

APPENDIX E

**2019 Mission Ridge Hydrology Memo
(WNR Group)**

**2022 Water Resources Memo
(American Land and Water)**

APPENDIX E

2019 Mission Ridge Hydrology Memo



"Solutions to water quality, quantity, permitting & planning issues"

December 31, 2019

Clay White
Director of Planning, LDC, Inc.
20210 142nd Ave NE
Woodinville, WA 98072

Re: Mission Ridge Hydrogeology for Plan Revision

Dear Mr. White:

Per your request, the Water & Natural Resource Group, Inc. (WNR Group) reviewed the proposed application revisions for Planned Residential and Commercial construction at the Mission Ridge Expansion development. On March 26th, 2018, the WNR Group prepared a Hydrogeology Review Memorandum for the proposed project. This Hydro Memorandum presented the following conclusions and recommendations:

"The preliminary hydrogeologic investigation at the site has determined that the availability of future water needs may be present in deep bedrock fractures in the vicinity of the proposed Mission Ridge Expansion project as defined by EMS and VLF geophysical surveys. These fractures appear to be in some degree of hydraulic continuity with surface water in the Squilchuck Creek drainage. Several water rights are currently used at the Mission Ridge ski area for indoor use and snow making activities. Although these approved diversions are located within the lower drainage area, it appears that the deep bedrock aquifers may be the source for the intermittent creeks, and as such can be inferred to be within the same hydrologic water budget."

Proposed water use at the expansion project will primarily occur during winter and spring months when water is most available. Proposed snow making, a non consumptive use, will also be a benefit to creek flows in spring and summer months, by allowing additional snow pack melt to the creeks."

In summary, it is our opinion, that the potential availability of groundwater for domestic and snow making uses may be available from deep bedrock fractures at the site. These deep bedrock fractures appear to be in hydraulic continuity with the surface waters near the ski area where current water right diversions are being utilized.”

WNR Group has reviewed the changes to the phased planning related to the Mission Ridge Project. The changes proposed appear to represent a de minimus change of potential water requirements from the original application. As such, the WNR Group does not recommend any additional changes to the Hydrogeologic Memo dated March 26th, 2019.

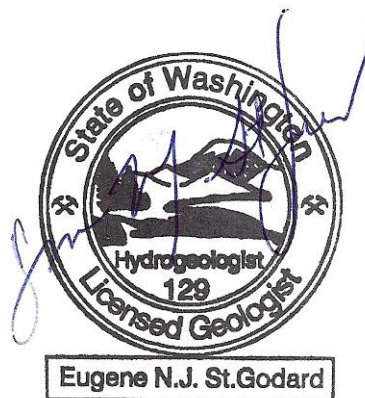
On March 19th, 2018, the WNR Group prepared Memorandum that outlined a Scope of Work for further defining the potential for water resource availability at the site. The change under the revised application does not warrant a proposed change to the future recommendations for hydrogeologic work required for future water supply. Therefore, the WNR Group still recommends that the next phase of hydrogeologic work be conducted as outlined in our March 19th, 2018 Memorandum – “The Mission Ridge Expansion – Estimate of Future Work”. The completion of the recommended Scope of Work will assist with fully defining the water availability for the site.

We appreciate the opportunity to be of service to Tamarack, LLC in providing our interpretation of groundwater conditions at the Site. Should you have any questions regarding this Memorandum, please do not hesitate to call us at your earliest convenience.

Very truly yours,
Water & Natural Resource Group, Inc.



Eugene N.J. St. Godard, R.G., L.Hg.
Principal Hydrogeologist/Owner
WNR Group, Inc.



Signed: December 31st, 2019



Water & Natural Resource Group, Inc.
Gene St.Godard, R.G., L.Hg., CWRE
PO Box 28755
Spokane, Washington 99228
Cell: 509-953-9395

MEMORANDUM

To: Mr. Larry Scrivanich
PO Box 2174
Woodenville, WA 98072

From: Gene St.Godard, P.G., L.Hg., CWRE
Water & Natural Resource Group, INC.
Spokane, WA

Date: March 26th, 2018

Re: Mission Ridge Expansion Preliminary Hydro Review

Project No: 077-001 – Mission Ridge

SITE BACKGROUND

The Mission Ridge Expansion proposed development is located within private property near the Mission Ridge Ski Area located approximately eight miles southwest of Wenatchee within Chelan County (Figure 1). The property consists of 650 acres and is located within Section 19 and the NE¼ Section 30, Township 21 North, Range 20 E.W.M. (Figure 2). The subject area is currently zoned RR20 and the general plan designation is Land Use Code 88, Designated Forest Land. The property is identified in the Chelan County records as Property Identification No. (PIN) 19014, Parcel No. 212019000000 (Sec. 19) and PIN 19051, Parcel No. 212030100050 (Sec. 30), owned by Tamarack Saddle LLC. The proposed development will require water for up to a 400-unit multifamily community comprised of an estimated 120 single family homes and 280 condominium units, constructed in four phases over many years (Figure 3).

This Memorandum outlines the preliminary study used to identify potential water sources to supply potable drinking water to the proposed community.

PHYSIOGRAPHIC SETTING

The Mission Ridge Expansion development is located within a part of the Squilchuck Basin watershed which contributes water within the basin to Squilchuck Creek; Squilchuck Creek then flows in a generally northeasterly direction where it discharges directly to the Columbia River. The site is located in the National Watershed Boundary Dataset as Squilchuck Creek Subbasin. These subbasins are developed as follows:

The Watershed Boundary Dataset (WBD) is a comprehensive aggregated collection of hydrologic unit data consistent with the national criteria for delineation and resolution. It

defines the areal extent of surface water drainage to a point except in coastal or lake front areas where there could be multiple outlets as stated by the "Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD)" "Standard". Watershed boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative boundaries or special projects, nor particular program or agency. This dataset represents the hydrologic unit boundaries to the 12-digit (6th level) for the entire United States. Some areas may also include additional subdivisions representing the 14- and 16-digit hydrologic unit (HU). At a minimum, the HUs are delineated at 1:24,000-scale in the conterminous United States, 1:25,000-scale in Hawaii, Pacific basin and the Caribbean, and 1:63,360-scale in Alaska, meeting the National Map Accuracy Standards (NMAS). Higher resolution boundaries are being developed where partners and data exist and will be incorporated back into the WBD. WBD data are delivered as a dataset of polygons and corresponding lines that define the boundary of the polygon. WBD polygon attributes include hydrologic unit codes (HUC), size (in the form of acres and square kilometers), name, downstream hydrologic unit code, type of watershed, non-contributing areas, and flow modifications. The HUC describes where the unit is in the country and the level of the unit. WBD line attributes contain the highest level of hydrologic unit for each boundary, line source information and flow modifications.

Within the Washington State database, the site is identified as being within the northern portions of the Alkali-Squilchuck Water Resource Inventory Area (WRIA 40). Figure 4 presents a map showing the identification of the Washington State WRIA boundary and the National WBD subbasin boundaries. Note on map that boundaries within the different data bases do not exactly match.

This area is mountainous terrain with a variety of ecosystems and is being developed using an environmentally sensitive design that takes advantage of the land's natural contours. The Mission Ridge Expansion development plan has been formulated recognizing that significant potential and demand exists for overnight lodging and housing at the Mission Ridge Ski Area.

The United States Geological Survey (USGS) topographic quadrangle maps for the Site and vicinity were reviewed to determine the physical setting of the Site. The Site is located within the eastern area of the Mission Ridge, Washington 7-1/2 minute quadrangle map dated 1987 and the western edge of the Wenatchee Heights, WA 7-1/2 minute quadrangle map dated 1987. As shown on Figures 4 and 5, the Site is located along the southeast valley wall of Squilchuck Creek drainage, of which the north half and southwest quarter of Section 19 drains to Squilchuck Creek. The southeast quarter of the section drains towards the Stemilt Creek subbasin. For the hydrogeologic assessment, the portion of the property which lies within the Squilchuck Creek drainage will be the focus for identifying additional potential water sources. The general slope of this portion of the property is to the northwest in the western part of the property and to the north in the northern portions of the property. Slopes generally fall to the incised drainages of Squilchuck Creek.

Elevation relief across the property is approximately 1440 feet, with the highest elevation of approximately 4840 feet above msl in the central part of the property, which is the center of Section 19 and a low elevation of approximately 3400 feet above msl in the Squilchuck Creek drainage in the northeastern area of the property. Shallow unconfined groundwater in the gravels

perched on bedrock beneath the Site is inferred to flow to the drainages, as interpreted from the topographic slope in the area of the property. This inference is examined relative to physical data in this document.

SURFACE WATER IN SITE AREA

The Mission Ridge Expansion lies within a mountainous terrain which contains numerous springs and steep incised creeks. In the immediate area of the Site, several small unnamed intermittent creeks, which are inferred to be recharged from shallow springs located near the headwaters, flow in a northwesterly direction across the property. These intermittent deeply incised creek flows appear to be highly variable for short and for long-term durations, and is representative of the precipitation, snowpack, and temperatures within the Squilchuck Creek subwatershed. Flows are inferred to correlate with available groundwater from the thin shallow perched unconsolidated aquifer, and are dependent upon snowmelt and rain-on-snow events. Various unnamed intermittent tributaries flow directly into Squilchuck Creek which is tributary to the Columbia River near Wenatchee, WA.

Flow of creeks and streams in mountainous terrain varies highly, and depends directly on precipitation and snowpack. In this type of terrain, which has been visually observed at the Site, low flows occur during late fall and throughout the winter months. This flow is produced by low precipitation and high evapotranspiration (ET) from July through September, and October through March precipitation falling as snowpack. Flows increase in the late winter months and spring as rain-on-snow events occur and melting snow provides recharge to the creeks.

GEOLOGIC SETTING

The area between Wenatchee and Osoyoos, WA is within the eastern margin of the North Cascade subcontinent (Alt & Hyndman, 2002). West of Wenatchee is the area geologically identified as the Chiwaukum Graben, in which the Chumstick Formation is located. This geologic area butts up to the south against the Miocene Columbia River basalt plateau. North of the site near the town of Chelan was the southern extent of the of the glacial advance, with all of the country north of Chelan buried under the Okanogan lobe of the big ice sheet during the last ice age (Alt & Hyndman, 2002). The area south of Chelan, in the area of the Columbia River Valley, was scoured out by the regional Spokane glacial floods.

The Washington State DNR geologic map (WDNR, 1991) for the area of the Site was reviewed to interpret geologic conditions. As shown on Figure 6, the Site is located in the Wenatchee Mountains, which are located west of the Columbia River Valley in this area. The Site is located within the southern portion of an area defined as the Chiwaukum Graben (Willis, 1953). The area of the site is underlain by geologic units of early to middle Tertiary age and are covered by Columbia River Basalt Group rocks of Miocene age in areas to the south (Gressens, 1983). As shown on Figures 6 and 7, the site is underlain primarily by Tertiary Age sedimentary rocks of the Chumstick Formation. The Chumstick Formation in the area of the site is comprised mostly of sedimentary rocks.

The geology of the immediate area of the site is best described by Gressens et. al. (1981) as:

“The Chiwaukum graben in central Washington contains two unconformity-bounded fluvial and lacustrine units, here named the "Chumstick" and "Wenatchee" Formations. The Chumstick is dated at 45 m.y. (middle Eocene), and the Wenatchee is dated at 34 m.y. (early Oligocene) by the fission-track method on zircons from tuffs. Previously, both formations were thought to be part of the Swauk Formation, which is older. The Chumstick Formation rests on weathered crystalline basement and is several thousands of meters thick. Fanglomerate occurs at the base and along the margins. Most of the formation consists of feldspathic sandstone and pebbly sandstone of fluvial origin; but within the upper part, there is a lacustrine unit, herein designated the Nahahum Canyon Member. Tuff is common in the lower part of the formation. Both of the bounding faults, the Leavenworth and the Entiat, were active during deposition of the Chumstick Formation, but relief was greatest on the northeast (Entiat) side. The Wenatchee Formation occurs in the vicinity of Wenatchee, Washington, and is ≤ 300 m thick. It unconformably overlies the Chumstick Formation within the graben but overlaps the northeast side of the graben, where it lies directly on weathered metamorphic basement. The Wenatchee Formation, like the Chumstick, was deposited primarily in fluvial and lacustrine environments; unlike the Chumstick, much of the sediment is mature quartz sandstone. Relief in the source area probably was very subdued during its deposition.”

The geologic maps in the area show the bedrock near the Site contains numerous large fault zones (Figure 6), which often display water-bearing splay faults. Fault lines will typically form the Site's linear valleys. The area is heavily faulted with the NW-SE trending faults thrusting rock layers to the northeast, as depicted in Figure 8 (Gressens, 1983).

EMS SURVEYWORK

An EMS satellite survey was flown for the subject property, allowing the identification of deep water-bearing fractures. Geophysical surveying methods have been used since the 1940's for the interpretation of various geological conditions. The technology used in this survey is used to find useful quantities of underground water that may be present in fractures and voids. Using the magnetic component of the electromagnetic field generated by VLF (very low frequency) transmitters, it is possible to locate anomalies, such as saturated fractures within the bedrock. Identification of water-bearing fractures is difficult and the geology and hydrogeology professions typically use geophysical methods to assist with the location and depth of fracture aquifers. Geophysical surveys should not be used to confirm water source information, but they do provide projections of potential water sources. Location, depth, and yield of bedrock aquifers from the interpretation of the geophysical data is a professional best-judgment, and no exact warranty of the potential aquifer characteristics exists without the completion of subsurface exploration (e.g. drilling).

