Appendix D-4

Revised Supplemental Groundwater Resources Impact Assessment

TECHNICAL MEMORANDUM

SUPPLEMENTAL GROUNDWATER RESOURCES IMPACT ASSESSMENT, SHILOH CASINO AND RESORT, WINDSOR, CALIFORNIA

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This technical memorandum presents the methods and results of a supplemental Groundwater Resources Impact Assessment (GRIA) to evaluate potential groundwater-related impacts associated with the Shiloh Resort and Casino Project (Project), proposed by the Koi Nation (the Tribe) of Northern California.

In September 2023, an Environmental Assessment (EA) was prepared for the Project on behalf of the U.S. Bureau of Indian Affairs (BIA) to comply with the requirements of the National Environmental Policy Act (NEPA) (BIA 2023). The U.S. Environmental Protection Agency (EPA), the Town of Windsor, the Santa Rosa Plain Groundwater Sustainability Agency (SRPGSA), Sonoma County, Federated Indians of Graton Rancheria, and private individuals provided comments on the EA in November 2023. This supplemental GRIA has been prepared to further evaluate the potential for groundwater resource impacts associated with the proposed water demand for the Project and will be used as a basis to address concerns related to potential groundwater resource impacts identified in the comments on the EA.

1 PROJECT OVERVIEW AND SETTING

The Project is proposed to be constructed on a 68.6-acre property (the Site) located in unincorporated Sonoma County southeast of the Town of Winsor, California (Figure 1). The Site is currently developed as a vineyard with a single-family residence that is currently used as an office. The Tribe has submitted an application to the BIA to take the land into federal trust status for the benefit of the Tribe. Following acquisition into federal trust, the Tribe proposes to develop a gaming resort facility that includes a casino, hotel, ballroom/meeting space, event center, spa, and associated parking and infrastructure on the property.

Based on a review of historical aerial photographs available on Google Earth, it appears the residence and vineyard were developed in 2003 and 2004. Prior to 2003, it appears that a small orchard was present in the northwest portion of the Site and the remaining area of the Site was undeveloped grassland and trees.

Pruitt Creek, an ephemeral stream that runs northeast to southwest from the Mayacamas Mountains to the Site, generally bisects the property. Stream discharge data are not available for Pruitt Creek; thus, the frequency, duration, and volume of discharge are uncertain. Additional details on Pruitt Creek are provided in Section 4.2.

The Project Site is bordered by Shiloh Road, Esposti Park, and residential properties to the north, vineyards to the east, residential properties to the south and Old Redwood Highway to the west. Residential and commercial properties, a mobile home park, and Shiloh Neighborhood Church are west of Old Redwood Highway. The surrounding area is generally developed for residential, agricultural, and commercial use.

The water demands for the Project Site have been refined from those reported by HydroScience (2023) to better support the impact analysis described herein and are described in Section 3. There are four existing groundwater supply wells located on the Project Site, with pumping capacities ranging from 120 to over 600 gallons per minute (gpm) (HydroScience 2023). In the surrounding area, the Town of Windsor provides water service to the area north of the western portion of the Site. The area north of the eastern portion of the Site, east and south of the Site is served by private domestic and irrigation wells. The area west of the Site is served by several small community water systems.

2 PROJECT DESCRIPTION

The EA evaluated the Proposed Project (Alternative A) and a reasonable range of alternatives including a Reduced Intensity Alternative (Alternative B), a Non-Gaming Alternative (Alternative C) and a No Action Alternative (Alternative D). The focus of this Supplemental GRIA is on evaluating the potential impacts associated with implementation of Alternative A. Groundwater-related impacts associated with Alternatives B and C will be less. Additional details regarding the project alternatives are provided in the EA (BIA 2023). This section describes Alternative A (the Proposed Project), which is further evaluated in the remaining sections of this Supplemental GRIA.

The Proposed Project consists of construction and operation of resort hotel and casino with associated parking and infrastructure southeast of the intersection of Shiloh Road and Old Redwood Highway. The resort facility would be located in the western portion of the Project Site and would include a three-story casino, a five-story, 400-room hotel with a spa and pool area, ballrooms and meeting space, and ancillary parking areas, access roads, landscaped areas and a small vineyard.

The casino and hotel would comprise approximately 538,137 square feet and 268,930 square feet of building space, respectively. Parking would be provided on the ground floor of the casino and in a four-story parking garage and paved surface lot on the east side of Pruitt Creek. An enclosed, clear-span pedestrian bridge would provide access to the hotel and casino from the parking structure and would be constructed without disturbing the bed and banks of Pruitt Creek. Under Alternative A, approximately 46 acres of existing vineyard would be removed to construct Project facilities. The remaining approximately 14 acres of vineyard would be retained.

The potable water demand for the Project would be met by pumping groundwater from up to two new on-site supply wells that would be screened from approximately 400 to 600 feet below ground surface (bgs) in the Santa Rosa Plain groundwater subbasin (HydroScience 2023). The Project non-potable water demand would be met by using recycled tertiary treated water produced by the on-site wastewater treatment facility. Recycled water would be used for toilet and urinal flushing, on-site landscape irrigation, on-site vineyard irrigation and cooling tower makeup water. Efforts are reportedly in progress to develop agreements to provide additional recycled water to vineyards in the Site vicinity.

3 PROJECT WATER BALANCE

The total Project water demand is estimated at 315 acre-feet/year (AFY) and includes both potable and non-potable uses (HydroScience 2023). The potable water demand (supplied by a new well or wells) would be approximately 191 AFY (170,000 gallons per day [GPD]) and the total non-potable water demand (supplied by recycled water) would be 124 AFY (108,000 GPD).

Table 1 describes the well completion details and estimated yields for the existing on-Site wells. Existing groundwater uses at the Site result in a groundwater demand of approximately 34 AFY and include the following:

- Vineyard irrigation, estimated at 0.5 acre-feet per acre based on water duty estimates used by Sonoma County and the Town of Windsor, and consistent with the lower bound of mapped irrigation rates estimated by USGS (Woolfenden and Nishikawa 2014), applied to 59.3 acres during the irrigation season (generally June to October) for a total of 29.7 acre-feet.

- Frost-protection pumping, estimated at 4 acre-feet, based on information provided by the Ranch Manager, Patin Vineyard Management, and applied to the vineyard as needed in March and/or April.

- Domestic well pumping is estimated at 0.5 acre-feet per year based a study of rural domestic water demand by the Water Research Foundation (2016).

The above uses would be discontinued if the Project is constructed, partially offsetting the Project groundwater demand.

As described in the EA, impacts from the Project on groundwater recharge due to land use changes are expected to be less than significant (BIA 2023).[1] This is because the Project will include construction of stormwater retention/detention facilities that maintain the stormwater discharge from impervious surfaces constructed for the Project at rates that are no greater than current levels (HydroScience 2023). As discussed in Section 4.2, the existing vineyard at the Site extracts a significant amount of soil moisture storage derived from local precipitation (approximately 20 inches/year). Because the amount of precipitation and runoff at the Site will remain relatively constant and the amount of consumptive use by

[1] For perspective, soils on the Project Site are classified as Hydrologic Group C, with relatively low permeabilities and slow infiltration rates; therefore, the Project Site is not a significant source of natural recharge (BIA 2023).

vegetation will decrease once the vineyard is removed, there will be an increase in the amount of soil moisture available to move downward through the soil profile and recharge groundwater. As such, it is likely the Project will actually result in an increase in groundwater recharge.

Annual water demands for the existing land uses and the Proposed Project are summarized in Table 2. Existing water demands are described above. Project water demands are taken from Appendix C of the EA (HydroScience 2023).

TABLE 2: EXISTING AND PROPOSED SITE WATER DEMAND AND SUPPLIES

Alternative	Water Uses and Supply Sources	Vineyard Acreage	Estimated Average Annual Supply (AFY)	Estimated Average Annual Demand (gpd)
Existing Land Uses	Vineyard Irrigation, Frost Protection, Domestic Well Use (Groundwater) [1]	59.3	34	30,500
Proposed Project (Alternative A)	Potable Water (Groundwater)	13.7	191	170,000
	Non-Potable Water (Recycled Water)		124	108,000
Total Project Water Demand			**315**	**278,000**

Notes:

1. Irrigation and frost protection water demands are seasonally variable.

4 PROJECT SETTING

4.1 LOCAL WATER SUPPLIES

The Town of Windsor provides water service to the area north of the western portion of the Site. The area north of the eastern portion of the Site, east and south of the Site is served by private domestic and irrigation wells. The area west of the Site is served by several small community water systems. The Town of Windsor's primary potable water supply sources include the Russian River Well Field and Sonoma Water Agency's transmission system via the Santa Rosa Aqueduct (Woodard & Curran 2021). The Russian River Well Field, operated by Sonoma Water Agency since 1984, consists of five production wells that capture Russian River underflow with capacities up to approximately 1,300 gpm. These wells are located outside of the Santa Rosa Plain subbasin boundaries, which is the groundwater basin that the Project is located within (refer to Section 4.4.1). Sonoma Water Agency sources its water from the Russian River and supplements the supply with groundwater pumped from wells within the Santa Rosa Plain Groundwater Subbasin. In addition, the Town of Windsor operates a non-potable irrigation well (the Esposti Irrigation Well) and maintains a standby potable water supply well (the Esposti Park Well), which are located across East Shiloh Road at Esposti Park, northwest of the Project Site (Figure 1). The available construction details for these wells are summarized in Table 1. Finally, Windsor has three additional inactive groundwater wells in the subbasin (Bluebird 1, Bluebird 2, and the Keiser Park Irrigation well). Additional small municipal, irrigation and domestic supply wells are located throughout the surrounding area as described in Section 4.4.3.

The Town of Windsor adopted a Water Master Plan update in 2011 proposing four phases of water system improvements through the year 2040 to address deficiencies and provide for planned future growth (RMC 2011). Included in the 2011 WMP were plans to rehabilitate or replace the Town's existing Esposti Park and Bluebird wells and use them as potable water sources for the Town's water supply system. The WMP proposed to inject water diverted from the Russian River in the winter and extract this water to meet dry season demands using these wells. A Program Environmental Impact Report (PEIR; Horizon 2011) was adopted together with the WMP on September 7, 2011.

In 2019, the Town adopted an additional update to its WMP (Woodard & Curran 2019). In that update, it was noted that since adoption of the 2011 WMP, *"… potable water demands have decreased, so the Town has not moved forward with MAR[2] exploration but has maintained the short-term well replacement projects and continues to investigate options for developing off-river municipal wells."* Thus, injection of Russian River water at the proposed well sites was no longer being considered. Instead, the town proposed moving forward with investigation of the North Windsor well to determine whether development of this supply would require arsenic treatment and considered either installing the North Windsor well or implementing arsenic treatment at the existing Esposti Park well by 2025. By 2030, both wells were proposed to be in service. The 2020 Urban Water Management Plan (UWMP) proposes the use of both the Esposti Park well and the North Windsor well to supplement the town's potable water supply during single-dry and multi-dry years at a rate of 350 AFY, each. It notes planned water quality testing for the North Windsor well to determine next steps for development (Woodard & Curran 2021).

The PEIR adopted for the Town of Windsor's 2011 WMP found that the groundwater level and aquifer sustainability effects from implementation of the proposed groundwater storage and recovery program could be addressed through operational balancing of groundwater injections and withdrawals, and recommended implementation of certain mitigation measures to ensure impacts on groundwater level fluctuations would be less than significant (Horizon 2011). Although the 2019 WMP changed the operational scheme for Esposti Park Well and the North Windsor Well to an extraction-only scheme, the potential drawdown and aquifer effects of operating the wells in this fashion do not appear to have been evaluated in any published studies or CEQA documents.

4.2 SURFACE HYDROLOGY

The Santa Rosa Plain watershed is divided into three drainage areas: Mark West Creek, Santa Rosa Creek, and Laguna de Santa Rosa, which are part of the middle Russian River watershed (USGS 2006; SRPBAP 2014). The Project is within the Mark West Creek subwatershed, which covers 86 square miles in the

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[2] MAR refers to Managed Aquifer Recharge, or in this case the injection of Russian River Water during the wet season for later dry season recovery.

northern part of the Santa Rosa Plain watershed. The Project Site is located in the low-lying, relatively flat, area of the Mark West Creek subwatershed a short distance west of the Mayacamas Mountains.

