot 7, Plan KAP 32677, Twnshp 27	003-337-537	30.59	11.93	10.90	RDCO	LH	19.69	18.66	4.1	26.8
18	Highway 33 E	Allan & Marie Wingenbach & Jennifer Matzelle	Lot 6, Plan KAP 32677, Twnshp 27	003-337-430	29.90	5.94	17.00	RDCO	LH	12.9	23.96	6.4	41.8
19	Highway 33 E	Allan Wingenbach	Lot 5, Plan KAP 32677, Twnshp 27	003-337-251	32.94	0.04	13.00	RDCO	LH	19.94	32.90	4.9	31.9
20	4631 Highway 33 E	McDonald Acres	Lot 2, Plan KAP 32677, Twnshp 27	003-336-824	18.59	0.00	9.00	RDCO	LH	9.59	18.59	3.4	22.1
21	Highway 33 E	B. Winter (S. of McDonalds Ac.)	Lot 4, Plan KAP 32677, Twnshp 27	003-337-103	34.72	0.00	6.70	RDCO	LH	28.02	34.72	2.5	16.5
22	Highway 33 E	B. Winter (W of Dave's Creek)	Lot 1, Plan KAP 32677, Twnshp 27	003-336-646	45.62	25.92	19.00	RDCO	LH	26.62	19.70	7.2	46.7
23	5055 Highway 33 E	Brian Stewart	Lot 3, Plan KAP 32677, Twnshp 27	003-336-948	45.88	0.00	10.00	RDCO	LH	35.88	45.88	3.8	24.6
24	Joe Riche Road	BMID - Hadden Reservoir site	Lot 9, Plan KAP 10212B, Twnshp 27	013-582-402	26.30	0.00	1.00	RDCO	LH	25.3	26.30	0.4	2.5
25	5105 Hwy 33 E	BMID - WTP & Reservoir site	Parcel A, Plan B10213, Twnshp 27	013-582-640	121.25	106.63	1.00	RDCO	LH	120.25	14.62	0.4	2.5
NON-SHADED CELLS DENOTE THAT THE PARCEL IS COMPLETELY OUTSIDE BMID BOUNDARIES				TOTAL AREA	2284.89	1884.89	1340.00			944.89	400.00	506.52	3292.38
GRAY SHADING DENOTES LOTS PARTIALLY WITHIN BMID BOUNDARIES												0.378	L/s/acre
BLUE SHADING DENOTES LOTS PARTIALLY WITHIN BMID BOUNDARIES												2.457	ML/acre