Figure 9 (western area near ski area) and Figure 10 (eastern area near expansion) presents the results of the EMS geophysical survey conducted at the project site. As shown in the figures, there are numerous fractures with potential water located across the Site. The highest probability of locating groundwater is typically where two or more fractures intersect within the fractures containing the strongest geophysical signature. Numerous fractures across the Site show high signatures (5 to 6), and therefore probably contain groundwater. A more detailed site investigation using field VLF technologies was conducted at the Site on June 22, 2017 in order

to identify three to four locations which may contain the highest probability of groundwater for project use.

The VLF ground verification supported the EMS Survey in determining that points #4, #5, and #6 are the preferred drilling locations of the anomalies identified in the satellite survey. In addition, a VLF survey was conducted in the western area of the site in case an additional water supply well was needed near the ski lodge. The EMS and VLF surveys recommended site anomaly #10 in this area. These four sites are identified as proposed wells PW-4, PW-5, PW-6 and PW-10 on Figures 4, 7, and 11.

Ecology Water Well Logs - An Internet search of the Washington State Department of Ecology's water well database was conducted. Search criteria of Township 21 North, Range 20 East, Section 19, and Township 21 North, Range 19 East, Sections 24, 25 and 26 was entered. Only one well log was identified within the four sections searched. This well log is for the domestic well at the Ski Area lodge facility within the SE ¼ SW ¼ Section 24, T21N., R19E.W.M. The well log is shown in Figure 12.

The well log is only completed to a depth of 100 feet below grade and intercepted gravels and clay to a depth of 48 ft, then intercepted basalt with gravel interbeds to the full depth explored of 100 feet. Yield in the well was estimated at 100 gpm at the time of drilling.

Hydrogeologists Site Visit

Gene St.Godard, a licensed Professional Hydrogeologist in Washington (L.Hg. #129), conducted a site visit on June 22nd, 2017. The geologic conditions of the site were inspected during this site visit. The field visit also consisted of looking for bedrock outcroppings, talus and colluvium on and in the vicinity of the property to document the geologic setting of the area. Numerous outcroppings of sedimentary rocks were observed on or near the site. A generalized search of the existing ski lodge property in Section 24 and the proposed development property in Section 19 and 30 was conducted in order to document the location of the existing and proposed water source locations. Four existing water diversions are located on the ski lodge property in addition to a constructed reservoir. Locations of these sites are shown on Table 1 and Figure 11. These diversions divert water under existing water rights.

Four proposed well locations were also identified in the field and GPS locations collected. These included one location near the existing lodge (PW-10) and three within Section 19 (PW-4, PW-5, and PW-6). The GPS locations are shown in Table 2 and on Figure 11.

Table 1: Site Water Diversion GPS Coordinates

Existing Diversions	Latitude	Longitude
AEH922 (8-inch existing Dom Well)	N47.29138	W-120.39857
Lake Creek Diversion	N47.29322	W-120.40172
Developed Spring Location (36"-corrugated pipe)	N47.29316	W-120.40247
Squilchuck Diversion (within buried vault)	N47.29094	W-120.70008
Reservoir (at top of hill)	N47.28117	W-120.42853

Table 2: Proposed Well GPS Coordinates

Proposed Wells	Latitude	Longitude
PW-4	N47.29572	W-120.37807
PW-5	N47.29506	W-120.37875
PW-6	N47.29523	W-120.38130
PW-10	N47.29362	W-120.39642

HYDROGEOLOGIC CONCEPTUAL MODEL

A generalized conceptual hydrogeologic model was developed to illustrate the hydraulic continuity of the aquifers underlying the Mission Ridge Development Site and the Squilchuck Creek Valley. This generalized description of the hydrogeologic system at the Site was developed from existing published documents and data, and site-specific data collected from test pits, well points, and water well drilling. The on-site data developed during this project is discussed later in the report.

The Site's hydrogeologic regimes consist of two distinct aquifer systems. The first is the shallow, seasonal perched aquifer that is located in the shallow unconsolidated sediments above the bedrock. This seasonal aquifer system is in direct hydraulic continuity with the surface water streams on the property. After snowpack has melted, this aquifer is depleted as it recharges the creeks. The second hydrogeologic system consists of a deep bedrock fracture aquifer system. This system is not in direct hydraulic continuity with the surface waters except in areas where the deep incised drainages may cross the fracture flow system. Both hydrogeologic regimes are recharged primarily from rain and snow in the spring and winter seasons.

The shallow aquifer near the Site is a thin unconfined colluvium aquifer that is inferred to be seasonal and appears to consist of only a few feet of saturated sediments. Typically within alpine systems such as at the site, saturated conditions are present only in the winter and spring months. Groundwater in this shallow unconsolidated aquifer flows from the elevated ridges towards Squilchuck Creek drainage. Some direct flow within the creeks may be a result of recharge of bedrock fracture aquifers that may be in hydraulic continuity with the intermittent streams and creeks when hydraulic heads in the fracture aquifer are elevated above the creek elevations. The ski area currently has three areas in which they are developing water from these creeks and springs. These developed areas are inferred to have a recharge component from the deep bedrock fractured aquifers.

Most water users in the mountainous terrain get drinking water from deep bedrock fracture aquifers. In the vicinity of the Site, these are located at depths of several hundred feet within the Tertiary (Eocene Age) sedimentary rocks which are in contact with the Miocene basalts south of Squilchuck Creek. These aquifers appear not to be in direct hydraulic continuity with the shallow perched aquifer. However, some hydraulic connection to surface water in the drainages may occur where the incised drainages intersect the bedrock fracture.

Groundwater and surface-water flows in the Squilchuck Creek drainage are directly influenced by the geologic controls within the valley, and may be locally variable depending on depth to bedrock and valley width for the unconsolidated aquifer and depth, lateral extent, and thickness of the fractures. Recharge to the shallow valley aquifer primarily comprises precipitation infiltration, snowpack depth, and interaction with surface water bodies. Confined aquifers in the deeper bedrock may be recharged from some infiltration along the valley walls and/or from recharge areas further up the headwaters of the drainage where the fracture systems are incised by stream erosion. Water collected in the headwaters of Squilchuck Creek and its tributaries flows through the valley in the form of shallow groundwater and surface water, and discharges to Columbia River Valley aquifer and river near the city of Wenatchee, Washington. Therefore, in our opinion, surface and groundwater within the boundaries of the Squilchuck sub-basin as outlined in Figure 4. It would be our recommendation that an exploration hole be completed either at PW-6 or PW-5.

The water budget at the existing site is what is observed in typical mountainous terrains. Availability of water is typically found during winter and spring seasons. If the proposed development occurs, the majority of use will occur during these seasons when water is available. Potable groundwater for in house use at the site will be in highest demand during the winter months, not during the low flow time period of the hydrologic cycle. In addition, water will also be required during the winter months for snow making activities. The development of a snow pack on the ski slopes near the development is a non-consumptive use, and will also effectively help stream flows during the spring and summer months by allowing more recharge to the surface waters during the spring melt. Water during summer and fall months will be de minimus at the proposed development. Therefore, it is inferred that the proposed development, which will have highest demands during spring and winter months, will not have a major affect on the water budget within the basin.

CONCLUSIONS

The preliminary hydrogeologic investigation at the site has determined that the availability of future water needs may be present in deep bedrock fractures in the vicinity of the proposed Mission Ridge Expansion project as defined by EMS and VLF geophysical surveys. These fractures appear to be in some degree of hydraulic continuity with surface water in the Squilchuck Creek drainage. Several water rights are currently used at the Mission Ridge ski area for indoor use and snow making activities. Although these approved diversions are located within the lower drainage area, it appears that the deep bedrock aquifers may be the source for the intermittent creeks, and as such can be inferred to be within the same hydrologic water budget.

Proposed water use at the expansion project will primarily occur during winter and spring months when water is most available. Proposed snow making, a non consumptive use, will also be a benefit to creek flows in spring and summer months, by allowing additional snow pack melt to the creeks.

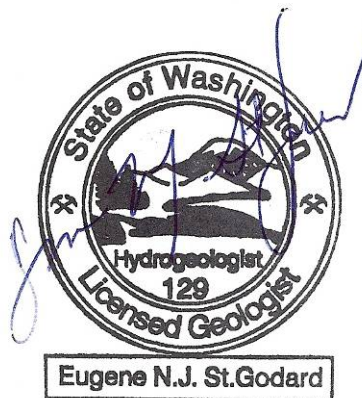
In summary, it is our opinion, that the potential availability of groundwater for domestic and snow making uses may be available from deep bedrock fractures at the site. These deep bedrock fractures appear to be in hydraulic continuity with the surface waters near the ski area where current water right diversions are being utilized.

We appreciate the opportunity to be of service to Tamarack, LLC in providing our interpretation of groundwater conditions at the Site. Should you have any questions regarding this Memorandum, please do not hesitate to call us at your earliest convenience.

Very truly yours,
Water & Natural Resource Group, Inc.



Eugene N.J. St. Godard, R.G., L.Hg.
Principal Hydrogeologist/Owner
WNR Group, Inc.



Signed: March 26th, 2018

BIBLIOGRAPHY

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United States Geological Survey, 1987: Wenatchee Heights, Washington 7-1/2 minute Topographical Map.

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MISSION RIDGE EXPANSION

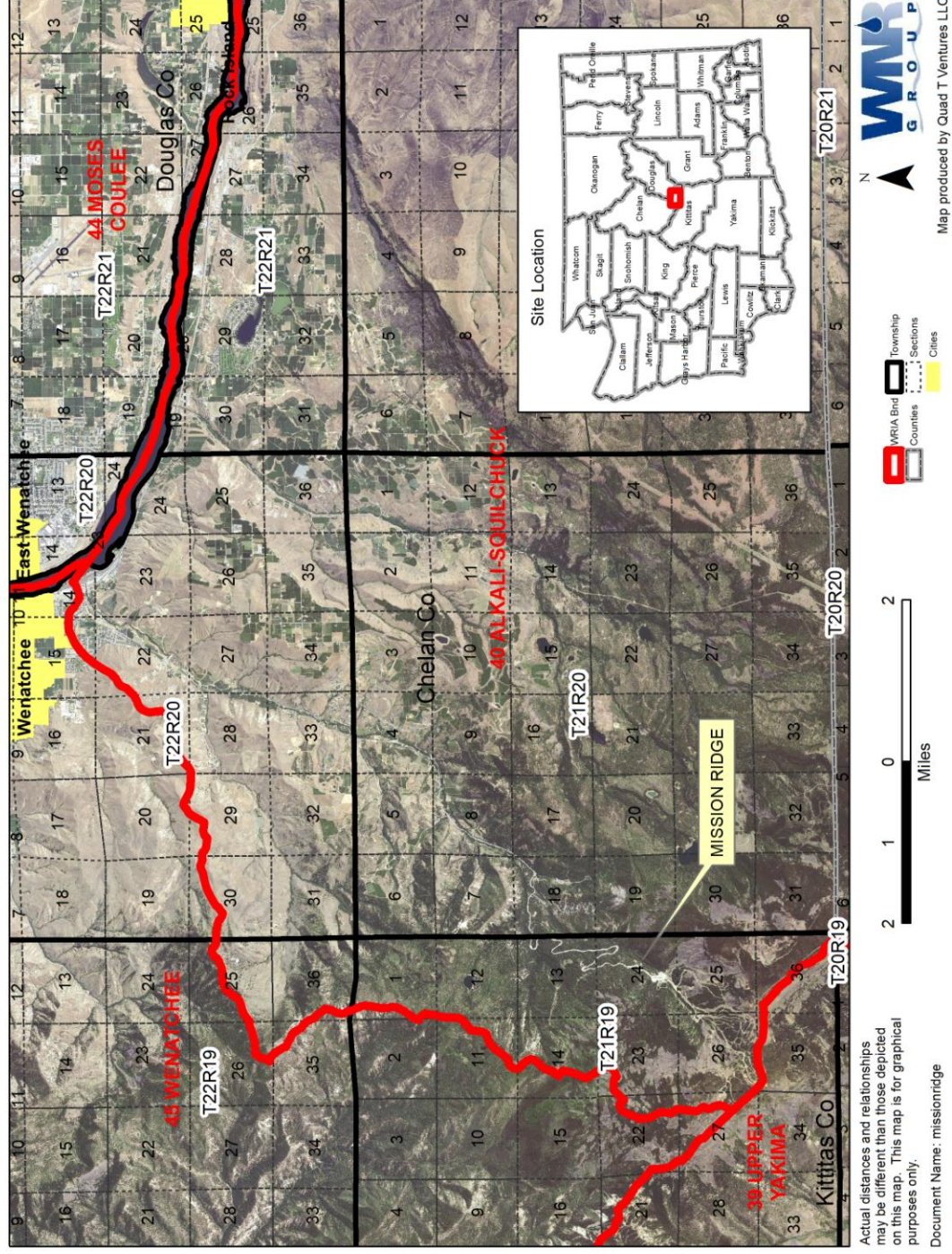


FIGURE 1: MAP SHOWING LOCATION OF MISSION RIDGE SKI AREA AND PROPOSED MISSION RIDGE EXPANSION SW OF WENATCHEE, WA.