Figure 2 shows hydrologic features in the vicinity of the Project Site. Mark West Creek, approximately 1 mile to the south, is the only perennial stream in the immediate vicinity of the Project. The Russian River is located more than 4 miles to the west. Numerous intermittent streams and ephemeral drainages are also mapped in the Site vicinity. These streams and drainages originate in the foothills of the Mayacamas Mountains to the east. In addition, a number of ponds, lakes and reservoirs are mapped in the area.

Pruitt Creek generally flows northeast to southwest from the Mayacamas Mountains across the Santa Rosa Plain to its confluence with Pool Creek approximately 1 mile west of the Project Site. The existing topography of the Project Site is relatively flat and generally slopes toward the creek, which bisects the Site from the northeast to the southwest (Figure 2). Pruitt Creek begins in the Mayacamas Mountains, where it and several unnamed tributaries are mapped as intermittent. As described in the Aquatic Resources Delineation Report (Sequioa 2022), Pruitt Creek is considered intermittent on the valley floor because (1) pooled and flowing water in the channel appears to be a result of seasonal rains and not perennial hydrology; (2) significant ordinary high-water mark indicators indicate seasonal flow; and/or (3) background sources (National Wetlands Inventory, National Hydrography Dataset, United States Geological Survey [USGS] topographic maps) indicate seasonal flow. Information provided by Sonoma County suggests a short reach of Pruitt Creek between the Mayacamas Mountains and Faught Road may support perennial flow (Sonoma Water 2023). The available data suggest the creek may be connected to the shallow groundwater table in this area.

In the northeast portion of the Project Site and for a short distance upstream, Pruitt Creek is surrounded by an area of riparian mixed hardwoods that is likely sustained by a number of water sources, including soil moisture derived from seasonal precipitation, streamflow and shallow groundwater. Based on regional groundwater levels, it is unlikely this reach of the stream, when flowing, is groundwater connected. Within the Project Site, the wetted channel of Pruitt Creek is about 3 to 10 feet wide with an active floodplain width of approximately 10 to 30 feet or more (Sequoia 2022). Pruitt Creek enters the Project Site through a box culvert beneath Shiloh Road and leaves the Site as an open channel to the adjacent property before flowing through a box culvert beneath Old Redwood Highway.

Using information derived by the Parameter-Elevation and Regression of Independent Slopes Model, the 30-year average annual precipitation at the Site is approximately 34 inches (PRISM 2024). The average annual evapotranspiration (ET) for the Site from 2018 to 2023 was estimated using OpenET and found to be 26 inches (OpenET 2024). This ET value represents the consumptive demand of water by the vineyard at the Site. Given that the reported irrigation water duty for vineyards in this area is 6 inches, and irrigation occurs during the summer and fall when precipitation is minimal, we conclude that most of the vineyard water demand at the Site is met by soil water storage derived from precipitation. We note that in the absence of the on-Site vineyard some of the soil moisture that is currently being used by the vineyard would percolate downwards and recharge the groundwater table.

4.3 POTENTIAL GROUNDWATER-DEPENDENT ECOSYSTEMS

Reported potential groundwater dependent ecosystems (GDEs) and wetlands near the Project Site are shown in Figure 3. Potential GDEs were identified using the Natural Communities Commonly Associated with Groundwater dataset developed for the California Department of Water Resources (DWR) by The Nature Conservancy (TNC) in cooperation with the California Department of Fish and Wildlife (TNC 2024). Wetland areas were identified using the National Wetlands Inventory (U.S. Fish & Wildlife Service 2024). Additional information considered was derived from the USGS National Hydrography Dataset (USGS 2024), the Aquatic Resources Delineation Report completed by Sequoia Ecological Services (2022), mapping of Public Trust Resource Protection Areas (O'Conner Environmental 2023), mapping of interconnected surface water and GDEs contained in the Santa Rosa Plain Groundwater Sustainability Plan (SRPGSP) (SRPGSA 2022), groundwater level data for monitoring wells at nearby contamination sites (SWRCB 2024), and groundwater level date for monitoring wells near Pool and Mark West Creeks contained in the SRPGSP (SRPGSA 2022).

During preparation of the EA (BIA 2023), four seasonal wetlands, covering an area of approximately 0.019 acres, were identified and delineated on the western edge of the Project Site between the perimeter fencing and the Old Redwood Highway. Topography and vegetation patterns indicate that these wetlands are hydrologically connected to the drainage ditch along Old Redwood Highway and an evaluation of the upland soils suggests the wetlands are at least partially influenced by agricultural irrigation (Sequoia 2022). As explained in the EA (BIA 2023), these would likely revert to upland areas should irrigation cease, indicating they are unlikely to be groundwater connected.

As shown on Figure 3, there are a number of streams, ponds, and wetlands in the general vicinity of the Project Site, but there are no wetlands mapped within or immediately adjacent to the property. The closest mapped aquatic features are two freshwater ponds that appear to be manmade and located north and east of the Project Site. Both freshwater ponds appear to be storage basins associated with vineyards. A freshwater emergent wetland is mapped south-southwest of the Project Site west of Old Redwood Highway. Along Mark West Creek south of the Project Site, there are several freshwater forested/shrub and freshwater emergent wetlands.

The depth to the regional water table documented in shallow monitoring wells at two leaking underground storage tank sites located approximately 1 mile west and 0.8 miles south of the Project Site (see Figure 9) is reported to range from approximately 10 to 25 feet below ground surface (bgs), and to fluctuate approximately 5 to 10 feet (and sometimes up to 20 feet) seasonally (Stratus 2023a and 2023b; SWRCB 2024). In addition, the depth to groundwater at wells SRP0707 and SRP 0165, located near Pool and Mark West Creeks to the north and south of the Project site, respectively is 20 to 30 feet as shown in Appendix 3B of the SRPGSP (SRPGSA 2022). Finally, reported groundwater levels in well completion reports for production wells completed at the Project site are 70 to 80 feet bgs. Modeling results reported in Section 5 indicate that groundwater in the intermediate and deep production aquifers beneath the site are in muted hydraulic communication with shallow groundwater producing simulated groundwater depths of about 20 feet. These data suggest it is unlikely that surface water ponds, emergent wetlands and intermittent streams such as Pruitt Creek in the vicinity of the Project Site are groundwater connected. An exception may be the reported perennial reach of Pruitt Creek extending from the foot of the Mayacamas Mountains approximately to Faught Road (Sonoma Water 2023). Monitoring over a number of years has reportedly confirmed the perennial presence of water where the stream emerges from the mountains. Groundwater would be expected to be shallower along this recharge boundary, so this perennial reach could well be a losing, groundwater connected stream reach that provides mountain front recharge to the subbasin. Additionally, streambed sediments are typically coarser and more permeable where streams emerge from mountain fronts, resulting in rapid infiltration rates and relatively steep groundwater table gradients. Additional monitoring would be required to confirm whether this is the case.

Maps showing interconnected surface water along Pruitt Creek near and crossing the site are included in Section 3.2.6.2 of the SRPGSP (SRPGSA 2022). These maps were prepared from modeling run outputs to estimate the depth to groundwater beneath streambeds and the percentage of time the streams are interconnected. We note that these results are only accurate to the extent the model is calibrated and accurate for the simulated streams. Given that the available groundwater level data near the Project site indicate depths to groundwater are likely from 10 to 30 feet below ground level, it seems unlikely that Pruitt Creek is significantly groundwater connected near the site except for the perennial pools upstream of Faught Creek. Additional monitoring would be required to confirm whether this is the case.

Sonoma County recently conducted a delineation study to identify Public Trust Review Areas (PTRA) to support implementation of the County's Well Ordinance (O'Conner Environmental 2023). Areas were delineated where pumping from new wells could potentially deplete surface water that supports high value aquatic habitat, so that additional review and permitting requirements could be implemented to protect Public Trust resources in these areas. The study identified the area near the Project Site, including the reported perennial reach of Pruitt Creek, as having a low habitat value and a low risk of streamflow depletion. Hence the area was not designated as a PTRA. We note that monitoring observations of this stream reach reportedly identified rainbow trout and Steelhead trout (*Oncorhynchus mykiss*) on several occasions (Sonoma Water 2023). To our knowledge, these sightings have not been confirmed by others, but may indicate a higher habitat value and level of sensitivity.

An area of riparian vegetation mapped as potential GDEs are located along Pruitt Creek in the northern portion of the Project Site and off-site to the northeast (TNC 2024; See Figure 3).[3] These potential GDEs extend for a distance of approximately 0.7 miles from the northeast portion of the Project Site upstream to near the Mayacamas Mountains. Vegetation in this area is identified as consisting of riparian hardwoods, and is dominated by Eucalyptus, Valley oak, Oregon ash, Buckeye, California bay-laurel and Coast live oak, with native and non-native shrubs, grasses and herbs in the understory (Sequoia 2022). In a riparian setting, these species typically derive their water supply from a combination of precipitation, streamflow and, when present, shallow groundwater.

[3] Groundwater dependent vegetation was also mapped in the SRPGSP along Pruitt Creek and presented as Figure 3-19; however, the map is relatively low resolution and appears to duplicate the mapping available from TNC; therefore, it was not relied upon to prepare Figure 3.

Normalized difference vegetation index (NDVI) trend imagery for 1985 through 2022 was obtained from TNC, and trend data from 2008 to 2022 is shown on Figure 3 (TNC 2024). The NDVI trend provides a metric of the change in vegetation health and leaf density over time and indicates that there has been little to no change in vegetation health and leaf density along the Pruitt Creek corridor from 2008 through 2022, indicating that the amount of water available to these potential GDEs has not changed significantly over the long term. A similar result is noted for 1985 to 2022.

4.4 HYDROGEOLOGY

The following describes the hydrogeologic information for the vicinity of the Project Site that forms the basis of a Conceptual Site Model (CSM) used to evaluate the potential effects of groundwater extraction for the Project.

4.4.1 HYDROGEOLOGIC SETTING

The Project Site is located within the Santa Rosa Plain Groundwater Subbasin (Basin No. 1-055.01), the largest subbasin in the Santa Rosa Valley Basin (DWR 2021). The Santa Rosa Valley Basin is located between the Mayacamas Mountains and the Mendocino Range and also contains the Wilson Grove Formation Highlands Subbasin (1-059), Healdsburg Area Subbasin (1-055.02), and the Lower Russian River Valley Subbasin (1-060). Figure 4 shows the hydrogeologic setting and groundwater basins surrounding the Project Site. Table 3 summarizes the subbasin details.

TABLE 3. SUMMARY OF SANTA ROSA PLAIN GROUNDWATER SUBBASIN

DWR Groundwater Basin Number	Approximate Area (square miles)	SGMA Priority	Critical Overdraft
1-055.01	125	Medium	No

Source: DWR 2021
SGMA = Sustainable Groundwater Management Act

The Santa Rosa Plain Subbasin is about 22 miles long and ranges from about 0.2 miles wide at its northern end to about 6 to 9 miles wide in the valley area of the subbasin. It has an estimated groundwater storage capacity of approximately 4,313,000 acre-feet. Groundwater-bearing sediments range in thickness from approximately 50 feet to more than 1,000 feet with an average thickness of about 400 feet (DWR 2004).

The west-northwest striking Trenton Ridge fault (Figure 4) runs diagonally across the middle of the Santa Rosa Plain and divides it into two separate groundwater storage units (Nishikawa 2013). The Project Site is located north of the Trenton Ridge fault and within the Windsor Basin storage unit, which measures approximately 5.5 miles by 7.5 miles, has an overall triangular shape, and is fault bounded to the south and east. As mentioned previously, the Trenton Ridge fault is located to the south and the Healdsburg fault zone is approximately 3,500 feet to the east of the Project Site and is represented as a horizontal flow barrier in a groundwater model developed by the USGS that is further described in Section 5.

The area of the Santa Rosa Plain Subbasin surrounding the Project Site is generally mapped as having a low groundwater recharge potential (SRPBAP 2014). Reports by the USGS indicate that vertical migration of recharge in the Santa Rosa Plain is potentially limited by the presence of low-permeability clays in the Glen Ellen and Petaluma Formations (Nishikawa 2013). Soils underlying the Project Site are generally classified as Hydrologic Group C, which have low infiltration and high runoff potential (BIA 2023).

In the northern part of the subbasin, groundwater generally flows from east to west, away from the Mayacamas Mountains and towards the Santa Rosa Plain (DWR 2004). As described above, vertical groundwater flow is somewhat impeded by the heterogeneous bedding and clays of the alluvial valley fill and Glen Ellen Formation.