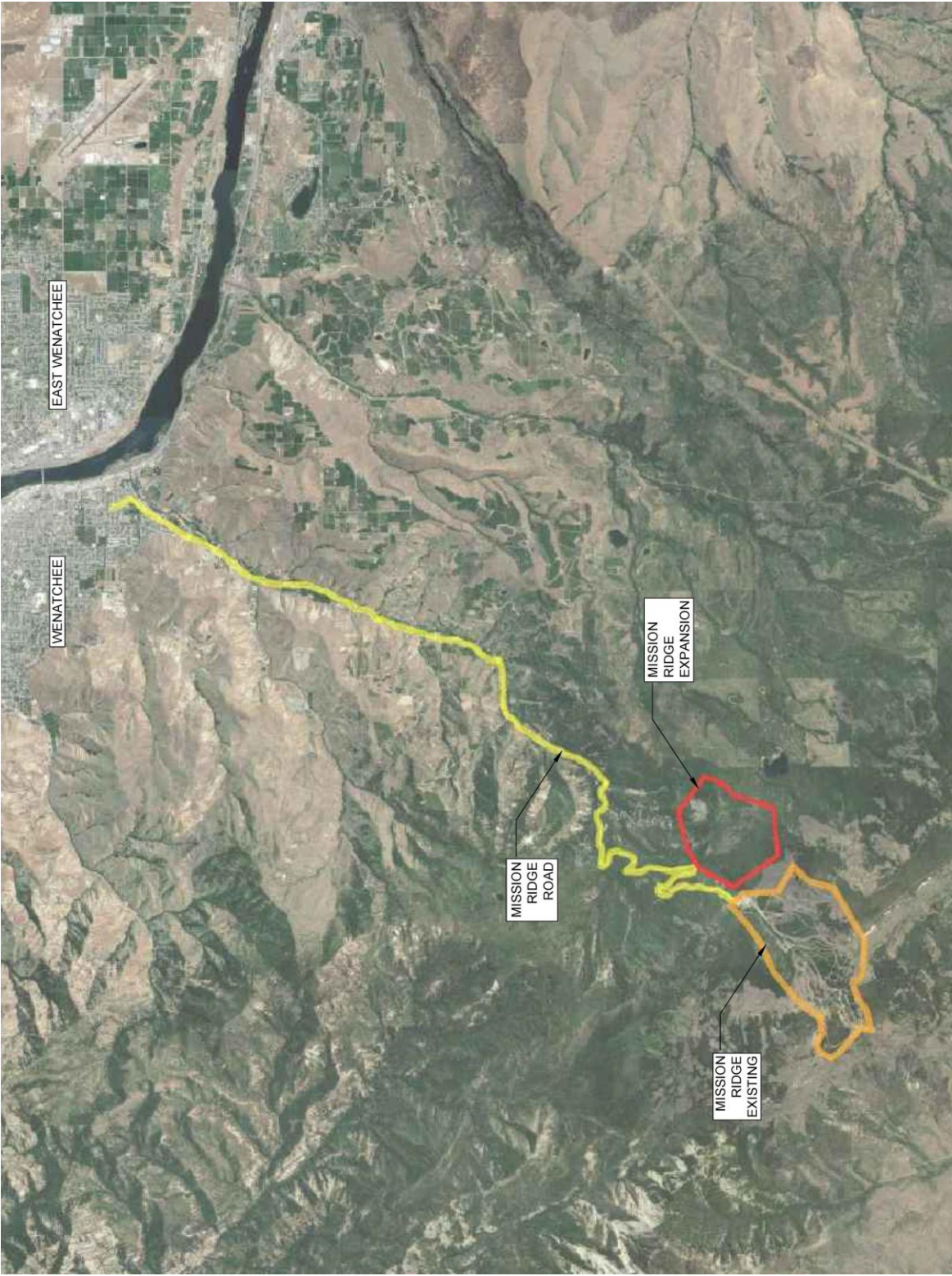


FIGURE 2: MAP SHOWING LOCATION OF PROPOSED PROJECT IN SECTION 19 (T21N, R20E.W.M.) NEXT TO MISSION RIDGE SKI AREA.

MISSION RIDGE EXPANSION

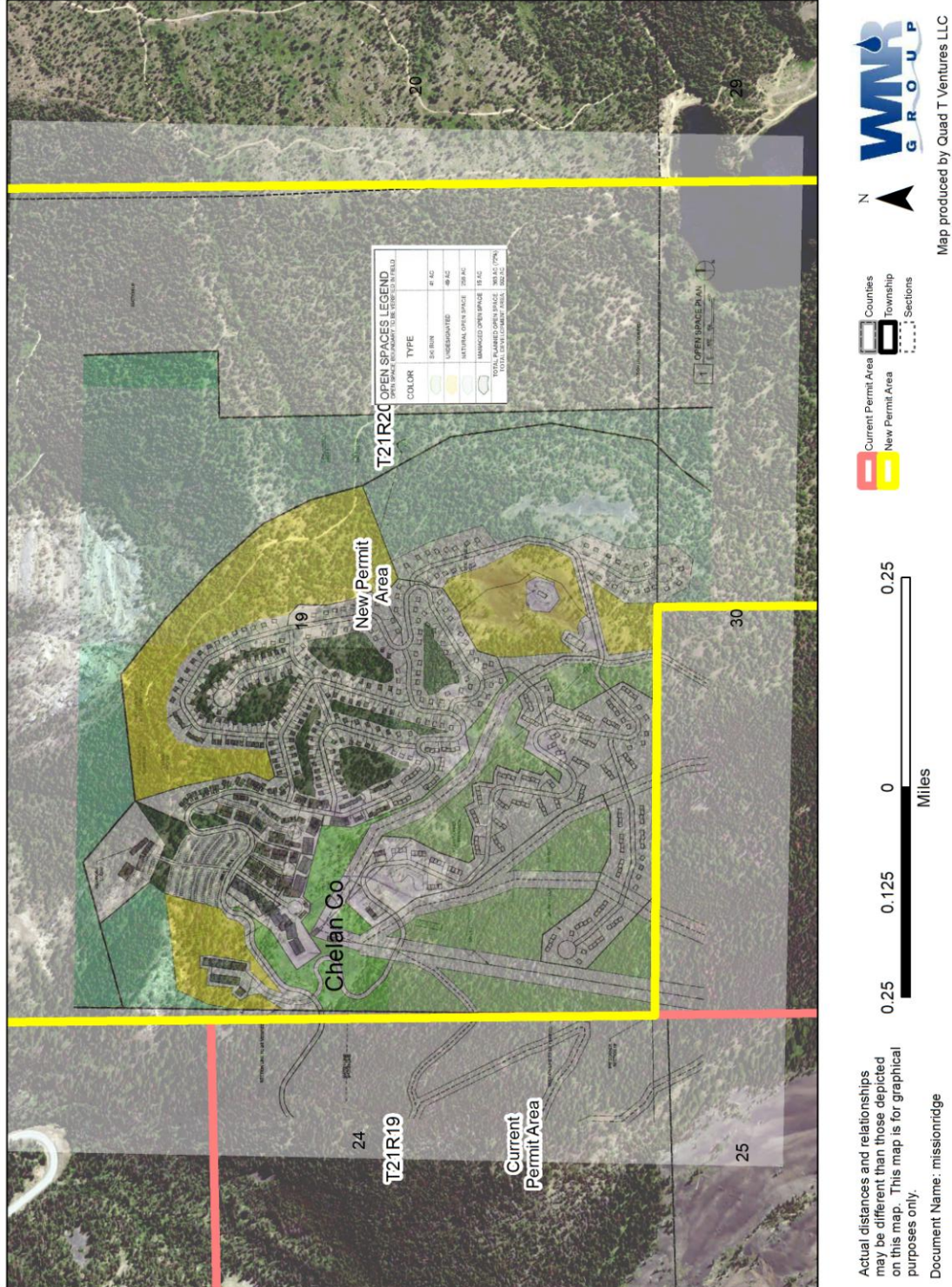


FIGURE 3: PROPOSED VILLAGE AT MISSION RIDGE EXPANSION WHICH WILL REQUIRE WATER.

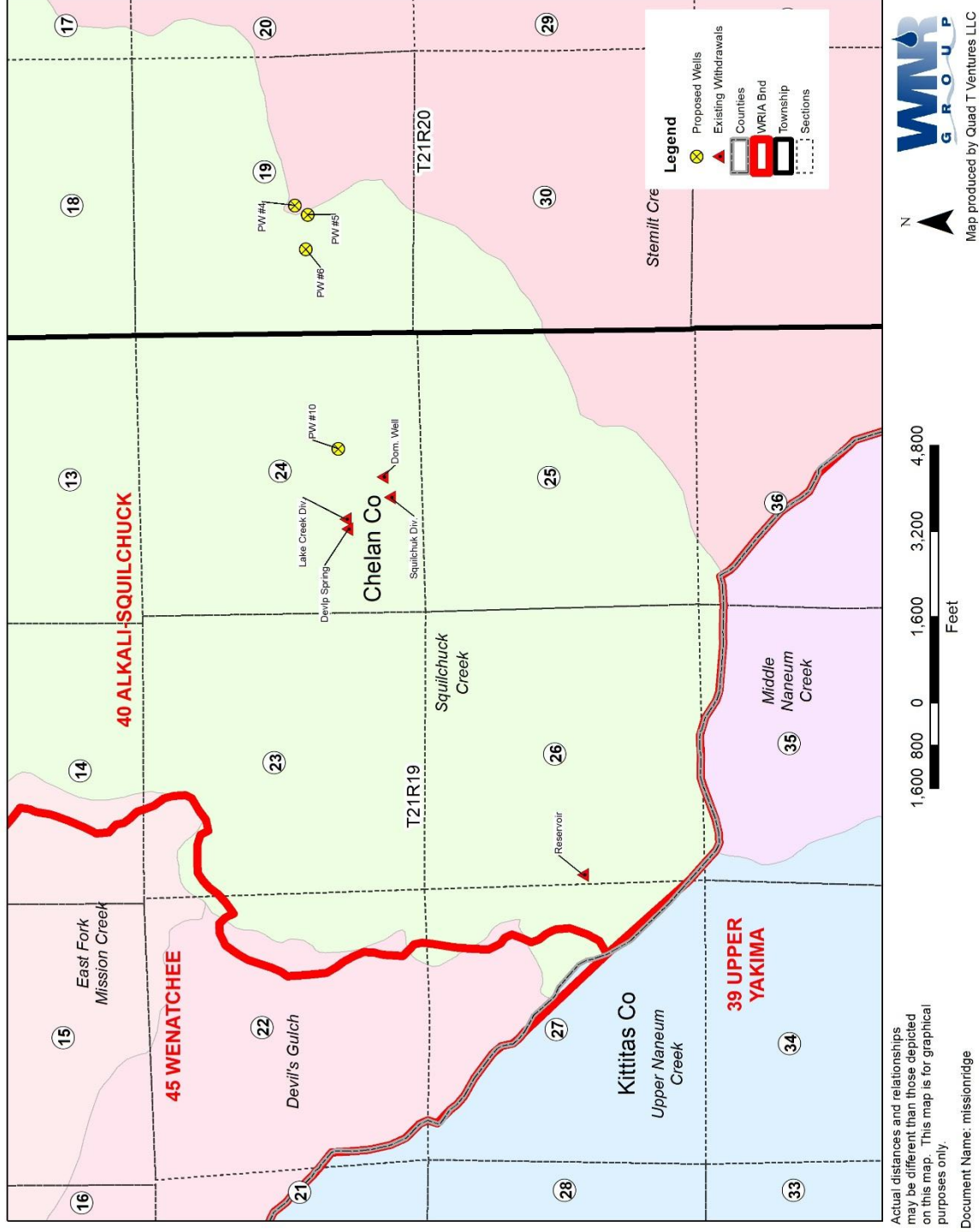


FIGURE 4: MAP SHOWING WASHINGTON STATE WRIA BOUNDARY AND NATIONAL WBD BOUNDARIES. LOCATION OF EXISTING WATER RIGHT DIVERSION POINTS AND GEOPHYSICAL IDENTIFIED PROPOSED WELL SITES ALSO SHOWN.

The map is a topographic representation of the Mission Peak area in Chelan County, Washington. It features contour lines indicating elevation, with major peaks like Mission Peak and Wanatchee Mtn. labeled. A yellow rectangular box in the upper left corner is labeled 'New Permit Area' and contains the number '19'. A red rectangular box in the center and lower right is labeled 'Current Permit Area' and contains the number '25'. The map is divided into sections by a grid, with labels like 'T21R19', 'T21R20', 'T21R21', and 'T21R22' visible. Other labels include 'Mission Peak', 'Wanatchee Mtn.', 'Squillchuck', 'Marion Lake', 'Clara Lake', 'Mission Ridge Winter Sports Area', 'Upper Wheeler Res.', 'Wenatchee National Forest', 'Colocokum', 'Kititas Co', and 'Chelan Co'. The map also shows various roads, trails, and landmarks like 'Mission Peak Ski Lift' and 'Wanatchee Mtn. Radio Facility'. The text 'FORREST' is written vertically on the left side, and 'WILDLIFE AREA' is written vertically on the right side.

A horizontal scale bar labeled "Miles" is positioned below the map. It has a central point labeled "0" and two points on either side labeled "0.5". The bar is divided into two equal segments by the "0" mark.

Map produced by Quad T Ventures LLC

FIGURE 5: TOPOGRAPHIC MAP SHOWING LOCATION OF PROPOSED SITE IN SECTION 19 & 30, T21N, R20E.W.M.

40 ALKALI-SQUILLCHUCK

45 WENATCHEE

Chelan Co

Dom. Weir

Devils Spring

Lake Creek Div

Squillchuck Div

Reservoir

New Permit Area

Current Permit Area

Legend

- Proposed Wells
- Existing Withdrawals
- Current Permit Area
- New Permit Area
- WRWA Bnd
- Geologic Units
- Counties
- Township
- Sections

Geologic Units

- Mc(e) - Tertiary sedimentary rocks and deposits
- Mv(gR2h) - Miocene Columbia River Basalt Group, Grande Ronde Basalt
- Mv(gR2h) - Miocene Columbia River Basalt Group, Grande Ronde Basalt
- PLMIs - Tertiary sedimentary rocks and deposits
- Qa - Quaternary alluvium
- Qc - Quaternary mass-wasting deposits
- Qd - Quaternary mass-wasting deposits
- Qe - Quaternary mass-wasting deposits
- Qf - Quaternary mass-wasting deposits
- Qg - Quaternary mass-wasting deposits
- Qh - Quaternary mass-wasting deposits
- Qi - Quaternary mass-wasting deposits
- Qj - Quaternary mass-wasting deposits
- Qk - Quaternary mass-wasting deposits
- Ql - Quaternary mass-wasting deposits
- Qm - Quaternary mass-wasting deposits
- Qn - Quaternary mass-wasting deposits
- Qo - Quaternary mass-wasting deposits
- Qp - Quaternary mass-wasting deposits
- Qq - Quaternary mass-wasting deposits
- Qr - Quaternary mass-wasting deposits
- Qs - Quaternary mass-wasting deposits
- Qt - Quaternary mass-wasting deposits
- Qu - Quaternary mass-wasting deposits
- Qv - Quaternary mass-wasting deposits
- Qw - Quaternary mass-wasting deposits
- Qx - Quaternary mass-wasting deposits
- Qy - Quaternary mass-wasting deposits
- Qz - Quaternary mass-wasting deposits

Scale

1,500 750 0 1,500 3,000 4,500 Feet

North Arrow

Document Name: missionridge

Actual distances and relationships may be different than those depicted on this map. This map is for graphical purposes only.

FIGURE 7: GEOLOGIC MAP OF THE IMMEDIATE AREA OF THE MISSION RIDGE EXPANSION IN SECTION 19 & 30 AND THE GENERAL AREA AROUND THE MISSION RIDGE SKI AREA WEST OF THE SITE. THE AREA IS UNDERLAIN BY TERTIARY AGE SEDIMENTARY ROCKS COVERED WITH QUATERNARY AGE MASS WASTING DEPOSITS. SEVERAL NW-SE TRENDING FAULTS ARE IDENTIFIED IN THE AREA (WDNR, 1991).

Key To Geologic Units*

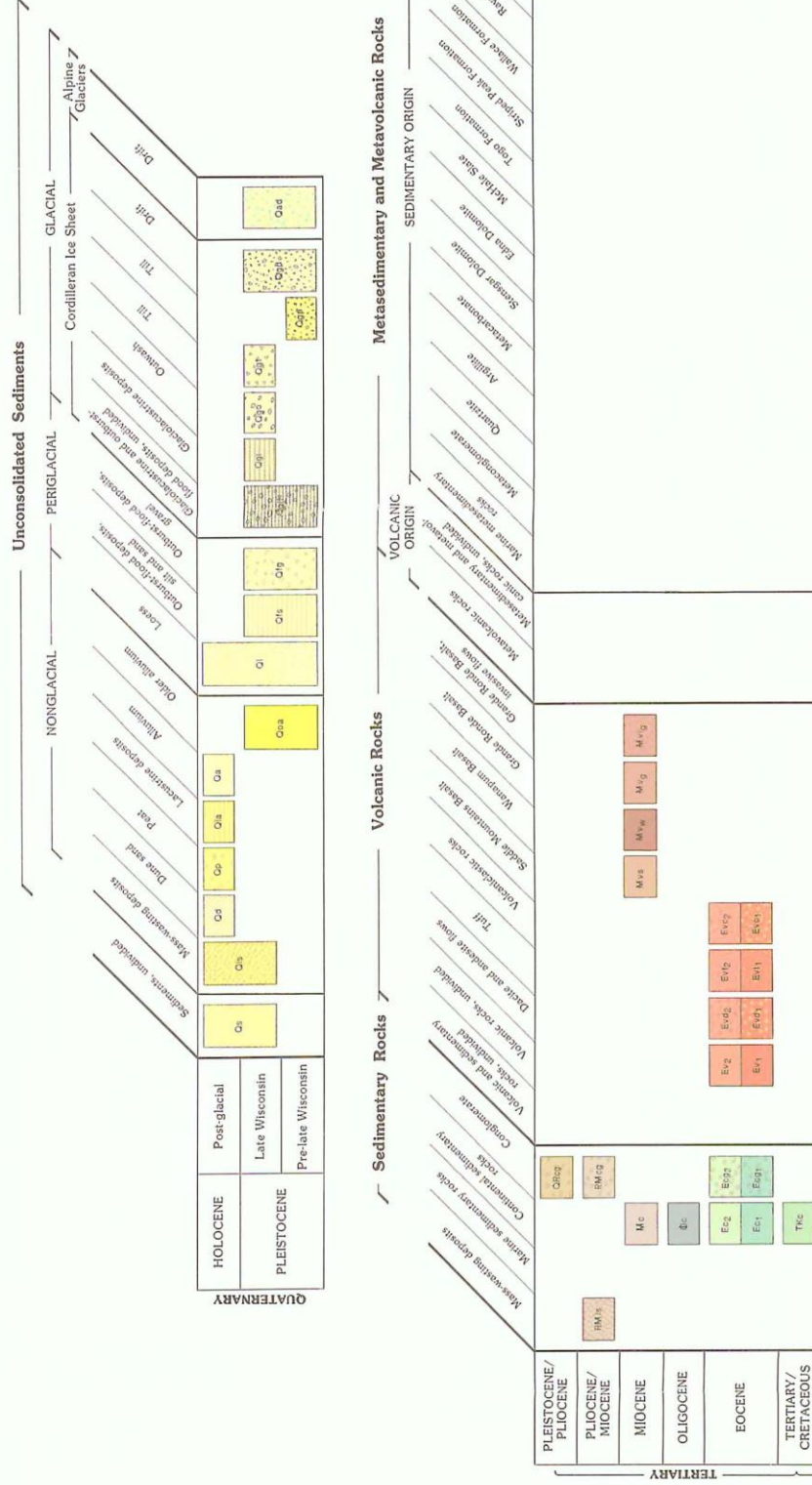


FIGURE 7-A: KEY TO GEOLOGIC MAP SYMBOLS.

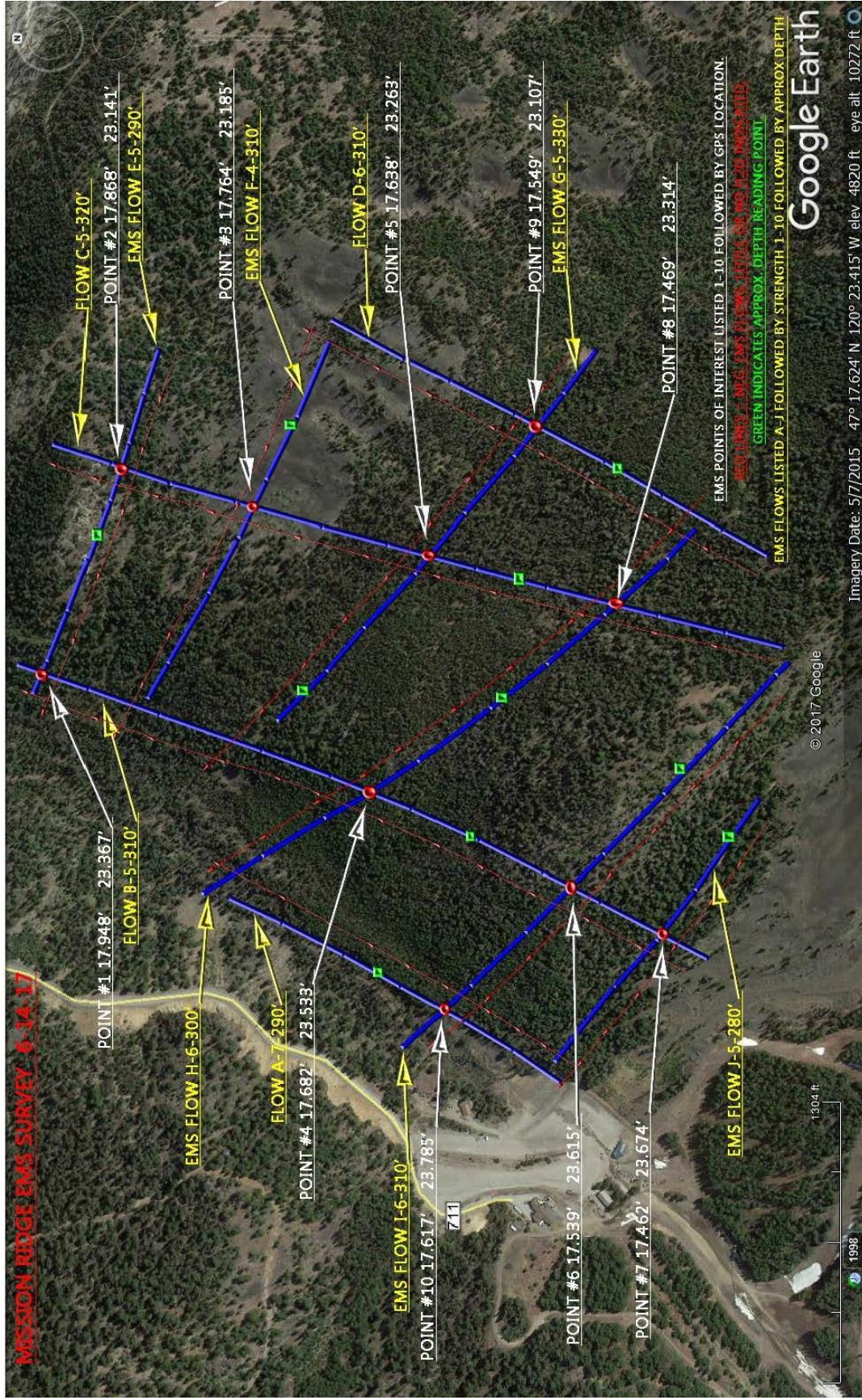


FIGURE 9: EMS SURVEY MAP OF WESTERN AREA SHOWING POTENTIAL RANKING OF DRILLING LOCATIONS.

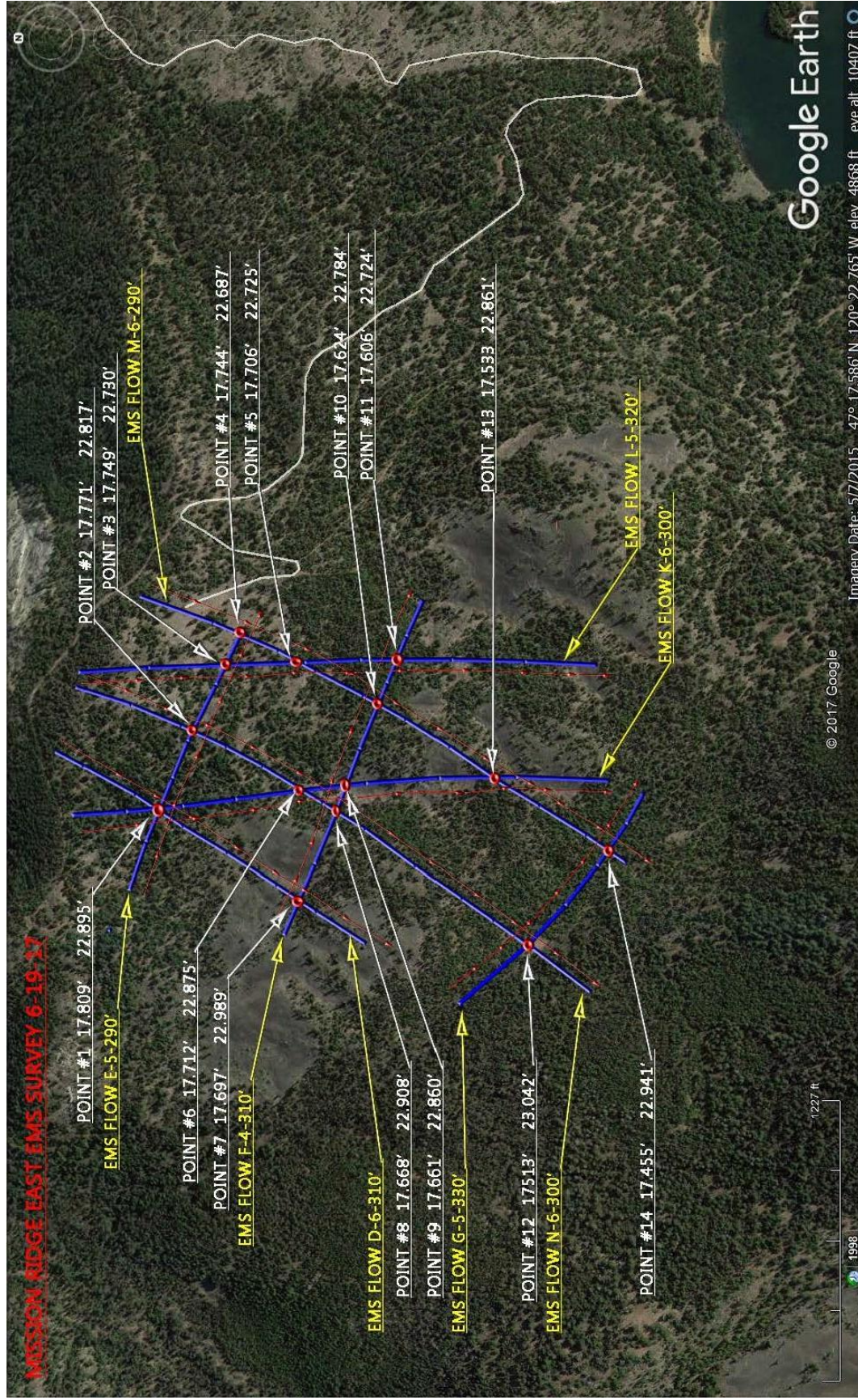


FIGURE 10: EMS SURVEY MAP OF EASTERN AREA SHOWING POTENTIAL RANKING OF DRILLING LOCATIONS.