Long-term groundwater monitoring in the Santa Rosa Plain Groundwater Subbasin indicates that groundwater levels are relatively stable to increasing, especially in the northern portion of the subbasin, including the area near the Project Site (SRPGSA 2022). The Project Site is not located in an area that is designated as overdrafted, critically overdrafted, or in adjudication (City of Santa Rosa 2021). According to the DWR (2018), in the northern portion of the basin, groundwater elevations fluctuated from approximately 38 to 58 feet above mean sea level (amsl) between 2011 and 2017. Available hydrographs from monitored wells near the Project Site are shown in Figure 5. These wells are completed in the shallow, shallow/intermediate, and deep groundwater zones described in Section 4.4.3, and are generally representative of the groundwater level trends across the major hydrostratigraphic units in the vicinity of the Project Site. The well construction details for these wells are summarized in Table 1. The hydrographs show that groundwater levels fluctuate on an annual basis due to seasonal effects but have remained relatively stable over the period of record. A USGS Scientific Investigation Report also describes groundwater levels in the northern portion of the subbasin as relatively stable with slight increases in some areas (Nishikawa 2013). Seasonal groundwater level fluctuations near the Project Site range from about 5 to 10 feet and can be as much as 20 feet (Figure 5 and Section 4.3).

Hydrographs for representative monitoring point (RMP) wells for which Sustainable Management Criteria have been developed under the local Groundwater Sustainability Plan (GSP) are shown in Figure 6. These hydrographs also show relatively stable groundwater elevations with some seasonal fluctuation, with groundwater levels at or just below the Measurable Objective (MO) set for each well. In general, water levels for the RMP wells were near historical low groundwater levels in 2021, which was classified as a very dry water year. This is likely due to lower recharge and a greater use of groundwater to meet water demands during this drought period. As seen on the hydrographs for SRP0375 and SRP0376, water levels rebounded to the MO after the fall of 2021. These data indicate that groundwater demands are in relative equilibrium with groundwater recharge and fluctuate over the short term but display relatively stable long-term trends. Drawdown during drought periods is offset by groundwater level recovery during normal and wetter years, which is a hallmark of sustainable groundwater management.

4.4.2 GEOLOGIC SETTING

As shown on the geologic map of the Santa Rosa Plain (Figure 7), the Project Site is located within the Windsor Basin structural trough, which is centered near the Town of Windsor. The Windsor Basin is bounded by the Healdsburg fault zone on the east, the Trenton Ridge Fault on the south, and poorly exposed normal faults on the west, and contains basin fill sediments to a depth of approximately 3,000 to 6,500 feet (Langenheim et al., 2008). The Healdsburg fault zone is contiguous with the Rodgers Creek fault zone to the south. These fault zones have a northwest trend and are right-lateral faults that are part of the San Andreas transform system. As noted in Section 4.4.1, a ridge formed by the Trenton Ridge Fault separates the Windsor Basin from the Cotati Basin to the south.

The USGS (Woolfenden and Nishikawa 2014) prepared a geologic cross section south of the Project Site (A to A') (Figure 8). Geologic units that underlie the Project Site include Quaternary alluvial deposits, the Glen Ellen Formation, the Petaluma Formation, and Mesozoic Basement rocks. The Quaternary alluvial deposits generally consist of intermixed clays, silts, sand, and gravels with an estimated thickness of up to 550 feet and are younger than 12,000 years (Nishikawa 2013). The Glen Ellen Formation consists of lenses of poorly sorted alluvial gravel, sand, and clay that are partially cemented (Cardwell 1958). The formation is early Pleistocene to Pliocene in age (approximately 3 to 3.5 million years old) and up to 500 feet thick in the basin (Nishikawa 2013). The Pliocene-aged Petaluma Formation (approximately 5 million years old) was deposited in a continental to shallow marine transitional environment and consists predominantly of silt and clay-rich mudstones with local beds and lenses of poorly sorted sandstones and conglomerates (Nishikawa 2013).

To the east of the Project Site, on the other side of the Healdsburg faut zone and beneath the Mayacamas Mountains, the Sonoma Volcanics overlie the basement rocks. The Sonoma Volcanics are Miocene to Pliocene in age (approximately 2.5 to 8 million years old) and are interbedded with volcaniclastic sedimentary rocks. Estimated to be up to 3,000 feet thick, the Sonoma Volcanics are generally exposed in the Mayacamas and Sonoma Mountains and are found beneath the valley floor, where the unit is interbedded with the Petaluma and Glen Ellen formations (Nishikawa 2013). The bedrock basement of the Santa Rosa Plain Subbasin is formed of Mesozoic aged rocks of the Franciscan Complex, the Great Valley Sequence, and the Coast Range Ophiolite. The Mesozoic basement rocks are not exposed within the Wilson Basin and only found in the western portion and the northeast portion of the Santa Rosa Plain Subbasin. Further descriptions of the geology of the Sant Rosa Plain Subbasin can be found in the GSP (SRPBAP 2014) and the hydrologic properties of the geologic units are described in Section 4.4.3.

The potential for subsidence in the Santa Rosa Plain Subbasin is addressed in the GSP (SRPGSA 2022). In general, changes in the land surface elevation can be a result of tectonic forces, hydraulic isostatic loading, increases in effective stress due to groundwater withdrawals, and other forces. Excessive groundwater pumping can reduce the hydrostatic pressure, which can cause fine-grained materials such as clays to consolidate, resulting in a permanent lowering of the land surface that does not recover after groundwater levels are restored. There is only limited land subsidence data for the Santa Rosa Plain with one station in the Santa Rosa Plain. The station recorded a positive change in land surface elevation of 0.01 inches from 2005 to 2019, corresponding to an annual increase in land surface elevation of 0.003 inches (SRPGSA 2022).

Another study assessing the Rodgers Creek Fault for evidence of creep indicated evidence of potential subsidence and uplift in the southern portion of the Subbasin that may be related to groundwater pumping (Funning *et al.* 2007; Jin and Funning 2017). The area and timing of subsidence correlate with groundwater level declines and recovery. Groundwater levels declined due to an increase in municipal groundwater pumping and then recovered as municipal pumping was reduced. This data indicates that the southern portion of the Santa Rosa Plain Subbasin has experienced minor elastic subsidence that has not caused permanent consolidation of the fine-grained units in the aquifer system.

Recent spatial variance of ground surface change data collected by DWR using Interferometric Synthetic Aperture Radar (InSAR) show insignificant land surface elevation change from 2015 through 2018 in the vicinity of the Project site (SRPGSA 2022).

4.4.3 HYDROSTRATIGRAPHIC UNITS

The three principal water-bearing geologic units present in the vicinity of the Project Site are the Glen Ellen Formation, Petaluma Formation, and Sonoma Volcanics. They are overlain by Quaternary Alluvium, which provides some water to shallow wells. The underlying basement rocks are not considered a significant supply source in the subbasin. A USGS groundwater modeling report for the Santa Rosa Plain watershed describes the Glen Ellen Formation as heterogeneous and variable in thickness, typically hundreds of feet thick (Woolfenden and Nishikawa 2014). Similarly, the Santa Rosa Plain GMP notes that the Glen Ellen Formation is approximately 100 to 150 feet thick in the Windsor hydrogeologic subarea and is underlain by the Petaluma Formation, except at the western edge of the subbasin. Deposited in the late Tertiary Period, the Petaluma Formation is the deepest and thickest aquifer in the region, reaching depths of at least 2,000 feet in the Windsor subarea (SRPBAP 2014). On the eastern side of the Windsor subarea, the Miocene-Pliocene-age Sonoma Volcanics interfinger with the Petaluma Formation.

Local hydrostratigraphic information indicates varying interpretations regarding the depth of the Glen Ellen Formation near the Project Site. Boreholes drilled for the Esposti Park and Bluebird wells to 1,040 feet and 867 feet, respectively, did not encounter marker beds for the top of the Petaluma Formation (RMC 2010). Reports by RMC (2010) and GHD (2017) therefore concluded the Glen Ellen Formation is deeper than shown in the USGS cross-section in Figure 8. Because these wells are located relatively close to the Project Site (0.3 miles and 1.8 miles, respectively), the boring logs provide the most useful information for delineating the local groundwater-bearing zones, and the attribution of these sediments to specific formations is of little importance. For the purposes of this analysis, the following major hydrostratigraphic units in the vicinity of the Project Site were identified. These designations represent the upper 1,000 feet of the stratigraphy in the basin, are consistent with hydrogeologic reports prepared for the Town of Windsor, and are a further refinement of the groundwater zones described in the EA.

- **Shallow Zone (first water to approximately 120 feet bgs):** Comprised of sand and gravel with interbeds of sandy clay. (The Shallow Zone is referred to as the water table zone elsewhere in this GRIA, and is simulated using model Layer 1 in Section 5.)

- **Intermediate Zone (approximately 130 to 350 feet bgs):** Comprised of sand and gravel with some volcanic ash and interbeds of silty to sandy clays. This hydrostratigraphic zone is separated from the overlying shallow zone by a clay to silty clay aquitard occurring from approximately 120 to 130 feet bgs that is assumed to be laterally continuous near the Project Site based on the available well log data. (The Intermediate Zone is simulated using model Layer 3 in Section 5.)

- **Deep Zone (greater than 350 feet):** Comprised of sand and gravel with interbedded clay and sandy clay and separated by a sandy clay aquitard of variable thickness occurring from approximately 335 to 380 feet bgs that is assumed to be laterally continuous near the Project Site based on the available well log data. (The Deep Zone is simulated using model Layers 4, 5 and 6 in Section 5.)

Construction details for wells near the Project Site show water supply wells completed in the shallow, intermediate, and deep zones (Table 1). In general, domestic wells in the area tend to be screened in the shallow and intermediate zones, while municipal and irrigation wells are completed in the intermediate and deep zones. Many of the wells are screened across multiple groundwater zones (Table 1). Figure 9 shows the locations of the wells summarized in Table 1 in addition to several shallow monitoring wells not included in the table. Finally, well completion depth statistics from DWR for domestic wells in the nine PLSS sections near the Project Site are shown in Figure 10 to provide an overview of the density and depths of domestic wells and depths in the region. It should be noted that some domestic wells reportedly extend into the deep zone in this area; however, the shallow and intermediate zones are the primary domestic water source in the region, and the average domestic well depth is in the intermediate zone.

A major structural feature important to the CSM of the area is the Healdsburg Fault, which forms the eastern boundary of the Windsor subbasin (HydroScience 2023). The Healdsburg Fault is an active strike-slip fault bordering the foothills of the Mayacamas Mountains and is the northward extension of the Rogers Creek Fault Zone (RMC 2010). As is typical for similar faults in the region, offset of sedimentary beds and formation of fault gouge is reported to impede groundwater flow; the USGS groundwater model for the Santa Rosa Plain watershed simulates the fault as a horizontal flow barrier (Woolfenden and Nishikawa 2014).

4.4.4 AQUIFER PROPERTIES

The USGS modeling report for the Santa Rosa Plain watershed describes the aquifer properties of the water-bearing formations in the vicinity of the Project Site based on regional data and previous studies (Woolfenden and Nishikawa 2014).

To validate the aquifer parameters used in the USGS model in the area near the Project Site, the following key reports and data were reviewed and compared to the USGS data:

- GHD, 2017. Town of Windsor and Windsor Water District Esposti Supply Well Redevelopment, Pump Test, and Treatment Feasibility Study. Dated October 3.

- SRPGSA, 2022. Groundwater Sustainability Plan for the Santa Rosa Plain Subbasin.

- RMC, 2010. Windsor Groundwater Well Installation and Testing Project Summary Report. Prepared for the Town of Windsor in association with E-Pur. September.

- DWR, 2004. California's Groundwater Bulletin 118, North Cost Hydrologic Region, Santa Rosa Valley, Santa Rosa Plain Subbasin. Updated February 27.

- Well Completion Reports reporting specific capacity test results for wells near the Project Site completed in the shallow and intermediate water-bearing zones.