MISSION RIDGE EXPANSION

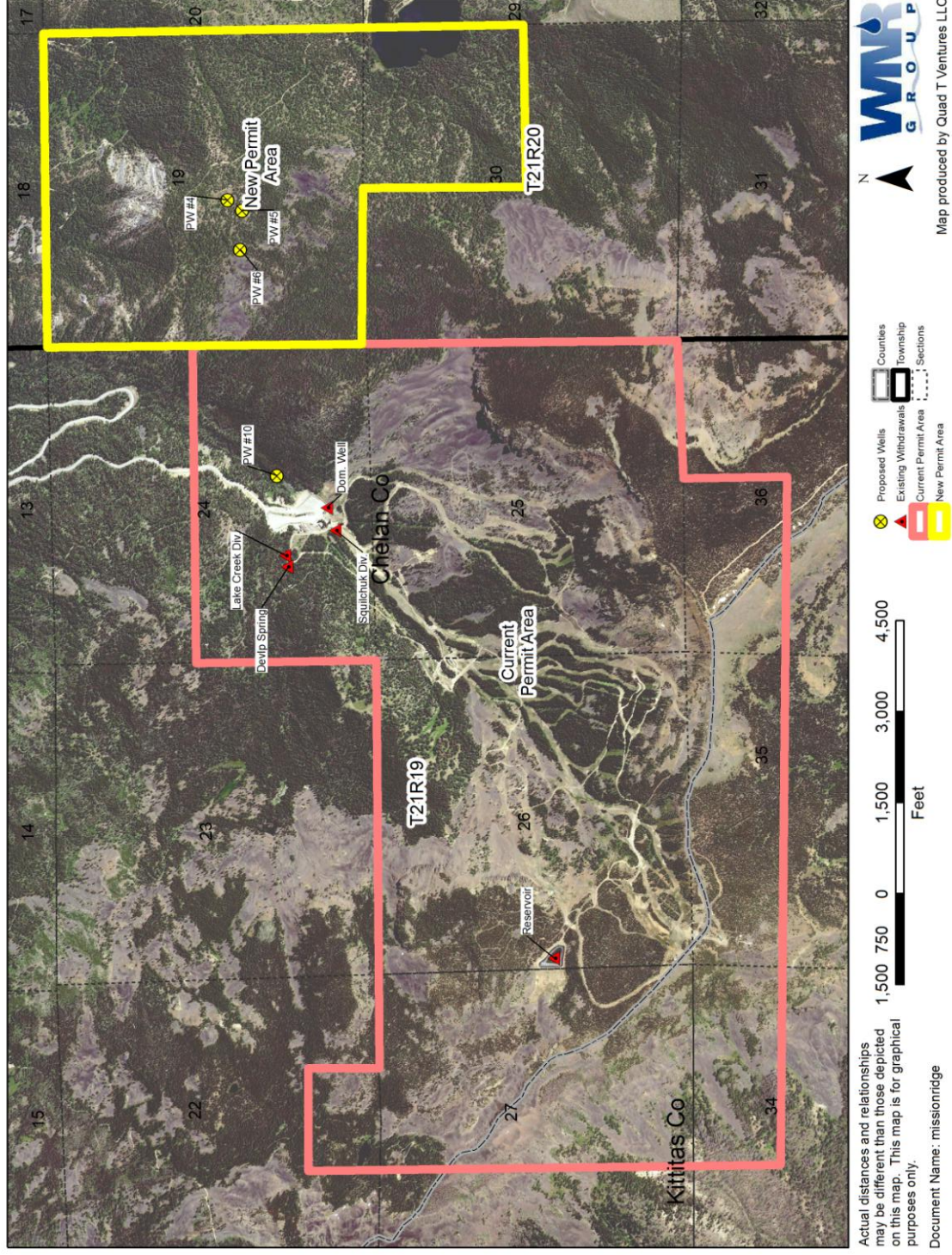


FIGURE 11: LOCATION OF EXISTING DIVERSIONS AND PROPOSED WELL LOCATIONS ACROSS THE SITE.

FIGURE 12: WELL LOG FOR MISSION RIDGE SKI AREA LODGE WELL.

Attachment A

IDEA4WATER

EMS Survey Report



IDEA4WATER Inc.

Site Survey Report

IDEA4WATER Inc.
121 Iowa Ave. Suite 1K
Whitefish, MT 59937
(208) 290-8811
info@idea4water.com

Results

Introduction

IDEA4WATER Inc. was contracted by Mission Ridge Ski Resort via Gene St. Godard to perform a site survey at 7500 Mission Ridge Rd., Wenatchee, WA. (Township 21N, Range 19/20E, Section 24/19)

Purpose

The objective of the investigation was to identify subsurface fractures that could contain underground water. The investigation consisted of an EMS and/or VLF survey. The investigation was successful in identifying a number of geophysical anomalies thought to be useful in finding water. The survey was conducted on June 24, 2017.

Water Survey

It is a well known fact that fresh water often sits in fracture zones in rock structures. Finding these fractures are the key to obtaining positive results when drilling for water. Finding the best place to drill can radically reduce the costs of drilling.

Geophysical surveying methods were developed in the 1940s, 1950s and 1960s. The methods used since this time have become more sophisticated and with the evolution of digital technologies, geophysicists have had a chance to obtain and analyze information obtained and develop more accurate and meaningful results.

The technologies used in this survey are known for finding useful quantities of underground water that may be trapped in rock fractures and cavities. This enables us to be able to determine the best site for drilling a well. By utilizing the magnetic components of the electromagnetic field generated by VLF (very low frequency) transmitters, it is possible to locate anomalies which provide a view of what structures exist underground. This is done by comparing electrical resistances of structures which are created by using the low frequency waves that are sent out by military radio transmitters around the world.

Survey Design

The EMS survey was conducted first and numerous potential water flows were discovered. The VLF survey area was then conducted. We conducted numerous runs along the flows to be certain that both technologies gave us information showing that we had water flows at those locations.

Results

The EMS results are listed below. The blue flow lines indicate good signals which could hold the potential for water. The red flows indicate very little likelihood of containing significant water. The blue crossing points of the lines were of extreme interest as they are most likely to contain the largest volumes of water.

The VLF survey was conducted to pinpoint the location of the crossing points and to verify that water is being indicated by this technology also. The frequency used was 24.7 kHz. The profiles were run at 90/270 degrees.

The EMS and VLF were in total agreement and the points determined to be the most likely to produce the best water were at points #4, #5, #6 from the East Area. We anticipate a maximum drilling depth at this point of about 450 feet*.

POINT #1 17.402 22.949
FLOW #1 17.402 22.949

POINT #2 17.402 22.949
FLOW #2 17.402 22.949

POINT #3 17.402 22.949
FLOW #3 17.402 22.949

POINT #4 17.402 22.949
FLOW #4 17.402 22.949

POINT #5 17.402 22.949
FLOW #5 17.402 22.949

POINT #6 17.402 22.949
FLOW #6 17.402 22.949

POINT #7 17.402 22.949
FLOW #7 17.402 22.949

POINT #8 17.402 22.949
FLOW #8 17.402 22.949

POINT #9 17.402 22.949
FLOW #9 17.402 22.949

POINT #10 17.402 22.949
FLOW #10 17.402 22.949

POINT #11 17.402 22.949
FLOW #11 17.402 22.949

POINT #12 17.402 22.949
FLOW #12 17.402 22.949

Google Earth

Interpretations

The EMS and VLF survey was successful in mapping several anomalies. While surveys can give information that can be somewhat ambiguous, there are a number of anomalies thought to be associated with underground water. The confidence in the results of the water prospecting survey are average.

Drilling Recommendations

We recommend drilling at points #4, #5, #6 in the East Area to a depth of 450 feet*. The drilling order should be point #4 (Due to the strong flow of M-6 and the additional fracturing in that area), #6 (Due to Very Good signals in that area), then #5 (Due to the Very Good signals) in the East Area.

The EMS Flows listed below are rated based on the quality of the signals received.

M-6 Excellent/Outstanding
E-5 OK
L-5 Very Good
N-6 Good
K-6 Very Good
F-4 OK

If adequate water is not obtained, we recommend Hydro fracturing the well. We believe that this will give the best volume of water for the money spent.

These results are respectfully submitted this 28th day of June, 2017.



Norman Larson, President

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* In the event that there is in excess of 50 feet of clay, this depth will increase by 150 feet.

APPENDIX E

2022 Water Resources Memo

TECHNICAL MEMORANDUM

Date: January 20, 2022

Project: Mission Ridge Expansion

Project No.: 21006

Issued by: Bill Sullivan, LHG | (509) 699-0682 | bill@AmericanLW.com

Subject: Water Resources Existing Conditions and Impacts from Proposed Development

Authored By:



William M. Sullivan

January 20, 2022

Bill Sullivan, LHG
Hydrogeologist

Executive Summary

American Land and Water Consulting (American) completed a planning-level assessment of water resources elements related to the proposed Mission Ridge Ski and Board Resort (Mission Ridge) Master Planned Resort expansion project (Project). This memorandum addresses specific areas for discussion identified by Chelan County in Chapter 3 (Water) of its Mission Ridge Master Planned Resort Expansion Environmental Impact Statement (EIS) Scoping Status Summary Document Revised on September 21, 2020.

The Project is an expansion of the existing Mission Ridge Resort on approximately 502 acres of privately-owned land in Section 19, and a small portion of the NE ¼ of Section 30, T. 21 N., R. 20 E.W.M. (Site) adjacent to the existing resort. The majority of the Site and the entire existing resort lie within the upper Squilchuck Creek watershed.

To complete this planning-level assessment, we reviewed information contained in project proposals, SEPA documents, and reports comprising the known body of work for water resources in the Squilchuck basin including documents developed supporting the approved Watershed Plan for Water Resources Inventory Area (WRIA) 40A (Stemilt-Squilchuck).

This memo:

- summarizes existing water resource conditions in the Squilchuck watershed including at the Site;

- provides projected demand estimates for the Project's proposed public water system;
- describes alternatives for physical water supply;
- summarizes legal water availability (water rights);
- provides an assessment of potential impacts to water quantity and quality resulting from the Project and identifies mitigation measures; and
- evaluates the Project for consistency with the approved WRIA 40A Watershed Plan.

Based on our assessment, we have determined that:

1. There is adequate water available for the Project. Two water supply alternatives were identified that are both capable of providing sufficient physical and legal water availability to meet projected water supply demands through full buildout. This conclusion is based on:
 - The estimated total demand for the Project's Group A community public water system at full buildout is 241 acre-feet per year (ac-ft/yr) including 231 ac-ft/yr for indoor use and 10 ac-ft/yr for outdoor use. Estimated water demand for the Project is consistent with other recreational/residential developments in the region. The Project's public water system will not be used for snowmaking.
 - Under water supply Alternative 1, a portion of water system demand would be met using water rights currently owned by Mission Ridge and the balance would be supplied by Chelan County PUD (CPUD).
 - Up to 90 ac-ft/yr of demand may be met using existing Mission Ridge water rights that authorize water sources located within the Squilchuck basin. Mission Ridge does not plan to seek a new water right appropriation to supply the Project. It does plan to seek water right changes to align attributes of existing authorizations with Project needs. Any potential impact resulting from these changes will be fully mitigated through Washington's water laws that are established to protect existing instream and out-of-stream rights when water right changes are approved. There will be no enlargement of existing authorized quantities.
 - The balance of water demand of about 151 ac-ft/yr would be supplied by CPUD's Group A community water system using sources located outside of the Squilchuck basin that are in hydraulic continuity with the Columbia River. CPUD's water system currently extends to a reservoir in the Forest Ridge neighborhood located less than 0.5 mile north of the Site (Figure 1).
 - Under water supply Alternative 2, all water system demand (241 ac-ft/yr) would be supplied by CPUD. Based on initial discussions with CPUD, it appears the utility has sufficient physical and legal water availability to supply the Project under Alternative 2.
 - Initial discussions with CPUD indicate its Group A water system has adequate physical and legal availability to supply the Project. The State's Municipal Water Law authorizes CPUD to exercise its existing municipal water rights anywhere within the boundaries of its service area.

- CPUD routinely extends water service to supply new developments. Expansion of CPUD's water system will be subject to all applicable permitting processes.
 - Mission Ridge is currently coordinating with CPUD to initiate an engineering study to further investigate the feasibility of expanding its service area to supply the Project under a wholesale agreement and to identify needed improvements to its existing system. Locations for the service extension pipeline and pump stations will be determined through subsequent engineering study.
2. The Project is not expected to negatively impact water supplies and instead is expected to increase overall water availability in the Squilchuck basin throughout the year and especially during low flow periods benefitting instream and out-of-stream uses including irrigation. The conclusion is based on:
- The maximum quantity of water consumptively used (lost from Squilchuck basin) will be small and well within authorized water rights. Consumptive use losses from supplying 90 ac-ft/yr of demand from sources in the Squilchuck basin under Alternative 1 are estimated to be no more than about 18 ac-ft/yr, or a continuous rate of about 0.02 cubic feet per second (9 gallons per minute). By comparison, mean annual flow in Squilchuck Creek estimated at 7.5 cubic cfs.
 - Importing water for the Project from CPUD under Alternatives 1 and 2 will negate all consumptive losses and will provide substantial net water supply benefit to the Squilchuck basin via return flows. Assuming CPUD supplies 151 ac-ft/yr for indoor water use having a 90 percent return flow rate (Ecology, 2018), water augmentation to the Squilchuck basin under Alternative 1 is estimated to be about 136 ac-ft/yr, or an average continuous rate of about 0.2 cfs. If all water for the Project's water system is supplied by CPUD under Alternative 2, water augmentation increases to 208 ac-ft/yr and 0.3 cfs continuously.
 - Additionally, Mission Ridge plans to expand its artificial snowmaking operation to the Project site using existing water right authorizations. The WRIA 40A Watershed Plan specifically recognized benefits of snowmaking to water supplies in Squilchuck Creek. Snowmaking prolongs the spring freshet period by increasing water storage. It also increases the quantity of cold water infiltrating to groundwater. Prolonging the freshet period benefits aquatic habitat, delays mandatory cuts to downstream irrigation rights, and delays the need to release cool water from high-elevation reservoirs in the Squilchuck basin until later in the season. Increased infiltration results in additional inflow of cool groundwater to sustain baseflows during late season low flows.
3. Potential water quantity and quality impacts resulting from erosion and sedimentation, stormwater runoff, and wastewater discharge will be fully mitigated through existing required permitting processes that are established to be protective of surface and groundwater resources.
4. The Project was assessed for consistency with the WRIA 40A Watershed Plan and supporting documents. The Planning Unit approved the Watershed Plan in 2007 consistent with RCW 90.82.

- The Project would not be in conflict with desired future conditions, opportunities, and recommendations identified by the Planning Unit.
 - The Project is expected to result in a substantial increase of water supplied to the Squilchuck basin on a continuous basis fulfilling several major objectives listed the Watershed Plan including:
 - Providing domestic water from regional (out-of-basin) water supply sources;
 - Enhancing groundwater recharge and baseflow;
 - Creating domestic water interties to increase reliability of the drinking water supply; and
 - Using artificial snowmaking at Mission Ridge to enhance stream flows in Squilchuck Creek by retiming water delivery;
5. Our planning-level assessment did not identify any water elements that would limit development of the proposed Project or impacts to water resources that cannot be fully mitigated through compliance with applicable regulations and standard permitting processes (See Section 4 of this report). Suggested conditions to mitigate potential impacts from the Project include:
- The development shall comply with all applicable local, state, and federal rules and regulations, and must obtain all appropriate approvals and permits.
 - If existing water rights will be utilized for development which requires water right transfers, transfer should be approved by the Department of Ecology prior to preliminary plat approval.
 - Prior to preliminary plat or building permit approvals, proof of potable water must be provided to Chelan County. For domestic water supplied by expansion of the CPUD's public water system, the utility must provide written confirmation agreeing to provide water for the proposed development. All water system improvements must be designed, constructed, and placed in accordance with CPUD's standards and requirements. Completion of the improvements, including necessary easements, must be accepted in writing by CPUD. Expansion of CPUD's water system will be subject to applicable permitting processes including an update to its Group A water system plan to be approved by Washington Department of Health (DOH).
 - Discharge of wastewater to groundwater will require approval from Chelan-Douglas Health District (CDHD) and DOH to comply with Washington State antidegradation policies under WAC 173-200. Discharge of wastewater to surface water will require compliance with the federal Clean Water Act and state antidegradation policies under WAC 173-201A including a National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit administered by Ecology.
 - A final site-specific stormwater plan and report prepared by a Professional Engineer licensed in the State of Washington that conforms to Ecology's 2019 Stormwater Management Manual for Eastern Washington (SWMMEW) and Chelan County's

Stormwater Management Code (SMC, Chapter 13.16) shall be submitted and accepted by Chelan County prior to construction.

- The Project will result in greater than 1-acre of disturbed ground requiring coverage under the NPDES Construction Stormwater General Permit (CSWGP). As part of the CSWGP, a Stormwater Pollution Prevention Plan (SWPPP) and a Temporary Erosion and Sediment Control Plan (TESC Plan) shall be submitted to and accepted by Chelan County prior to grading. The SWPPP and TESC Plan shall be maintained on-site and updated as needed to address and prevent any sediment or sediment-laden water from leaving the Project Site.

1.0 Introduction

American Land and Water Consulting (American) drafted this technical memorandum to support planning and permitting for the proposed Mission Ridge Ski and Board Resort (Mission Ridge) Master Planned Resort expansion project (Project). Chelan County is the lead agency for State Environmental Policy Act (SEPA) review for the Project. This memo provides a planning-level assessment of water resources elements related to the Project and addresses specific areas for discussion identified by Chelan County in Chapter 3 (Water) of its Mission Ridge Master Planned Resort Expansion Environmental Impact Statement (EIS) Scoping Status Summary Document Revised on September 21, 2020.

This memo addresses the following specific areas for discussion presented by Chelan County:

a. Groundwater and surface water movement/quantity/quality

- Further analysis of the water requirements for the project, availability of sufficient ground water for resort uses, and of the potential adverse impacts resulting from the use of groundwater on stream flow and irrigation water downstream of the site.*
- Alteration of the absorption characteristics of the site.*
- Contamination of runoff water with trace amounts of petroleum residues, heavy metals, phosphorus, nitrogen and other pollutants associated with vehicle traffic and property maintenance.*

b. Public water supplies

- Feasibility and impact of extending the Chelan PUD public water system to the project site, which may require improvements to the existing water system.*
- WRIA 40A Watershed Plan.*
- WRIA 40A Water Quantity Analysis.*

The Project comprises approximately 502 acres of privately-owned land adjacent to the current Mission Ridge Ski and Board Resort (ski resort) in southwestern Chelan County, Washington (Figure 1). Most of the planned development will occur in Section 19 and a small portion of the NE ¼ of Section 30, T. 21 N., R. 20 E.W.M. (Site).

The current ski resort consists of ski lifts and runs, a lodge, support facilities, and parking lot located on over 2,000 acres of leased federal and state land.

The Project is proposed to be constructed as a Master Planned Resort offering year-round recreational, commercial, and residential uses. Based on information in the Mission Ridge Expansion Project Narrative (Mission Ridge, 2020), the Project at full buildout will consist of 275 single family units (later revised to 265), 621 condominiums/townhouses/duplexes, a 57-room hotel/lodge, housing for 80 employees, and services for 110,000 annual visitors. Infrastructure required to support planned the Project includes roadways, sidewalks, a public water system, and wastewater treatment.

2.0 Background

This section summarizes water resources in the Squilchuck watershed and at the Project Site.

2.1 Related Studies

The body of work relating to water resources in the Squilchuck basin and at the Site is summarized below and listed in the References section of this memo.

The Watershed Plan for Water Resources Inventory Area (WRIA) 40A (Stemilt-Squilchuck) was approved by the Planning Unit in 2007 in accordance with the Watershed Planning Act (RCW 90.82; Chelan County, 2007a). The Planning Unit elected to complete the required water quantity assessment (Chelan County, 2007b) and optional multi-purpose water storage assessment (Chelan County, 2010). The Planning Unit elected to not complete optional water quality, instream flow, and habitat assessments.

Hydrologic studies preceding the watershed plan include reports by Woolridge (1972) assessing Squilchuck Creek in the context of other nearby watersheds, Woodridge (1994) addressing upper Squilchuck Creek at the Mission Ridge Ski Resort, and a watershed assessment completed by the U.S. Forest Service (1998). WNR Group (2019) completed a survey-level evaluation of hydrogeologic conditions at the Site supporting planning for the Mission Ridge expansion project.

Washington State Department of Ecology (Ecology) operated a continuous recording stream flow gaging station near the mouth of Squilchuck Creek from 2008 through 2012. Other stream flow data are limited to spot flow measurements collected over decades as summarized in Chelan County (2007b).

Potential impacts to aquatics, wildlife, and botany were assessed supporting SEPA compliance for the Project (Washington Conservation Science Institute, 2020) and it was concluded there will be no population impacts for a properly mitigated Project.

The Washington State Conservation Commission completed an evaluation of limiting factors to migration of anadromous fish in the creek (Andonaegui, 2001) and the Washington Department of Fish and Wildlife inventoried fish passage barriers and irrigation diversions in the creek (2006).

The Stemilt Partnership, formed by Chelan County in 2007, represents agriculture, wildlife, recreation, development, and conservation interests within WRIA 40A. Its priorities, vision, and landscape strategies for these watersheds are documented in the Stemilt-Squilchuck Community Vision (Chelan County, 2008).

Two geotechnical studies completed supporting the Project include a reconnaissance-level geologic hazards assessment primarily focused on Section 19 (GN Northern, 2017) and a site evaluation report for the proposed access roadway (GN Northern, 2020). The Site was determined to be suitable for the intended development subject to recommendations in these reports.

2.2 Existing Watershed Conditions

The Project is located within the upper reaches of the Squilchuck Creek watershed (watershed, basin) in southeastern Chelan County. Squilchuck Creek comprises approximately half the area of WRIA 40A along with Stemilt Creek adjacent to the south. This summary of existing water resources conditions in the Squilchuck basin and at the Site is based on information from sources listed in the References section of this memo.

Squilchuck Creek is a 10.6-mile long perennial stream forming a direct tributary to the Columbia River. It drains approximately 17,600 acres of the eastern slope of the Cascade Mountains southwest of Wenatchee. The Squilchuck watershed is bounded to the west by Naneum Ridge and to the east by the Columbia River. The watershed forms a canyon bounded to the north by foothills of the Wenatchee Mountains and to the south by Wheeler Ridge and Wenatchee Heights. Major perennial tributaries to Squilchuck Creek include Miners Run and Lake Creeks that empty to Squilchuck Creek downstream and upstream from the Site, respectively.

Anadromous fish passage in Squilchuck Creek is limited by a natural gradient barrier to the lowermost reach within about 1 mile upstream from the confluence with the Columbia River. No water bodies within the Squilchuck Creek watershed are listed by Ecology as impaired on its 303(d) list under The Clean Water Act.

Land surface elevations range from about 640 feet asl near the Columbia River to greater than 6,800 feet above sea level (asl) at Naneum Ridge. The Site lies several hundred feet above Squilchuck Creek at elevations between about 4,500 and 5,000 feet asl. Most of the Site lies in a northwest-sloping bowl draining toward Squilchuck Creek. A portion of the Project in the east half of Section 19 and Section 30 will be situated on an east-sloping hillside draining toward the Stemilt Creek basin.

Vegetation communities in the watershed range from shrub-steppe in low and middle elevations to mixed coniferous and subalpine forest in high elevations. Irrigated commercial tree-fruit orchard covers much of the land surface on gentle slopes in lower and middle elevation areas. Land cover in the upper elevations is predominantly bare rock (basalt rubble). Land cover at the Site is primarily mixed coniferous forest. Up to about 50 acres of the Site is covered by basalt rubble.

Mean annual precipitation in the watershed ranges from 8 inches near the Columbia River to 32 inches at Naneum Ridge and is about 27 inches at the Site. Approximately 70 percent of annual precipitation falls as snow between October and April. As a result, the hydrology of Squilchuck Creek is characterized by snowmelt with peak flows occurring between April and July. About 65 percent of annual water flow occurs during these months. Baseflow from groundwater storage

sustains stream flows during later summer and mid-winter months when rainfall is scarce. Mean annual flow is estimated to be 7.5 cubic feet per second (cfs; Chelan County, 2007b). Low stream flows are typically less than 2 cfs. High stream flows are typically 20-30 cfs and can exceed 50 cfs for brief periods.

About 13 percent of annual precipitation goes to runoff and about 35 percent goes to groundwater recharge. An unknown quantity of recharge returns to the creek as baseflow. The balance of 52 percent of annual precipitation is attributed to evapotranspiration.