Aquifer parameter estimates pertinent to the geologic units and the model layers in the vicinity of the Project Site are summarized in Table 4. Hydraulic conductivity (K) estimates for the Alluvium range from 2 to 51 ft/day, which is consistent with the USGS model values assigned to Layer 1. For the Glen Ellen Formation, K was reported to range from 13 to 23 ft/day by Woolfenden and Nishikawa (2014) and a wide range of transmissivity values has been estimated from other data sources. Model Layers 3-8, which appear to represent the Glen Ellen Formation, are generally within these reported ranges, with a few high outliers. Similarly, the range of transmissivity values for the Petaluma Formation reported by Wolfenden and Nishikawa (130 -1,600 square feet per day [ft^2/day]) is consistent with the deeper layers of the USGS model.[4]

As a result of its pumping test at the Esposti Park well, RMC (2010) concluded that the intermediate the intermediate and deep zone in the vicinity of the well are likely isolated from the shallow zone by an aquitard. This conclusion was based on a lack of drawdown in the nearby Esposti Park non-potable irrigation well and Mobile Home Estates well after 32 hours of pumping. We note that it can be difficult to infer the competence of an aquitard to isolate an overlying aquifer from pumping in the aquifer beneath it based on a relatively short-term pumping test. To that end, we note that the modeling analysis conducted for this GRIA and discussed in Section 5 suggests that drawdown would have been observed if the test were extended for a longer period of time. As such, while several clay layers appear to exist that can be correlated across several wells in the area, their effectiveness to isolate the shallow zone from underlying pumping cannot be confirmed at this time.

[4] Data for these deeper aquifer layers are not summarized in Table 4 because they are well below the completion depths of interest to this evaluation. The reader is referred to Wolfenden and Nishikawa 2014 for additional information.

TABLE 4: REPORTED HYDRAULIC PROPERTIES

Hydrostratigraphic Unit	Reference Source	Hydraulic Conductivity (ft/d)	Transmissivity (ft^2/d)	Transmissivity based on Sc[1] (ft^2/d)	Storativity	Specific Yield (%)
Alluvium	Woolfenden and Nishikawa 2014	*Not Reported*				
	Santa Rosa Plain GSP	2 – 51			0.0013 – 0.19	
	DWR 2004					8 – 17
Shallow-Intermediate	Well Development (08N09W13A002M)			27		
Shallow-Intermediate	Well Development (Esposti Irrigation)			769		
Intermediate	Well Development (4820/Well #2)			67		
Glen Ellen Formation	Woolfenden and Nishikawa 2014	13 – 23				3 – 7
	Kadir and McGuire (1987)	5	785			
	RMC 2010		96 – 3,850			
	DWR 2004			<2,675		
Intermediate-Deep (Glen Ellen Formation)	Well Development (3925/Well #3)			698		
Deep (Glen Ellen Formation)	Pump Test (Esposti Park)	6.3	555			
Petaluma Formation	Woolfenden and Nishikawa 2014		130 – 1,600			
	Santa Rosa Plain GSP					3 – 7
Sonoma Volcanics	Woolfenden and Nishikawa 2014		0.8 – 5,300			0 – 15

USGS Santa Rosa Plain Hydrologic Model (SRPHM)[2]	**Hydraulic Conductivity (ft/d)**		**Transmissivity (ft^2/d)**	**Transmissivity based on Sc[1] (ft^2/d)**	**Storativity**	**Specific Yield (%)**
SRPHM Layer	*Mean K_h*	*Geomean K_h*	*Geomean*	*N/A*	*Mean*	*Mean*
Layer 1	9.9	1.9	171.1		0.13	13.5
Layer 2	0.8	0.25	12.4		8.65E-05	9.6
Layer 3	6.0	0.6	122.2		3.57E-04	9.9
Layer 4	3.5	0.3	19.3		1.22E-04	8.5
Layer 5	2.4	0.1	18.3		2.55E-04	8.4
Layer 6	1.0	0.05	6.3		2.40E-04	8.6
Layer 7	0.6	0.02	2.8		2.04E-04	12.8
Layer 8	0.4	0.01	1.35		2.55E-04	4.5

Notes:

1. Sc – specific capacity. Transmissivity based on specific capacity was estimated using empirical relationships from Driscol (1986).
2. Woolfenden and Nishikawa (2014). Model parameters were extracted and summarized for the area of interest.

5 EFFECTS ANALYSIS

5.1 OVERVIEW OF MODELING APPROACH

The Santa Rosa Plain Hydrologic Model (SRPHM) developed by the USGS (Woolfenden and Nishikawa 2014) formed the underlying model architecture to assess drawdown impacts of the Project. The model grid of the SRPHM was locally refined around the area of interest. Current understandings of local hydrogeology from investigations performed for the Town of Windsor wells incorporated into the refined model. Proposed Project and Cumulative Impacts pumping scenarios were simulated using a comparative superposition-based approach to assess drawdown spatially and temporally over the model domain.

5.1.1 CONCEPTUAL APPROACH

To assess the effects of Project pumping, a superposition-based modeling approach was used whereby model results are compared to an initial baseline condition to estimate the drawdown induced by additional well pumping. Superposition modeling is a widely used approach when evaluating the effects of a project or action (Reilly et al.1987). When using this approach, a model is run twice, once with the action being evaluated and once without, and the two results are superimposed and subtracted. The result is a simulation of the change induced by the simulated action or actions, with the absolute values in each run. Mathematically, this approach can to some extent “subtract out” or lessen the errors that are inherent in any model by focusing on the change in water levels rather than prediction of absolute values.

The baseline condition was generated by retaining all the water budget inflows and outflows incorporated into the USGS model and adding the seasonal pumping of the three on-Site irrigation and frost-protection wells and one on-Site domestic well. These baseline conditions were simulated using the USGS historical 35-year modeling period to allow conditions to stabilize and reach a steady state. The 2010 model results were then used as a steady state condition to generate a 50-year baseline model.

To simulate Project pumping, a Project forecast scenario was run in which the existing on-Site wells were replaced by the proposed Project pumping conceptualized as a single new well at the location on the east side of the Project Site proposed by HydroScience (2023). The new well was pumped at a constant rate equal to the Alternative A groundwater demand. The simulated pumping was started at the end of the baseline simulation and carried forward for a 50-year forecast period to simulate Project effects over the planning horizon specified in SGMA (California Water Code §10721(r)).

To simulate cumulative impacts, a forecast scenario was run which added pumping two new municipal wells described in the Town of Windsor 2020 UWMP (Woodard & Curran 2021). Consistent with the operating strategy for these proposed municipal wells presented in the UWMP, they were simulated to be operated only during dry years. The number and timing of dry years during which pumping occurred followed a climate change simulation scenario included in the USGS model.

The impact assessment model used in this GRIA includes the following simplifying assumptions:

- First, the constant baseline conditions, while appropriate for a relative comparison of drawdown impacts, do not provide a representative basis for predicting actual potentiometric heads across the region of interest. Rather, the superposition approach focuses on understanding the response of the system to changes in the baseline conditions induced by additional pumping.

- Second, the hydraulic properties of the lithologic units represented in the USGS SRPHM were assumed to be generally appropriate for the local area of interest. Minimal refinements to the hydrostratigraphy were incorporated, as described in Section 5.4 (i.e., addition of a clayey aquitard layer). Available reported data within the Project vicinity was used to verify the overall hydrostratigraphic conceptual model and properties. This was considered sufficient for the purpose of evaluating the likely Project and cumulative impacts.

- Finally, the simulated dry periods represent hypothetical forecasts based on data from the GSP and climate change scenarios used in Woolfenden and Nishikawa (2014). We did not alter any groundwater inflows or outflows other than pumping. This is an acceptable simplification when using a superposition modeling approach.

5.1.2 MODELING CODE SELECTION

The SRPHM was developed to help manage the hydrologic resources of the Santa Rosa Plain watershed (Nishikawa 2013; Woolfenden and Nishikawa 2014). The SRPHM couples the modeling codes GSFLOW and MODFLOW to simulate interactions between surface-water and groundwater from 1975 to 2010, as well as several projected climate scenarios. The setting of the SRPHM encompasses the Project Site and provides a basis for the hydrogeologic conditions to be simulated for the Project lifetime. The Python package FloPy was used to extract inputs and outputs from the original SRPHM and refine the area of interest for the Proposed Project and Cumulative Impact forecast scenarios. FloPy is an opensource set of Python scripts to run MODFLOW and related groundwater programs, offering both flexibility and transparency within the groundwater modeling process (Hughes et al. 2023; Bakker et al. 2016)

5.2 MODEL DOMAIN AND DISCRETIZATION

The SRPHM domain spans the Santa Rosa Plain Watershed. For this supplemental GRIA analysis, a localized child model was subdivided into the northwestern portion of the SRPHM. The active extent of the parent model follows that of the Santa Rosa Plain Groundwater Basin to the north and is truncated to the south and east approximately 6 miles from the Project Site (Figure 11). The active extent of the child model measures 3.75 miles (west to east) by 4.25 miles (north to south) and is centered a short distance northwest of the Project Site to optimize evaluation of drawdown within the basin fill between the proposed North Windsor Well on the north and Mark West Creek on the south.

The original horizontal grid cell size of the SRPHM was retained in the parent model and is discretized spatially into a rectangular grid with uniform cell size of 660 ft by 660 ft (10 acres). Using the Local Grid Refinement (LGR) MODFLOW module, the child model area was further discretized into 132-ft by 132-ft grid cells (5x refinement). The two lowermost model layers of the 8-layer SRPHM model were removed from the parent and child models because they are substantially deeper than the aquifers of interest to this study. Evaluation of local boring logs from within the child model area indicated the consistent presence of a confining layer in the upper portion of Layer 3. Therefore, the child model grid was vertically refined, and a 20-ft thick layer (Layer 3a) was delineated to simulate this aquitard and reflect the local hydrostratigraphic conditions as illustrated in Figure 12.

5.3 BOUNDARY CONDITIONS

Boundary conditions at the edges of the parent model were established from the output of the 35-year SRPHM simulation by the USGS and are represented as constant head cells. The purpose of the outer boundary is to approximate far-field basin inflows, which in turn inform boundary flows into and out of the child model domain. The parent-model constant head boundary cells represent the SRPHM model-calculated heads for September 2010. The child model is bounded by a groundwater exchange boundary condition that calculates flows between the parent and child domains. The LGR module and groundwater exchange modules run the separate parent and child models concurrently to provide updated boundary conditions at the child model boundaries. The outside of the active lateral extent of the SRPHM and the bottom of Layer 6 were simulated as no-flow boundary conditions.

Recharge and evapotranspiration conformed to net recharge values calculated from the SRPHM model output for September 2010. Within the SRPHM, net recharge from the unsaturated zone is calculated from the budget components of the coupled GSFLOW-MODFLOW model. Accordingly, net recharge (net groundwater flux) incorporates fluxes from the unsaturated to saturated zones (i.e., groundwater inflows from soil moisture and stream seepage, and outflows from evapotranspiration and discharge to the soil zone or land surface; Woolfenden and Nishikawa 2014). For the purposes of this analysis, net recharge values were interpreted as either groundwater recharge or evapotranspiration varying spatially over the model domain but held constant at 2010 rates throughout the simulation.

5.4 HYDRAULIC PROPERTIES

Simulated hydraulic properties, including hydraulic conductivity, storage, and anisotropy ratios were consistent with the Windsor Basin Model Storage Unit of the SRPHM, with the exception of an added aquitard layer in the child model domain. Lithologic logs from the Bluebird and Esposti Park wells identify an approximately 20-foot thick sandy-clay aquitard between approximately 345 and 365 feet bgs (RMC 2010). This aquitard unit was designated Layer 3a, as noted in Section 5.2, and assigned a hydraulic conductivity of 1 ft/day and a vertical anisotropy ratio of 400. A cross-valley hydrostratigraphic section through the child model domain along the cross-section line A-A' (Figure 11) is shown in Figure 12.

The top three layers of the model were specified as convertible within the Node Flow Property MODFLOW package. Convertible layers transition from confined to unconfined aquifers if the head drops below the layer top elevation. Layers 4, 5 and 6 were simulated as confined.

A single fault, the Healdsburg Fault, was simulated east of the Project Site using the Horizontal Flow Barrier MODFLOW package. The barrier properties conformed to those used within the SRPHM; hydraulic characteristic of 1e-20 (1/day), assuming a standard fault width of 1-foot.