Geology of the watershed is characterized by steeply-dipping continental sedimentary rocks of the Tertiary Chumstick formation overlain by gently-dipping Tertiary Grande Ronde basalt of the Columbia River Basalt Group and Quaternary mass wasting deposits. The Chumstick Formation is comprised of siltstone, shale, sandstone, and conglomerate. It underlies the entire watershed and crops out at all but the highest elevations. Basalt occurs primarily in the upper elevations of the watershed above about 4,500 feet asl. Mass wasting deposits are primarily present along ridges, canyon walls, and in the upper elevations of the watershed. Alluvial deposits consisting of sand, gravel, silt, and clay line the bottoms of drainages. All four major geologic units described above are present at the Site.

Ecology's well database indicates about 100 wells are present in the watershed. Nearly all are used for domestic supply. Wells are concentrated along canyon bottoms and on hillsides in the lower and middle elevations of the watershed east of the Site. Few wells are present in the upper elevations and no wells are present at the Site. The nearest wells to the Site are located 0.5 mile to the southwest near Squilchuck Creek at the existing ski resort base in Section 24, T. 21 N., R. 19 E.W.M (Ecology IDs AGJ-097 and BJB-131). These wells supply the existing Mission Ridge Ski Resort Group A transient non-community (TNC) water system (No. 55335) approved for 5 connections supplying the lodge and support facilities.

Wells are completed throughout the watershed in all four of the major geologic units. Groundwater occurrence is generally localized and unpredictable. Groundwater occurs in the Chumstick Formation in open fractures along discontinuous, moderately permeable layers. Well yields in the Chumstick range from 1 to 30 gallons per minute (gpm) and average less than 10 gpm. Groundwater in basalt likely occurs within the basal unit. The few wells completed in basalt in WRIA 40A yield between 10 and 100 gpm. Groundwater in mass wasting deposits is highly localized and occurs where permeable basalt rubble overlies less permeable Chumstick Formation. Wells completed in mass wasting deposits typically yield between 5 and 30 gpm. Alluvium occupying drainage bottoms comprises the most productive groundwater unit in the watershed due to relatively high permeability and connection with surface water bodies. Wells completed in alluvium yield between 10 and 100 gpm. Existing Mission Ridge wells AGJ-097 and BJB-131 are completed in unconsolidated deposits (basaltic alluvium or mass wasting deposits) at depths of 100 feet bgs or less with reported yields between 40 and 100 gpm.

Groundwater is recharged by infiltration of precipitation. In general, relatively flat lying areas and areas comprised of basalt rubble and mass wasting deposits promote recharge. Additional artificial recharge comes from seepage associated with irrigation return flow, onsite sewage systems (OSS), and unlined irrigation ditches and reservoirs. Groundwater flow direction is primarily controlled by topography. Shallow groundwater generally flows perpendicular to local drainages while deep

groundwater flows northeasterly toward the Columbia River. Shallow groundwater discharges to the surface in springs along canyon walls and to streams along drainage bottoms. Deep groundwater discharges to the lower reaches of Squilchuck Creek and the Columbia River.

Surface water features at the Site consist a northwest-flowing intermittent stream in the western half of Section 19, and several small ponds. Squilchuck Creek lies about 1,000 feet to the northeast of the Site. Infiltration at the Site discharges to the intermittent stream in Section 19 and to Squilchuck Creek.

About half of mapped surface soils in Section 19 are classified as bedrock outcrop. The other half, where most project development will occur, are classified as having moderately low to moderately high drainage capacities ranging from 0.06 to 0.2 inches/hour. Stemilt silt loam, comprising about one-quarter of the land surface at the Site is classified as presenting a severe erosion hazard. All others are classified as moderate or lower.

The primary irrigation source in the watershed is surface water from Squilchuck Creek. Surface water is also conveyed via gravity from adjacent Mission and Stemilt Creek watersheds. In recent decades, surface water pumped from the Columbia River has become an important irrigation water source.

Major irrigation water purveyors include Beehive Irrigation District and Lower Squilchuck Irrigation District. Wenatchee Heights Reclamation District and Lower Stemilt Irrigation District also supply irrigation to portions of the Squilchuck basin.

A portion of irrigation water is stored in artificial reservoirs including high-elevation Beehive and H&H reservoirs and The Great Depression. Two small lakes near the ski resort comprise the only natural surface water storage. Mission Ridge operates a reservoir to store water diverted from Squilchuck Creek for artificial snowmaking.

Water rights and claims within the Squilchuck watershed are primarily for irrigation use. Over 200 permits and certificates and 100 claims are listed in Ecology's water right database. The basin underwent a Superior Court Adjudication completed in 1926 that validated then-existing surface water rights and claims of beneficial use predating the 1917 Water Code (RCW 90.03). Claims filed after 1926 have not been adjudicated. A substantial portion of water rights are subject to annual mandatory curtailment of diversion rates based on priority date or class of the rights as stream flows decrease following the spring freshet period.

3.0 Project Water Requirements

This section presents a planning-level assessment of water demand and supply alternatives.

3.1 Public Water System Demand Estimates

A Group A community public water system will be developed to support the Project. This section provides a projected water demand estimate for the Project considering indoor and outdoor uses based on development plans listed in the Project Narrative (Mission Ridge, 2020).

Planning assumptions for types and numbers of connections and population at full buildout are shown in Table 1. These assumptions and the resulting water demand estimates shown below are consistent with other recreational/residential developments in the region. Water for artificial

snowmaking was not considered in the demand estimate because it will not be supplied by the public water system.

Results of this water demand estimate were used to evaluate legal and physical water availability for water sources and to evaluate potential water resources impacts from the Project (see Section 4 of this report). Additionally, water demand estimates can be used to guide planning for water system and wastewater treatment facilities recognizing that estimates will be refined as the Project progresses.

The equivalent residential unit (ERU), based on a typical full-time single-family residence, was used to evaluate water system consumptive demand for two demand scenarios described below (ADD and MDD). Approximately 913 ERUs are expected at full project buildout (Table 1).

Average Day Demand (ADD)

ADD is the total annual consumptive demand per ERU averaged over 365 days. ADD is used to estimate water supply safe annual yield and required water right annual quantity.

Estimates for ADD are based on indoor use for 1 ERU of 200 gallons per day (gpd), distribution system leakage (DSL) of 10 percent, and factor of safety (FS) of 15 percent as recommended in the Washington State Department of Health (DOH) *Water System Design Manual* (DOH, 2019). ADD is estimated to be 250 gpd:

$$\text{ADD} = \text{indoor use (200 gpd)} + \text{DSL (20 gpd)} + \text{FS (30 gpd)} = 250 \text{ gpd}$$

Facilities differing from the ERU criterion were accounted by applying a factor. An ERU factor of 0.8 was applied to multi-family units as recommended in *Water System Design Manual*. ERU values for water usage for the hotel and employee housing were adjusted based on the guidance in Table 3-2 in the *Water System Design Manual*. Estimates for visitors and employees are based on 5 gpd per person.

Outdoor water use is assumed to be primarily for irrigation of drought-resistant native shrub vegetation to compliment the natural alpine setting and will use low flow application methods to minimize water consumption. Landscaping requirements will be established by the development's covenants, conditions, and restrictions.

Outdoor water use was estimated assuming a total of 8 acres of landscaping will be irrigated. This irrigated area is apportioned among residential and commercial facilities assuming 500 square feet (sf) per single-family unit, 250 sf per condo/townhouse, and 22,000 sf each for the hotel/lodge and employee housing. Numbers of ERUs assigned to irrigation water use were determined by dividing the annual total irrigation requirement (TIR) of the facility by the ERU value:

$$\text{ERUs} = \text{TIR} \times \text{number of irrigated acres} / 1 \text{ ERU rate}$$

The TIR for shrubbery was determined based on the annual crop irrigation requirement (CIR) in excess of rainfall for the index crop grapes contained in the US Department of Agriculture Natural Resources Conservation Service *Washington Irrigation Guide* (WIG) at Winthrop, Washington. Winthrop was selected because it has a similar climate to the Site. According to the WIG, the CIR for grapes is 1.11 feet. The TIR assuming a sprinkler application efficiency (Ea) of 85 percent is 1.31 feet:

$$TIR = CIR/Ea = 1.11 \text{ feet}/0.85 = 1.31 \text{ feet (15.7 inches)}$$

Based on a TIR 1.31 feet and irrigated area of 8 acres, the total irrigation demand is estimated to be 10.5 ac-ft/yr. This volume averaged over an assumed 153-day irrigation season (nominally May through September) is about 22,000 gpd or 15 gpm. Outdoor water use from October through April is assumed to be zero. The water system will not be used to supply snowmaking.

The total annual quantity (Qa) needed to meet ADD at full project buildout is estimated to be 241 ac-ft (Table 1).

Maximum Day Demand (MDD)

The MDD for an ERU is the highest volume of water an ERU is expected to consume over a 24-hour period excluding emergencies. MDD is used to guide water system source and storage design and assess adequacy of water right instantaneous quantity.

MDD per ERU was estimated by applying a peaking factor of 2.0 times ADD which falls in the range of values recommended by the *Water System Design Manual*. MDD is estimated to be 500 gpd:

$$MDD = ADD (250 \text{ gpd}) \times \text{Peaking Factor (2.0)} = 500 \text{ gpd}$$

The total instantaneous quantity (Qi) needed to meet MDD at full project buildout is about 302 gpm (Table 1).

Table 1. Mission Ridge Expansion Water Demand Estimate

Water Use	No.	Unit	ADD/ ERU (gpd)	Total ADD (gpd)	Annual (ac-ft)	Factor (x ADD)	MDD/ ERU (gpd)	Total MDD (gpd)
Single Family	265	units	250	62,250	74.0	2	500	132,500
Condo/townhome	621	units	200	124,200	138.8	2	400	248,400
Hotel / lodge	57	rooms	100	5,700	6.4	2	200	11,400
Employee housing	80	ea	50	4,000	4.5	2	100	8,000
Daily visitors	1,000	ea	5	5,000	5.6	2	10	10,000
Employees	150	ea	5	750	0.8	2	10	1,500
Irrigation	8	acres		22,318	10.5			22,318
TOTAL				228,218	240.5			434,118

Total ERUs = 913 Qa = 241

Qi = 302 gpm

ADD = Average Day Demand = 250 gpd/ERU

MDD = Maximum Day Demand - 500 gpd/ERU

ERU = Equivalent Residential Unit. Total number of ERUs = Total ADD/ ADD per ERU = 913 ERUs.

Qa = Annual Quantity (ac-ft)

Qi = Instantaneous Quantity (gpm)

3.2 Public Water Supply Alternatives

Two alternatives were identified to supply water to the Project's public water system. Both appear to be capable of providing sufficient physical and legal water availability to meet projected water system demand through full buildout of 241 ac-ft/yr.

Under water supply Alternative 1, a portion of water system demand would be met using water sources located within the Squilchuck basin under water rights currently owned by Mission Ridge with the balance supplied by Chelan County Public Utility District (CPUD) through extension of its Group A community water system service area. As described below, up to 90 ac-ft/yr could be supplied under existing Mission Ridge water rights. CPUD would supply the balance of 151 ac-ft/yr through wholesale water service to the Project's water system.

Under water supply Alternative 2, all water system demand would be supplied by CPUD.

CPUD currently supplies domestic water to the Forest Ridge development located within 0.5 mile north of the Site (Figure 1). Connecting to CPUD's Group A community water system would require construction of a new pipeline and pump station(s) to convey water from CPUD's Forest Ridge reservoir to the Site.

Mission Ridge has consulted CPUD and is coordinating to initiate an engineering study to investigate the feasibility of expanding its service area to supply the Project and to identify needed improvements to its existing system. Based on initial discussions with CPUD, it appears that the utility has sufficient physical and legal water availability to supply the Project. The exact location of an offsite pipeline and pumping station(s) to connect the Project with CPUD's water system is currently not known and will be determined through subsequent engineering study.

3.3 Physical Water Availability

Water supply Alternative 1 involves using water sources located within the Squilchuck basin consisting of groundwater and/or surface water to meet a portion of water system demand. New sources supplying the Project's Group A water system (e.g. new wells) must receive source approval from Washington State Department of Health (DOH) under WAC 246-290-130 including testing to demonstrate safe yield and source reliability.

Groundwater sources within the Squilchuck basin would include new wells in Section 19 and adjacent Section 24. Based on yields in nearby wells including existing Mission Ridge wells AGJ-097 and BJB-131 with reported yields up to 40 to 100 gpm, it appears that multiple wells might be needed to meet estimated MDD for the water system. WNR Group (2019) identified three prospective well locations in Section 19 and one in the vicinity of the existing ski area base in Section 24.

Diverting surface water for domestic supply is also an option; however, this would require construction of a water treatment plant. The primary surface water source within the watershed is Squilchuck Creek and its tributaries. Squilchuck and Lake Creeks are perennial streams currently used to supply water for snowmaking within the existing ski resort boundary and will also supply water for snowmaking at the Site under existing Mission Ridge water right authorizations. Surface water could also be used to supply irrigation water for the Project without the need for treatment if separate systems are constructed for irrigation and domestic water uses.

Water supply Alternatives 1 and 2 involve using an out-of-basin source to supply a portion or all the Project's water system demand. Water supplied by CPUD would come from groundwater wells in hydraulic continuity with the Columbia River.

3.4 Legal Water Availability

In addition to physical water availability, water supply alternatives for the Project must consider legal water availability. Mission Ridge does not plan to seek a new water right appropriation to supply the Project and instead plans to use quantities authorized under water rights in its existing portfolio. There will be no enlargement of existing authorized quantities.

The Mission Ridge water right portfolio includes several water rights having places of use appurtenant to the existing ski resort and Section 19. Attributes of water rights in the Mission Ridge portfolio are summarized in Table 2. Under water supply Alternative 1, these water rights would be used to supply a portion of projected water demand for the Project's public water system estimated at up to 302 gpm (0.67 cfs) instantaneously and 241 ac-ft annually. Mission Ridge estimates that about 90 ac-ft/yr of water system demand may be available using existing water right authorizations in its portfolio authorizing domestic use and by changing some water rights. The balance of water for the Project's public water system demand (about 151 ac-ft/yr) would be supplied by CPUD.

Table 2. Mission Ridge Water Rights and Applications

Document No.	Document Type	Name	Priority Date	Source	Qi (cfs)	Qa (ac-ft/yr)	Purpose
S4-25295C	Certificate	Wenatchee Mountain Inc.	5/23/1977	Squilchuck Crk, Lake Crk, Unnamed Spring	0.45 cfs	11	Commercial (snowmaking)
S4-31615P	Permit	New Mission, LLC	8/25/1993	Squilchuck Crk, Lake Crk, Unnamed Spring	1.4 / 0.1	348 / 10	Commercial (snowmaking)/ Domestic
CS4-CCVOL3P1030	Change ROE	Mission Ridge Mountain Corporation	1/8/1993	Lake Crk	0.1 cfs	2/ 2/ 23	Community Domestic/ Irrigation of 1 acre/Snowmaking
S4-*22348J	Adjudicated Certificate	Landreth Brothers and Inland Timber Co.	1/1/1901	Stemilt Crk	70.14	-	Domestic, Stockwater
S4-*25001JC	Change Certificate	Peshastin Forest Products Corporation	1/1/1870	Unnamed Crk Sect. 19	0.1	-	Irrigation of 5 acres
R4-31616P	Reservoir Permit	Mission Ridge Mountain Corporation	8/25/1993	Squilchuck Crk, Lake Crk, Unnamed Spring	-	300 ac-ft	Storage for Snowmaking
R4-33189	Application	New Mission, LLC	5/24/2017	Squilchuck Crk, Lake Crk, Unnamed Spring	-	300 ac-ft	Storage for Snowmaking

Using the water rights shown in Table 2 to supply the Project's municipal and snowmaking demand will require some attributes to be changed to align legal water availability with Project needs. Mission Ridge intends to seek several changes to water rights. Examples of changes to water right attributes could include adding a purpose of use, changing the season of use, expanding the place of use, and adding wells as authorized points of withdrawal. In Washington State, potential impacts from every proposed water right change are evaluated and mitigated by subjecting the proposal to legal tests demonstrating that the change:

- will not result in enlargement of authorized quantities;
- will not impair any existing water rights;
- is not detrimental to the public interest; and
- will not result in a change of the water source.

Legal availability for water supplied by CPUD is established under existing water rights authorizing its Group A community water system. Extending CPUD water service to Mission Ridge would involve expanding CPUD's water service area. Under the State's Municipal Water Law, Group A water systems may use their municipal use water rights to serve connections anywhere within an approved water service area.

Expanding artificial snowmaking to within the boundaries of the Project will not result in enlargement of existing authorized quantities.

4.0 Potential Impacts of the Proposed Development and Mitigation

This section provides a discussion of potential short-term and long-term impacts to water quantity and quality resulting from the Project and mitigation. Potential impacts can be fully mitigated through compliance with applicable regulations and standard permitting. Additional analysis will be required to meet project-specific permitting and design requirements for stormwater and wastewater facilities.

4.1 Changes to Landcover

Changes to landcover from the proposed development will consist of removal of vegetation exposing bare soil, replanting vegetation, changes to topography (cut and fill slopes), and increased impervious surfaces. With proper mitigation, these changes are not expected to result in decreased groundwater recharge, increased erosion, increased runoff, or mobilization of sediments or contaminants that could impact water resources. Proper mitigation will result in developed conditions that are expected to be consistent with pre-development conditions.

Erosion and Sediments

About one-quarter of Section 19 contains soils classified as having severe erosion hazard. The greatest potential for erosion is in areas cleared of vegetation and where bare soils are exposed during construction and during the first 1-2 years following land clearing prior to groundcover vegetation becoming fully established. Long-term erosion potential is low for areas where soils are fully stabilized following construction. Potential for onsite erosion and transport of sediments off-site during all project phases will be mitigated by:

- Minimizing ground disturbances;
- Avoiding development on steep slopes;
- Implementing Best Management Practices (BMPs) outlined Ecology's *Eastern Washington Stormwater Management Manual* (SMMEW; Ecology, 2019); and
- Complying with conditions of Ecology's Construction Stormwater General Permit (CSWGP) and Chelan County's Stormwater Management Code (SMC; Chapter 13.16).

Runoff and Recharge

About half of land surface in Section 19 is classified as soil having moderately low to moderately high drainage capacities and the balance is classified as rock outcrop having limited drainage capacity (NRCS, 2021). With proper mitigation, impacts to runoff and groundwater recharge resulting from replacement of permeable native soils with impervious surfaces including sidewalks, rooftops, and roadways are expected to be *de minimis*.

Short-term and long-term runoff impacts will be mitigated by designing and constructing stormwater facilities in accordance with the SMMEW and SMC. These require stormwater volumes generated from new impervious surfaces during design storm events to be retained onsite. Proper implementation of flow control BMPs will limit surface water runoff volumes to pre-development levels. Implementation of stormwater infiltration BMPs will minimize impacts to groundwater recharge because stormwater runoff will be infiltrated onsite consistent with pre-development conditions.

Stormwater Quality

Long-term cumulative impacts from trace contaminants have potential to degrade surface water and groundwater quality. Stormwater runoff from new impervious pollution-generating surfaces and landscaping has potential to contain trace amounts of contaminants including heavy metals (roadways and metal roofs); petroleum hydrocarbons, polycyclic aromatic hydrocarbons, pathogens, and road salts (roadways); and phosphorous and nitrogen (runoff from landscaping).

Potential long-term water quality impacts will be mitigated by implementing stormwater treatment BMPs including properly designed and constructed stormwater infiltration facilities in accordance with the SMMEW and SMC. Proper implementation of applicable BMPs will remove target pollutants or reduce their concentrations to levels that will not adversely affect public health, beneficial uses of surface water and groundwater resources, and will not cause a violation of groundwater quality standards.

Potential short-term impacts to water quality from the Project include an unlikely worst-case scenario, such as a spill, that could result in localized release of contaminants into the environment. These impacts will be mitigated during all project phases by implementing BMPs in the SMMEW, complying with the CSWGP and SMC, and through spill response planning and coordination with local emergency management agencies.

4.2 Water Use

The projected annual total demand for the Project's public water system of 241 ac-ft/yr will be supplied by a combination of sources located within the Squilchuck basin and outside of the basin under Alternative 1. Only sources located outside of the basin would be used under Alternative 2. Because substantial water will be imported, both water supply alternatives will result in increased water availability in the Squilchuck basin for instream and out-of-stream uses including irrigation.

Most projected annual water system demand (about 231 ac-ft/yr) is expected be for indoor use at residential and commercial facilities (Table 1). Ecology has established an indoor consumptive use rate of 10 percent (Ecology, 2018). The balance of 90 percent of indoor water use (about 208 ac-ft/yr) will be processed as wastewater that will become return flow to the hydrologic system.

Return flow will consist of groundwater or surface water depending on the wastewater processing systems that will be used (see wastewater discussion below). Most return flow is expected to occur within the Squilchuck basin because most of the Project lies within that basin. A minor portion of the Project's return flow volume could enter the adjacent Stemilt Creek basin if residences planned for that area use individual OSSs.

Assuming up to 90 ac-ft/yr of the Project's water system demand will be supplied from sources located within the Squilchuck basin under water supply Alternative 1, the quantity of water

consumptively used (not returned to the Squilchuck basin) will be no more than about 18 ac-ft/yr (10 ac-ft for outdoor use + 8 ac-ft for indoor use). This quantity is equal to a continuous rate of about 0.02 cfs. By comparison, mean annual flow in Squilchuck Creek estimated at 7.5 cfs. The quantity of water that would be consumptively used is within water right authorizations owned by Mission Ridge.

Importing water from outside the Squilchuck basin will negate any consumptive use losses and augment natural water supplies. Supplying the balance of the Project's water system demand from sources located outside of the basin will result in substantial net water gain from return flows.

Under Alternative 1, CPUD would supply 151 ac-ft/yr (241 ac-ft – 90 ac-ft) for indoor water use resulting in water augmentation of about 136 ac-ft/yr (151 ac-ft x 0.90) or an average continuous rate of about 0.2 cfs. If all water for the Project's water system is supplied by CPUD under Alternative 2, water augmentation to the Squilchuck basin would increase to about 208 ac-ft/yr or 0.3 cfs continuously.

Mission Ridge is coordinating with CPUD to commission an engineering study to determine the feasibility of extending the utility's water service to the Project and identify needed improvements to mitigate any potential impacts to CPUD's water system.

Mission Ridge also plans to expand its artificial snowmaking operation to the Project site using existing water right authorizations. Benefits of snowmaking to water supplies in Squilchuck Creek are specifically recognized by the WRIA 40A Watershed Plan (Chelan County, 2007a). Snowmaking prolongs the spring freshet period by increasing water storage and increasing quantities of cold water infiltrating to groundwater. These effects benefit aquatic habitat, delay mandatory cuts to downstream irrigation rights, delay the need to release cool water from high-elevation reservoirs in the Squilchuck basin until later in the season, and result in additional inflow of cool groundwater to sustain baseflows during late season low flows.

4.3 Wastewater

As mentioned above, the volume of domestic wastewater from indoor residential and commercial uses at full buildout is estimated to total about 208 ac-ft/yr or an average rate of about 190,000 gpd. There is no existing sanitary sewer utility available to serve the Project. The preferred method of wastewater disposal will be determined through engineering study.

Alternatives for conveying, storing, treating, and disposing of wastewater include multiple individual residential OSSs discharging to groundwater, one or more Large OSS (LOSS) discharging to groundwater, and a centralized municipal wastewater treatment plant (WWTP) discharging treated effluent to surface water in Squilchuck Creek.

Contaminants in sewage effluent can include pathogens, nitrate, metals, salts, and other trace quantities of toxic materials. The alternatives listed above for disposing of wastewater from the Project are regulated by state agencies and will require permitting. When properly designed and permitted, these wastewater disposal alternatives will conform to Washington State's water quality standards and antidegradation policies for protecting groundwater and surface water under WAC 173-200 and WAC 173-201A, respectively.

Wastewater disposal alternatives involving discharge of effluent to groundwater will require permitting through DOH in coordination with Chelan-Douglas Health District (CDHD). Analysis will be required to determine minimum lot size for wastewater disposal alternatives involving multiple individual OSSs to avoid loading groundwater with contaminants. Because the estimated effluent rate for the Project exceeds 100,000 gpd, several LOSSs or a combination of a single LOSS and multiple individual OSSs would be needed.

Construction of a WWTP discharging treated effluent to Squilchuck Creek will require a National Pollutant Discharge Elimination System (NPDES) permit administered by Ecology. NPDES permits are required for all discharges to surface water bodies to set discharge limits for pollutants and monitoring and reporting requirements.

5.0 Consistency with WRIA 40A Watershed Plan

Review of the WRIA 40A Watershed Plan indicates that the proposed Project would not be in conflict with desired future conditions, opportunities, and recommendations identified by the Planning Unit. The Project is expected to result in a substantial increase of water supplied to the Squilchuck basin on a continuous basis fulfilling several objectives of the Watershed Plan.

Examples of consistency between the proposed Project and watershed planning documents include:

- The WRIA 40A Water Quantity Assessment found that much of the water used for domestic use returns as groundwater storage and baseflow and that water imported for domestic use increases water availability;
- Watershed Plan Desired Future Condition No. 7 that states “Where feasible, provide domestic water from regional water supply to support future domestic and industrial development in WRIA 40A”;
- Watershed Plan Principal Recommendation Opportunity A-6 that states “Enhance groundwater recharge and baseflow”;
- Watershed Plan Principal Recommendation Opportunity A-8 that states “Evaluate the feasibility of creating domestic water interties to increase the reliability of the drinking water supply”; and
- Watershed Plan Desired Future Condition No. 5 that states “Evaluate artificial snowmaking and reservoir construction at the Mission Ridge Winter Sports Area to determine opportunities for enhancing water delivery in terms of timing and flow in the Squilchuck Creek watershed.”

While the Planning Unit did not address water quality, the Project will be properly permitted and designed to comply with Washington State’s water quality standards and antidegradation policies for protecting groundwater and surface water.

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Limitations

Work for this project was performed for Mission Ridge, LLC and this report was prepared consistent with recognized standards of professionals in the project vicinity and involving similar conditions, at the time the work was performed. No other warranty, expressed or implied, is made by American Land and Water Consulting, LLC.

We appreciate the opportunity to work with you. If you have any questions, please contact Bill Sullivan at (509) 699-0682 or Bill@AmericanLW.com.



Update: 1/20/22

Figure No.

1

Project Site and Vicinity Mission Ridge Expansion

Chelan County, WA
Project No. 21006

-  Proposed Expansion Development Area
-  Proposed Expansion Access Road
-  Existing Ski Resort Well Area
-  Existing Chelan PUD Reservoir

Basemap source: Caltopo