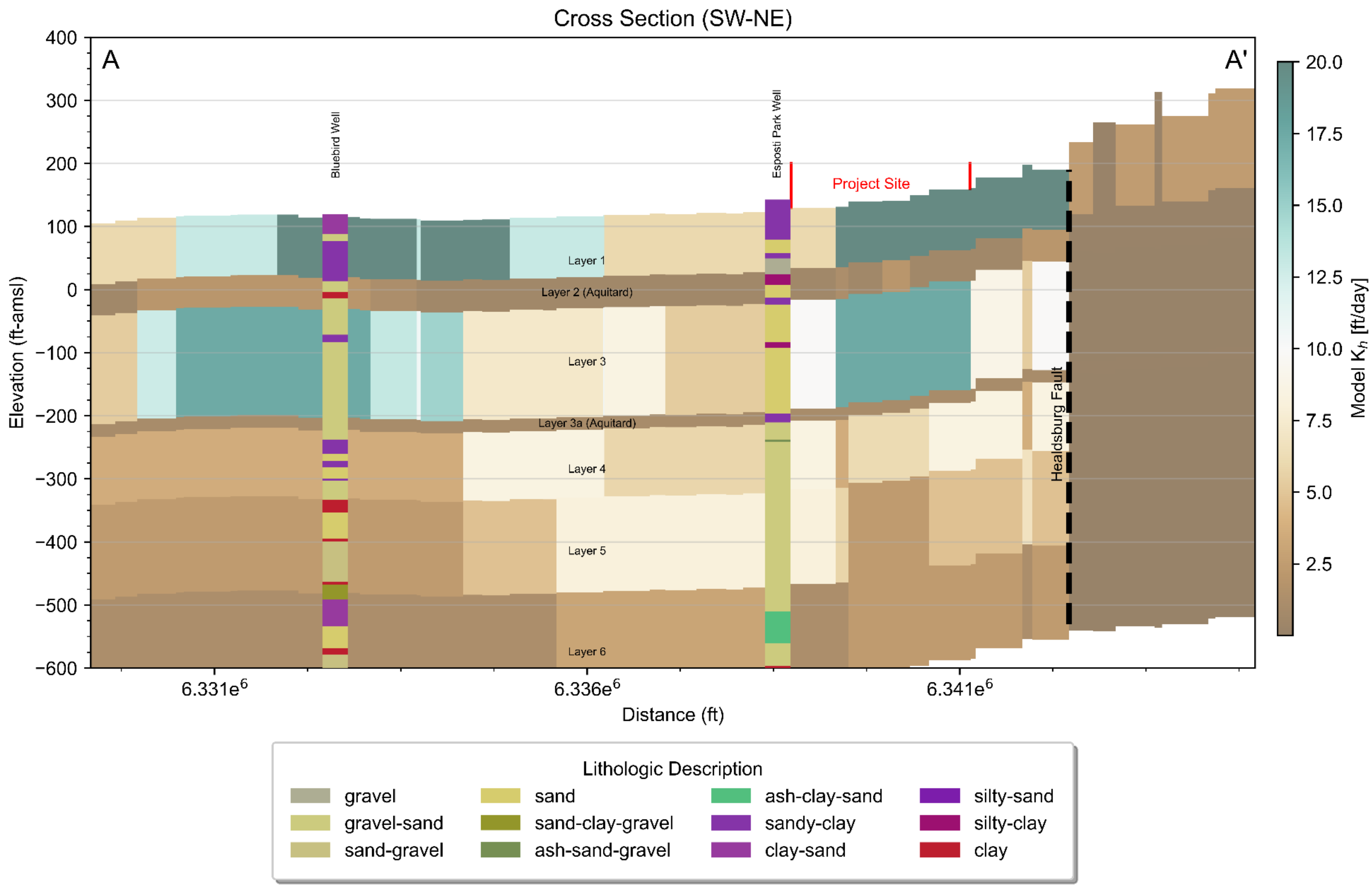

FIGURE 12: MODEL CROSS SECTION AND LOCAL LITHOLOGIC LOGS

5.5 STRESS PERIODS AND MODEL INPUTS

The baseline conditions simulation was conducted over a 50-year period and included existing on-Site pumping at the rates discussed in Section 3. All other model conditions were identical to those used to simulate the Proposed Project and Cumulative Impact forecast scenarios. Modeled pumping rates were simulated in as follows:

- Irrigation pumping was simulated from Well #1, pumping from Model Layers 3 and extracting a total of 29.7 acre-feet from June to October (5-months) each year.
- Frost-protection pumping was simulated in April each year, extracting a total of 4 acre-feet split equally between Well #1, Well #3 (pumping from Model Layers 3, 4 and 5) and Well #4 (pumping from Model Layer 3).
- Domestic pumping was simulated from Well #2, pumping from Model Layer 3 at a constant rate of 0.5 acre-feet per year.

Proposed Project and Cumulative Impact forecast scenarios were also simulated over a 50-year period. For the Proposed Project forecast scenario, only the proposed new on-Site well was simulated as pumping at a constant rate of 190 AFY within Layers 4 and 5 (refer to Figure 12 for model layers in cross-section).

The Cumulative Impact forecast scenario defined five distinct dry periods over a 50-year period to simulate the additional pumping from new municipal supply wells installed by the Town of Windsor and operated during drought years at a rate of 350 AFY each as specified in the Town's 2020 UWMP (Woodard & Curran 2021). Based on the SRPHM climate change simulations and inputs developed by the USGS, the frequency of drought periods is expected to increase with climate change; the frequency of dry periods simulated in the Cumulative Impacts forecast scenario approximately mirrors that used in the SRPHM high-emissions climate change scenario. The 30-year forecast period from the SRPHM was extended to 50 years using the simulated groundwater recharge for future climate predictions for high emission scenarios (Woolfenden and Nishikawa 2014, Chapter E, Figures 1c and 1d). Between September 2010 and 2060, five drought periods were simulated by the PA2 high emissions climate scenario. Drought periods were assumed to occur when annual recharge was less than 30,000 AF across the original SRPHM domain (Woolfenden and Nishikawa 2014). The frequency and approximate timing of drought periods from the PA2 scenario were then used to produce plausible future climate conditions to simulate the Town of Windsor's drought mitigation plan.

During the Cumulative Impact forecast scenario, the Town of Windsor's Esposti Park Well (which is expected to be brought online within the next several years) and the proposed North Windsor Well (which remains to be installed) are simulated to pump at a rate of 350 AFY during dry years. The pumping of these wells is simulated in addition to the constant pumping of the Project well at 190 AFY. The North Windsor Well was simulated within Layers 4 and 5 in the vicinity of Hiram Lewis Park. Hiram Lewis Park is one of two potential locations proposed for the North Windsor Well in the 2019 WMP update and is slightly closer to the Project Site than the alternative location off U.S. 101 south of Arata Lane. Because final design and construction of the North Windsor Well has not yet occurred, the depth of the screened interval was assumed to be the same as the existing Esposti Park Well. Figure 13 shows the pumping schedule for the Cumulative Impacts scenario.

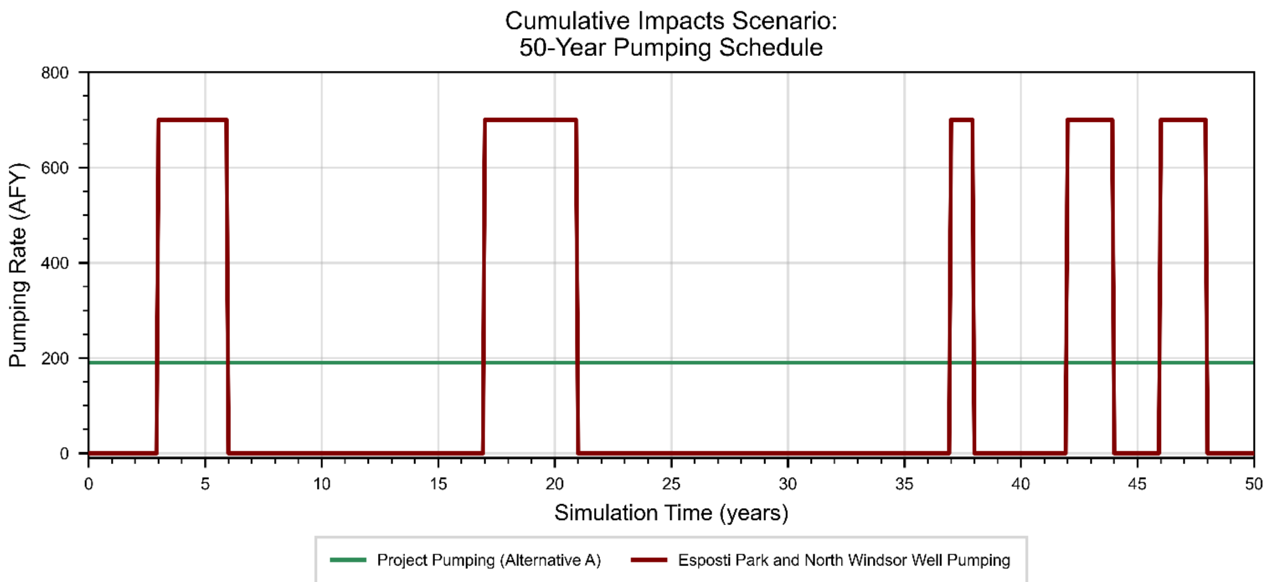

FIGURE 13: CUMULATIVE IMPACTS SCENARIO PUMPING SCHEDULE

5.6 OBSERVATION POINTS

Several observation points were simulated within the model to evaluate drawdown at locations and depths of interest. The locations of the observation points at which simulated drawdown data were extracted are shown in Figure 14 and Figure 15. Figure Three points covering the upstream, midstream, and downstream sections of the Pruitt Creek GDE were placed in Layer 1 to evaluate pumping effects on the local water table and possible stresses to groundwater-dependent vegetation. Additional observation points were established to assess potential interference drawdown impacts to existing nearby wells, including the nearest potential location of a domestic well, the nearest existing off-Site irrigation well, the Town of Windsor Bluebird Well and Esposti Park, the closest Representative Monitoring Well established for GSP compliance (SRP0376, Well #13 on Figure 9), and the nearest supply well for the Mobile Home Estates small community water system west of the Project Site (Well #17 on Figure 9). The domestic well observation point was inferred as the nearest potential location of a domestic well serving the residential area located north of the eastern portion of the Project Site across Shiloh Road. Since details regarding the completion depths of domestic wells in this area were not available, we assessed drawdown impacts at three observation depths representing the average, minimum, and maximum well depths reported by DWR in the PLSS section containing the Project Site (DWR 2024). Simulated drawdown at these observation points is discussed in Section 5.7 below.

5.7 DRAWDOWN RESULTS

5.7.1 PROPOSED PROJECT SCENARIO

The lateral extent of predicted drawdown at the water table (Model Layer 1) at the end of the 50-year simulation under the Proposed Project forecast scenario is shown on Figure 14. The maximum predicted drawdown at the water table at the Project Site is approximately 1.6 feet. The spatial extent of drawdowns greater than 1 foot extends in a north-northwest to south-southeast oriented oblong centered on the Project Site along the western side of the Healdsburg Fault and measuring approximately 1.5 wide by 4.5 miles long.

The lateral extent of drawdown in the pumped aquifer (Model Layer 5) at the end of the 50-year simulation is shown on Figure 15. The maximum drawdown at the Project Site is predicted to be less than 10 feet. Drawdown exceeding 5 feet is predicted to occur in an approximately circular cone of depression extending radially from the simulated well and extending approximately 0.25 mile west, 0.45 mile east, and approximately 0.35 miles north and south. Predicted drawdown decreases to less than 2 feet at distances ranging from approximately 1.0 to 1.8 miles from the simulated well.

Table 5 summarizes the predicted drawdown effects over time at the observation points described in Section 5.6 and shown on Figure 15. Simulated drawdown effects initially occur rapidly: approximately 60 to 90 percent of drawdown is predicted to occur within one month, and over 99 percent of drawdown is predicted to occur after one year. As summarized in Table 5, drawdown effects for the nearest potential domestic well location were predicted to stabilize at 2.89, 1.63 and 8.01 feet for the average, minimum and maximum reported domestic well completion depths, respectively. The maximum predicted drawdowns at nearby existing municipal/small community) supply and irrigation well locations range from 2.57 to 9.23 feet (for the Mobile Home Estates small community water system well and the irrigation well located on the parcel east of the Site, respectively). The simulated maximum drawdown at the water table at the simulated GDE observation points ranges from 1.58 to 1.62 feet.

As discussed in Sections 5.2 and 5.4, a 20-ft thick aquitard layer (Layer 3a) was incorporated in the child model domain to reflect the local hydrostratigraphic conditions. To test the effects of the aquitard on drawdown, the Project pumping simulation was also run without the aquitard and the results compared. The aquitard had a general muting effect on drawdown communicated upwards from the intermediate and deep zone to the shallow aquifer system. At the water table in the vicinity of the Project site, this muting effect decreased predicted drawdown by less than 20%.

TABLE 5: SIMULATED DRAWDOWN AT OBSERVATION POINTS - PROPOSED PROJECT SCENARIO

Time since Start of Pumping	Scenario: Preferred Alternative	Predicted Drawdown at Observation Point (feet)										
	Location	GDE Upstream	GDE Midpoint	GDE Down-stream	Esposti Park Well	Mobile Home Estates Well (Well #17)	Nearest Irrigation Well	Hypothetical Average Domestic Well	Hypothetical Shallow Domestic Well	Hypothetical Deep Domestic Well	RMP SRP0376 (Well #13)	Bluebird Well
	Model Layer	Layer 1	Layer 1	Layer 1	Layer 5	Layer 3	Layer 6	Layer 3	Layer 1	Layer 5	Layer 4	Layer 6
	Depth Range (feet-bgs)	*0 to 96*	*0 to 96*	*0 to 94*	*446 to 596*	*146 to 318*	*596 to 746*	*146 to 318*	*0 to 96*	*446 to 596*	*338 to 446*	*596 to 746*
1 month		1.01	1.00	0.98	2.49	1.76	8.24	2.05	1.02	7.06	1.04	0.73
6 months		1.55	1.56	1.53	3.31	2.51	9.15	2.82	1.58	7.94	1.74	1.38
1 year		1.58	1.59	1.56	3.35	2.54	9.19	2.86	1.61	7.98	1.77	1.41
5 years		1.60	1.60	1.57	3.37	2.56	9.21	2.87	1.62	8.00	1.78	1.42
25 years		1.61	1.61	1.58	3.38	2.57	9.22	2.89	1.63	8.01	1.79	1.43
50 years		1.61	1.62	1.58	3.38	2.57	9.23	2.89	1.63	8.01	1.80	1.43

5.7.2 CUMULATIVE IMPACTS SCENARIO

Figure 16 shows the results of the Cumulative Impact forecast scenario at the end of the 50-year simulation period and the maximum predicted drawdown, which occurs after multiple dry years. This scenario simulates pumping of the Town of Windsor Esposti Park and North Windsor wells at 350 AFY each during dry and critically dry years (Woodard & Curran 2021) in addition to pumping for the Project. At the end of the 50-year simulation, the drawdown at the water table and in the pumped aquifer is predicted to be similar to the drawdown predicted under the Project forecast scenario. This appears to be because the simulation ends after a period of non-drought conditions and water level recovery occurs relatively quickly in the groundwater system. However, at the end of multiple dry years, the magnitude of drawdown and the affected area increases across the model domain. At the water table, an elongate area of drawdown exceeding 5 feet measuring about 1 mile by 5 miles is predicted to predicted to extend along the west side of the Healdsburg Fault from about 1 mile southeast of the Esposti Park well to slightly under 1 mile northwest of the North Windsor Well. Drawdown exceeding 2 feet is predicted to extend for approximately another 1 to 2.5 miles outside of this area. In the pumped aquifer, drawdown cones exceeding 15 feet are predicted to form around the North Windsor Well, the Esposti Park Well and Project well, and the area of 10 feet of drawdown is predicted to extend approximately 1 by 1.5 mile around the North Windsor Well and 1.5 by 2 miles around the Esposti Park Well/Project well. An area of drawdown exceeding 5 feet measuring approximately 3 miles by 6 miles is predicted to encompass each of the above wells and most of the Town of Windsor.

Given the drawdown results observed in the Project Cumulative Impacts scenario described above, a Baseline Cumulative Impacts scenario was also simulated based on pumping of the Town of Windsor Wells only to differentiate the effects of Town of Windsor pumping from Project pumping. Figure 17 shows a comparison between the Baseline Cumulative drawdown and Project Cumulative drawdown results after multiple dry years. The simulated 4-ft drawdown contour in Layer 1 in the Baseline Cumulative scenario extends almost to the northern boundary of the Project, demonstrating the impact of Town of Windsor pumping only accounts for a large portion of the predicted drawdown shown in the Project Cumulative scenario. In Layer 5, drawdown is predicted to be less than 20 feet from either the Town of Windsor alone or the combined Town and Project pumping during dry years.

Table 6 summarizes the predicted drawdown effects for the observation points described in Section 5.6 under the following conditions:

- Cumulative drawdown effects of Project and Town of Winsor pumping after 50 years;
- Cumulative drawdown effects of Project and Town of Windsor pumping after multiple dry years; and
- Drawdown effects induced by the Town of Windsor pumping after multiple dry years.

The data presented in Table 6 show that the magnitude of drawdowns at the observation points after several dry years is significantly higher than Project drawdown alone. Cumulative drawdown at the GDE observation points is predicted to increase to approximately 6 feet, with approximately 73 percent of the drawdown attributable to pumping of the Town of Windsor wells. Drawdown at the domestic well observation points is predicted to increase to approximately 6 to 16.6 feet, with approximately 52 to 73 percent attributable to the Town of Windsor wells. Drawdown at nearby municipal and irrigation wells is predicted to increase to 8.7 to 17.5 feet, with approximately 47 to 71 percent attributable to the Town of Windsor wells.

Figure 18 shows the predicted drawdown over time at the nearest potential domestic well location. Drawdown results are plotted for the model layers representing the average, maximum and minimum screened intervals for domestic wells in the PLSS section encompassing the area directly north of the Project Site. Dry periods during which the Town of Windsor wells are simulated as being operated are delineated by the tan vertical bands. Maximum drawdown levels are predicted during drought periods and recover rapidly during normal periods when pumping from the Town of Windsor wells (Esposti Park and North Windsor) does not occur. Drawdown associated with the Town of Windsor wells recovers almost completely during normal and wet years.

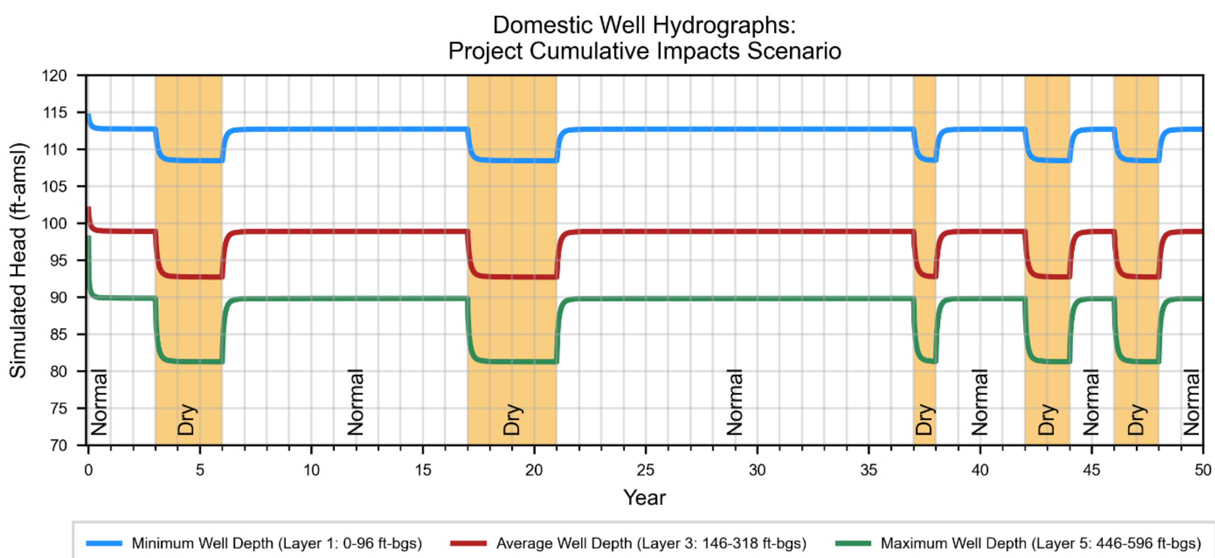

FIGURE 18: SIMULATED DRAWDOWN AT HYPOTHETICAL NEAREST DOMESTIC WELL

TABLE 6: SIMULATED DRAWDOWN AT OBSERVATION POINTS – CUMULATIVE IMPACTS SCENARIOS

Scenario/ Time since Start of Pumping		Predicted Maximum Drawdown at Observation Point (feet)									
	Location	**GDE Upstream**	**GDE Midpoint**	**GDE Downstream**	**Mobile Home Estates Well (Well #17)**	**Nearest Irrigation Well**	**Hypothetical Average Domestic Well**	**Hypothetical Shallow Domestic Well**	**Hypothetical Deep Domestic Well**	**RMP SRP0376 (Well #13)**	**Bluebird Well**
	Model Layer	***Layer 1***	***Layer 1***	***Layer 1***	***Layer 3***	***Layer 6***	***Layer 3***	***Layer 1***	***Layer 5***	***Layer 4***	***Layer 6***
	Depth Range (feet-bgs)	***0 to 96***	***0 to 96***	***0 to 94***	***146 to 318***	***596 to 746***	***146 to 318***	***0 to 96***	***446 to 596***	***338 to 446***	***596 to 746***
Cumulative and Project/ After 50 years		1.64	1.64	1.60	2.60	9.26	2.92	1.66	8.04	1.82	1.46
Cumulative and Project/ End of Extended Drought		5.89	5.93	5.76	8.73	17.49	9.08	5.91	16.60	6.66	8.08
Town of Windsor Pumping Only/ End of Extended Drought		4.28	4.31	4.18	6.16	8.26	6.19	4.28	8.59	4.86	6.64

Figure 19 shows simulated drawdown effects at the midstream point of the Pruitt Creek GDEs. During dry periods, the predicted drawdown at the water table at this location is up to 6 feet. The simulated hydrograph shows that both drawdown and recovery are expected to be relatively rapid. The magnitude of the short-term drawdown associated with the Town of Windsor wells, which is shown as lasting one to four years, is more than three times greater than the long-term equilibrium drawdown induced by pumping for the Project.

To test the effects of the added aquitard layer (Layer 3a) on drawdown, the Project Cumulative scenario was also run without the aquitard and the results compared. The aquitard had a general muting effect on drawdown communicated upwards from the intermediate and deep zone to the shallow aquifer system. At the water table in the vicinity of the Project site, this muting effect decreased predicted drawdown by less than 11%.

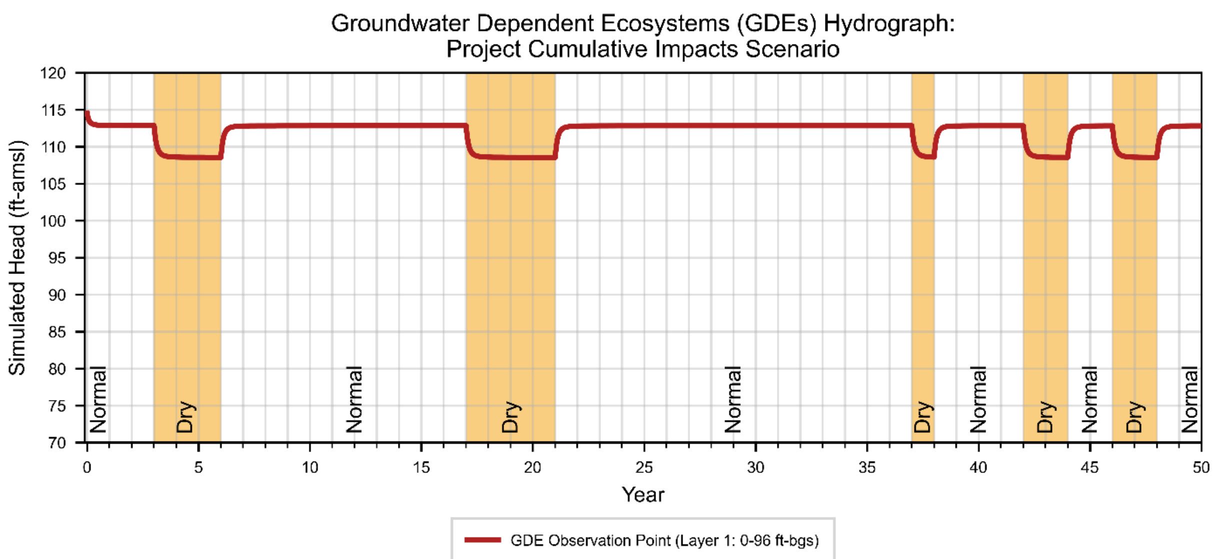

FIGURE 19: SIMULATED DRAWDOWN AT GDES ALONG PRUITT CREEK NORTHEAST OF PROJECT SITE

Figure 20 shows the predicted drawdown from the Project Cumulative Impacts scenario overlaid with the observed long-term hydrograph data from Well #13 (SRP0376), which is the closest Representative Monitoring Well used to assess compliance with the GSP for this area. The well is located 6,500 feet southwest of the Project well and is predicted to experience up to 6.7 feet of drawdown during dry years. Drawdown results are shown normalized to the average measured water level over the period 2012-2023 to gain perspective of the effect of cumulative drawdown on the long-term average and range of groundwater levels. Measured, long-term average, and predicted average groundwater levels are also shown relative to Minimum Thresholds and Measurable Objectives established for this well. The magnitude of simulated drawdown effects during dry years over a 50-year period, compared to the historical record for an 11-year period, shows that long-term average groundwater levels may be expected to decline by less than 2 feet, and are predicted to remain about 9 feet below the Measurable Objective for this well. Drawdown during dry years is predicted to be about 5 feet greater, driven by the additional drawdowns induced by Town of Windsor pumping; however, groundwater levels are predicted to recover to near the Measurable Objective for this well when the additional dry year pumping ceases during normal or wet years.

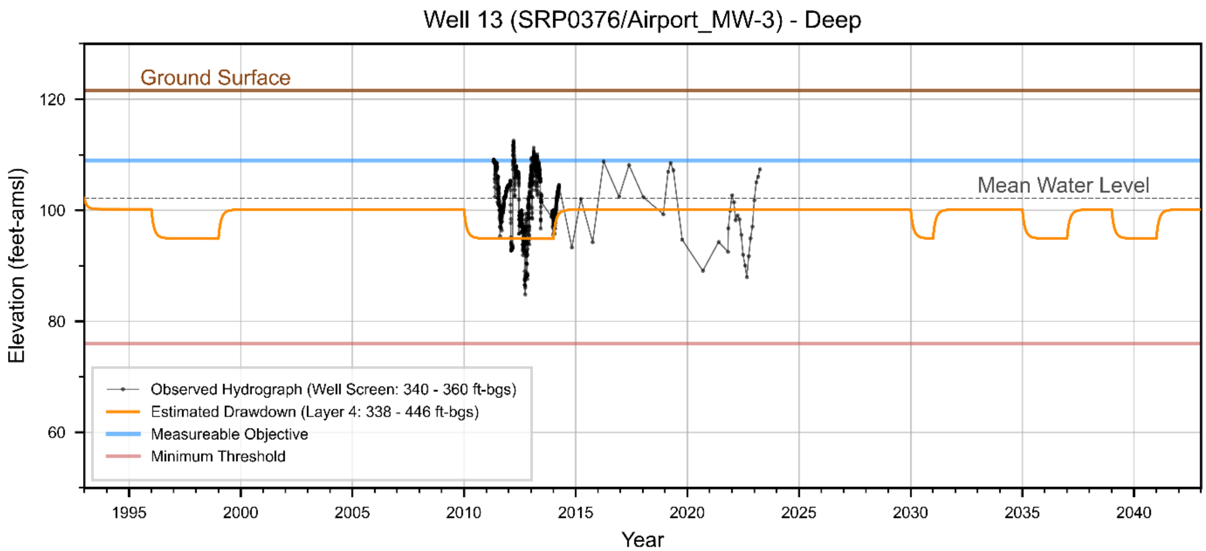

FIGURE 20: SIMULATED DRAWDOWN AT SRP0052 AND HISTORICAL MEASURED GROUNDWATER ELEVATIONS

6 IMPACT ANALYSIS

This section presents an evaluation of the potential environmental impacts associated with groundwater pumping at the Project Site with a focus on impacts related to groundwater resources. To support development of responses to comments received on the EA, the evaluation focuses on the following potential Project and cumulative impacts:

- Groundwater Drawdown:
  - Project and cumulative drawdown in the pumped aquifer, the shallow aquifer utilized by most domestic wells, and the water table; and
  - Interference drawdown to the closest irrigation, municipal supply and domestic wells.
- Consistency of the Project with the local GSP, including with the sustainable management goals, and evaluation of the likelihood the Project would interfere with its implementation by causing or contributing to:
  - Chronic lowering of groundwater levels;
  - Depletion of groundwater storage;

  - Water quality degradation due to induced contaminant migration or interference with cleanup efforts or water quality management plans;
  - Depletion of interconnected surface water, including potential flow in Pruitt Creek or impacts to GDEs; and
  - Land subsidence.

- Adequacy of groundwater supplies to meet Project and local water demand, including during dry and critically dry years.
- Cumulative impacts of the combined implementation of Project pumping and proposed future expansion of municipal pumping under the Town of Windsor 2020 UWMP.
- Consideration of climate change in the above evaluations.

The impact evaluations described below are provided in the form of reasoned evaluations organized by topic area.

6.1 GROUNDWATER DRAWDOWN

Regional drawdown, if it represents a substantial fraction of the overall available drawdown or groundwater in storage in an aquifer system, can result in less water supply being available for the future, insufficient availability of groundwater during dry periods, or a general increase in groundwater supply development costs. Interference drawdown is a more localized effect that occurs when the “cone of depression” that forms around a well when it is pumping intersects another well that can affect its operation by decreasing well yield, increasing pumping or maintenance costs and, in extreme cases, causing wells to go dry.

The wells potentially most vulnerable to interference drawdown are shallow wells, which have less available drawdown. As a result, the same amount of drawdown in a shallow well will potentially have a proportionally greater performance impact than with deeper wells. In this regard, it should be noted that domestic wells are often shallower than municipal, industrial and irrigation wells, but this is not always the case. A threshold of 5 feet of interference drawdown has been widely used to identify the potential for significant interference drawdown to shallow wells in groundwater resources impact assessments across the state under CEQA (JJ&A 2018). Based on available well completion data for the Site vicinity, most shallow domestic wells in the area extend at least 50 feet below the water table. Decreasing the available drawdown of a well with 50 feet of available drawdown by 10% is unlikely to result in a noticeable reduction in yield; therefore, a threshold of significance of 5 feet for shallow wells is reasonable.

Municipal, industrial and irrigation supply wells are generally completed to a significantly greater depth and constructed to support greater production capacities. Many domestic wells are also completed to greater depths below the water table. A threshold of 20 feet of interference drawdown has been widely used to identify the potential for significant interference drawdown to deeper wells in groundwater resources impact assessments across the state under CEQA (JJ&A 2018). An increased drawdown of less than 20 feet for these wells is not likely to significantly decrease well yield or result in other adverse effects, whereas drawdowns greater than 20 feet can noticeably increase the electrical costs of pumping large volumes of water from greater depths. For wells of intermediate depth, with available drawdowns between 50 and 200 feet, a threshold equal to 10 % of the available drawdown is often used.

Interference drawdown predicted to be induced by pumping for the Project at the end of the 50-year simulation period is summarized in Table 5 and may be summarized as follows:

- At the observation point representing the closest possible location for a nearby domestic well, the predicted drawdown is 1.63 feet for the shallowest reported domestic well depth in the PLSS section, 2.89 feet for average domestic well depth and 8.01 feet for the deepest reported domestic well depth. The predicted drawdown is less than 5 feet for shallow and intermediate depth wells. For the deepest reported domestic well depth, the predicted drawdown is much less than 20 feet and the reported maximum well depth is 535 feet, so this well would have at least several hundred feet of available drawdown. Based on the available data, Project interference drawdown impacts to nearby domestic wells would be less than significant.

- Predicted drawdowns induced by the Project at nearby municipal supply wells are 1.43 feet at the Town of Windsor Bluebird Well (bottom of screen interval 745 feet bgs), 2.57 feet at the closest supply well for the Mobile Home Estates small community water system (bottom of screen interval 191 feet bgs), and 3.38 feet at the Town of Windsor Esposti Park Well (bottom of screen interval 655 feet bgs). These drawdowns are much less than 20 feet or 10% of the available drawdown, and unlikely to result in adverse effects. Based on this information, impacts to municipal supply wells will be less than significant.

- The nearest irrigation supply well to the Project Site is located within the vineyard east of the Project Site. The predicted interference drawdown at this well is 9.23 feet and the reported bottom of the screen interval for this well (Well 5 in Table 1) is 310 feet bgs. The predicted drawdown is much less than 20 feet and is unlikely to result in adverse effects. Based on this information, interference drawdown impacts to nearby irrigation wells will be less than significant.

The spatial distribution of drawdown in the pumped aquifer predicted to be associated with the Project is shown in Figure 15. Drawdown exceeding 5 feet is predicted to be limited to an area measuring about ¼ square mile in a primarily rural area southeast of the Town of Windsor. Drawdown exceeding 2 feet is predicted to affect an area measuring about 1.5 by 2.5 miles. This drawdown is predicted to occur in the pumped aquifer, which has several hundred feet of available drawdown. Based on the thickness of the aquifer system and the available drawdown, the predicted amount and distribution of drawdown is not expected to significantly decrease the amount of groundwater available in storage or otherwise affect the availability of groundwater as a supply source. Based on this information, Project impacts to groundwater storage will be less than significant.

6.2 CONSISTENCY WITH LOCAL GROUNDWATER SUSTAINABILITY PLAN

6.2.1 CHRONIC GROUNDWATER LEVEL DECLINE

As discussed in Section 4.4.1 and shown in Figure 5, long-term monitoring of the Santa Rosa Plain sub-basin since the 1970s and 1980s indicates relatively stable groundwater-level conditions over time in the northern portion of the sub-basin. The Project Site is not located in an area designated as overdrafted (SRPGSA 2022). The predicted response of the aquifer system to pumping for the Project is a relatively rapid equilibration of groundwater levels to new levels that are roughly 5 feet lower in a relatively small area (about ¼ square mile) in a primarily rural area southeast of the Town of Windsor, and 2 to 5 feet lower in an area that measures about 1.5 by 2.5 miles (Section 5.7.1; Figure 15). Figure 6 shows that groundwater levels at Representative Monitoring Points in the northern subbasin are currently above Minimum Thresholds and near the designated Measurable Objectives. The relatively small amount of drawdown induced by the Projects predicted to affect these wells will not significantly change this condition. Based on the available information, the Project will not cause or contribute to undesirable results related to chronic groundwater level decline.

6.2.2 DEPLETION OF GROUNDWATER STORAGE

As noted above in Section 6.2.1, Figure 6 shows that groundwater levels at Representative Monitoring Points in the northern subbasin are currently above Minimum Thresholds and near the designated Measurable Objectives. The relatively small amount of drawdown induced by the Projects predicted to affect these wells will not significantly change this condition. Figure 20 shows the predicted drawdown at the nearest Representative Monitoring Point to the Project Site. Drawdown related to Project pumping is predicted to stabilize at about 1.8 feet in normal and wet years, and to recover quickly after dry years. Assuming the observed historical range of groundwater level variability continues in the future, groundwater levels are predicted to remain well above MTs. The relatively small amount of predicted drawdown associated with the Project would not be distinguishable from ambient seasonal fluctuations in groundwater levels and would not reasonably be expected to interfere with implementation of the GSP. Therefore, implementation of the Project will not significantly decrease the available groundwater in storage by causing or contributing to undesirable results related to groundwater storage depletion.

6.2.3 DEGRADATION OF GROUNDWATER QUALITY

Degradation of water quality by groundwater pumping can occur when groundwater extraction changes local groundwater gradients and induces migration and spread of contamination plumes associated with nearby spill or release incidents or interferes with their cleanup. Review of the State Water Resource Control Board's GeoTracker database indicates there are two groundwater contamination incidents near the Project Site that have impacted groundwater (SWRCB 2024). These are shown on the map in Figure 9 and include the Exxon Mobile site approximately 0.7 mile west of the Project Site and the Fast and Easy Mart site approximately 1.2 mile south-southeast of the Project Site. Review of the database indicates that the status of the Exxon Mobile case is reported as "Completed, Closed," and the Fast and Easy Mart status is reported as "Active, Verification Monitoring."

Various investigation, remediation and monitoring activities have been ongoing at the Fast and Easy Mart site since an underground gasoline storage tank leak was discovered in 1995. The most recent monitoring report was issued in October 2023 (Stratus 2023) and a Case Closure Review Summary Report was prepared by Regional Water Quality Control Board Staff in December 2023 (RWQCB 2023). These reports indicate that shallow groundwater has been impacted by gasoline hydrocarbons, fuel oxygenates and hexavalent chromium. The predominant groundwater flow direction in the shallow groundwater zones ranges from northwest to southwest, and a groundwater plume has extended from the site for a distance up to about 200 feet and is relatively stable.

Drawdown impact modeling indicates that groundwater drawdown in the shallow aquifer system induced by Project pumping is predicted to be approximately 1.5 feet at the Fast and Easy Mart site (Figure 14). This is well within the range of seasonal groundwater level fluctuations reported at the site, which is 5 to 10 feet (Attachment 1). Based on the limited magnitude of the predicted drawdown, the documented groundwater gradient direction, the limited extent and stability of the existing groundwater contamination plume, and the status of remediation and monitoring activities, it is very unlikely that groundwater pumping for the Proposed Project would influence the migration of the remaining contamination plume or interfere with cleanup operations. As such, pumping for the Proposed Project is expected to have no impact on water quality.

6.2.4 GROUNDWATER-DEPENDENT ECOSYSTEMS AND INTERCONNECTED SURFACE WATER

As discussed in Section 4.3, the documented depth to the regional water table indicates it is unlikely that aquatic resources identified in the vicinity of the Site are groundwater connected, except for a possible perennial reach of Pruitt Creek located northeast of the Site at the foot of the Mayacamas Mountains. Surface water and underflow at this location emerges from the Mayacamas Mountains and infiltrates into the valley fill aquifer. Sonoma Water (2023) identified several perennial pools in this area that receive water flowing from creek's watershed in the Mayacamas Mountains. Observation of the stream in this area indicated the stream bedload at this location contains abundant gravel. This is consistent with the location of these pools where the creek emerges from the mountains and flows onto the adjacent valley alluvium, and as a result, the pools are likely to experience relatively rapid infiltration rate that limit the distance of perennial flow away from the mountains. Flow in the creek extends beyond this area only during periods when sufficient discharge occurs from the mountains. Additional monitoring would be required to confirm whether surface water in Pruitt Creek at this location is groundwater connected, but it is likely that infiltration from the creek flows away from the pools at a relatively steep gradient and recharges the groundwater basin. Assuming that is the creek is groundwater connected, induced drawdown at the water table in the area could potentially increase vertical groundwater gradients and infiltration rates from the perennial reaches of the creek. As shown in Figure 14, the predicted water table drawdown in this area is approximately 1 foot. The extent of perennial water in this reach of Pruitt Creek would be expected to be controlled, in order of importance, by (1) the rate of water outflow from the Mayacamas Mountains; (2) the vertical impedance of the streambed; and (3) the gradient driving infiltration. While 1 foot of drawdown may increase vertical gradients somewhat, the gradients away from the perennial pools are likely already steep and the infiltration rates high, so the gradient increase likely would not result in significant additional flow. Based on the available information, in our opinion it is unlikely that the drawdown induced by the Project would significantly decrease the extent of aquatic resources or adversely affect aquatic species through stranding or habitat loss or degradation.

A potential riparian hardwood GDE area has been mapped along Pruitt Creek within and northeast of the Project Site and extending about 0.7 mile to the northeast, as shown in Figure 3. The maximum predicted drawdown at the water table (Layer 1) is 1.6 feet beneath this potential GDE area (Table 5). Drawdown is predicted to occur relatively rapidly, with approximately 70 percent occurring in the first month of pumping and 99 percent after one year (Table 5). The GDE is reported to include riparian hardwoods including Eucalyptus, Valley oak, Oregon ash, Buckeye, California bay-laurel and Coast live oak, with native and non-native shrubs, grasses and herbs in the understory (TNC 2024; Sequoia 2022). In a riparian setting, these species typically derive their water supply from a combination of precipitation, streamflow and, when present, shallow groundwater.

Risk assessment guidelines for GDEs developed by the State of New South Wales in Australia characterize drawdowns that are less than seasonal fluctuations as posing a low risk of adverse impacts (New South Wales Department of Primary Industries 2012). Research has shown that root distribution tends to be related to groundwater history; therefore, a rapid decline in water table relative to the condition under which roots developed may strand plant roots so they cannot obtain sufficient moisture (Shafroth et al. 2000). Although roots do tend to redistribute with the water table, plants cannot proliferate new roots if the water table decline is too rapid (Richards et al. unpublished; Stella and Battles 2010; Stella et al. 2010). Even relatively modest groundwater level declines can also significantly decrease the recruitment of new seedlings even if more mature trees ultimately adapt, potentially resulting in long-term riparian habitat decline or change (TNC 2018; Amlin and Rood 2002). On the other hand, riparian woodland communities in Mediterranean climates rely on naturally variable groundwater and streamflow to sustain recruitment and succession, and naturally variable hydrologic conditions are thought to promote more resilience to rapid change and climate stress (Rhode et al. 2021).

The predicted drawdown at the mapped GDEs on and near the Site (approximately 1.6 feet) is predicted to manifest relatively rapidly; however, this amount of drawdown is estimated to be only a fraction of the seasonal groundwater level fluctuation under which these woodlands have developed (5 to 10 feet have been documented near the Site). In addition, Pruitt Creek is an uncontrolled stream with highly variable flow. We note that the woodland species present are likely only partially reliant on groundwater for their water needs. Finally, we note that NDVI trends for the wetland area show little or no change in vigor over the last several decades (see Figure 3), during which the on-Site vineyard was developed, likely decreasing groundwater levels due to irrigation pumping.

Based on the available information, the additional drawdown induced by the Project is well within the range of historical hydrologic variability under which these potential GDEs developed and thrived. The GDEs should be capable of readily adapting to the predicted modest change in groundwater levels.

6.2.5 SUBSIDENCE

Land subsidence can occur when compressible clays are depressurized because of groundwater extraction, triggering water to flow from the clays into the surrounding aquifer, and ultimately causing consolidation of the clay under pressure from the overlying sediments. In general, most subsidence occurs when an aquifer is initially depressurized, but it can continue for months, or even years, after clays slowly dewater and adjust to the new pressure regime. If groundwater levels subsequently recover, subsidence generally does not resume (or does not progress as rapidly) until groundwater levels fall below historical low levels. Subsidence can occur especially in confined aquifer conditions, where the drawdown associated with groundwater extraction is greater than in unconfined aquifers.

From late 2005 to 2019, the nearest subsidence monitoring station in the Santa Rosa Plain showed a total vertical change of +0.1 inch. From 2015 to 2019 the total vertical change for the station was reported as 0.01 inch, with annual changes of +0.003 inch (SRPGSA 2022). Based on the lack of active subsidence reported in the subbasin, the lack of strongly confined regional aquifers, and the fact that drawdown induced by pumping for the Project is predicted to be well within the range of annual and year-to-year groundwater level fluctuations, it is very unlikely that pumping for the Project would result in subsidence impacts. As such, the Project is expected to have no subsidence impact.

6.3 CUMULATIVE IMPACTS

The drawdown modeling conducted for this GRIA predicts that the aquifer system in the vicinity of the Proposed Project will equilibrate relatively quickly to pumping conditions. The maximum cumulative effect of pumping for the Project and the two proposed Town of Windsor wells therefore occurs at the end of dry and multiple dry years, when the overall pumping rate is several times greater than Project pumping alone. At the end of the simulated dry periods when Town of Windsor pumping ceases, groundwater levels recover relatively quickly. Predicted maximum cumulative drawdowns at nearby well locations are summarized in Table 6 and may be summarized as follows:

- Maximum cumulative drawdowns at the hypothetical nearest possible domestic well location to the Site are predicted to be 5.91 feet for the shallowest reported well depth, 9.08 feet for the average reported well depth, and 16.6 feet at the deepest reported well depth. The predicted drawdowns for shallow and average wells exceed the thresholds discussed in Section 6.1 (5 feet for the shallowest reported well depth and 10% of the available drawdown for an intermediate depth well) and would be considered potentially cumulatively significant. The predicted drawdown for the deep domestic well would not be considered cumulatively significant because it is much less than 20 feet or 10% of the available drawdown for the well. It should be noted that the impacts resulting from Project pumping alone for wells of these depths is not predicted to be significant and accounts for approximately 30 percent of the total predicted cumulative drawdown. After the cessation of dry year pumping, drawdowns decrease quickly to the less than significant levels resulting from Project pumping alone.

- Cumulative drawdown predicted at nearby municipal and irrigation wells ranges from 8.08 to 17.49 feet, which is less than the 20-foot or 10% of available drawdown thresholds discussed in

Section 6.1. Based on this information, cumulative drawdown impacts to nearby municipal and irrigation wells would be less than significant.

- Figure 20 shows the predicted cumulative drawdown at the nearest Representative Monitoring Point (SRP0376) for the local GSP to the Project and Esposti Park wells. Drawdown is predicted to stabilize at about 1.8 feet in normal and wet years, and 6.7 feet in dry years. The repeated pattern of predicted drawdown and recovery in dry years is stable. The effect of cumulative drawdown will be to increase the range of fluctuation of groundwater levels in the well. Assuming future groundwater fluctuations are similar to historical patterns, high groundwater levels during normal and wet years will decrease only slightly and will be close to the MO, whereas low groundwater levels during dry years will be lower by about 5 feet, and up to approximately 28 feet below the MO. Average groundwater levels are predicted to be approximately 9 feet below the MO for the well during normal and wet years, and 14 feet below the MO during dry years. Groundwater levels are predicted to remain above the MT for this well for all year types. As noted previously, the pattern of drawdown during dry years and recovery during normal and wet years is consistent with sustainable groundwater management. Furthermore, the limited drawdown during normal and wet years would be indistinguishable from ambient groundwater fluctuations and is not reasonably expected to interfere with GSP implementation. For these reasons, cumulative impacts to groundwater storage are expected to be less than significant.

- Cumulative drawdown at the potential riparian hardwood GDE along Pruitt Creek on and near the Project Site is predicted to be just under 6 feet during dry years and to manifest relatively quickly. We note that Project drawdown is forecast to be in the range of 1.6 feet, which would represent a new and relatively stable baseline to which phreatophyte tree roots would have adjusted. The additional 4.2 to 4.3 feet of intermittent drawdown induced during dry years by the Town of Windsor wells is between three and four times greater than pumping for the Project alone. This amount of drawdown is similar to the low end of the range of observed seasonal groundwater level fluctuations. In the absence of groundwater level data at the Site, it may be expected that relatively rapid groundwater level fluctuations of this magnitude could exceed the ability of the trees' roots to adapt and could result in plant stress and habitat decline. Cumulative drawdown impacts at this GDE in dry years would therefore be considered potentially cumulatively significant; however, we note that adverse effects that could occur would result from the additional intermittent drawdown resulting from pumping of the Town of Windsor wells.

- Drawdown at the perennial pools in Pruitt Creek upstream from Faught Road is predicted to be near 2 feet during dry and critically dry years. This would result in increased infiltration rates from these pools. It is uncertain whether these cumulative effects would result in significant changes in the extent of the pools.

- Similar to Project impacts, cumulative drawdown would not be expected to result in significant water quality impacts or subsidence impacts.

Based on the above analysis, the potential for significant cumulative impacts related to interference drawdown and degradation of GDEs cannot be ruled out. We note that pumping by the Town of Windsor during dry years, which is projected to be nearly four times greater than pumping for the Project, is responsible for the majority of the potential adverse impacts related to well interference, and likely all of the potential adverse impacts to GDEs.

The results of the Cumulative Impacts modeling scenarios demonstrate that pumping from the proposed Town of Windsor water supply wells contributes far more to the extent of drawdown than Project pumping. To gain additional perspective on the contribution of Project pumping and Town of Windsor pumping to the extent of cumulative drawdown, Figure 17 compares the predicted lateral extent and amount of drawdown for the pumping of the Town of Windsor wells alone (Baseline Cumulative Pumping) to the amount of drawdown associated with pumping the Project well and the Town of Windsor wells (Project Cumulative Pumping). Figure 17 shows that the Project contributes marginally to the overall extent of drawdown in the shallow and deep aquifer zones.

As discussed in Section 4.1, the PEIR for the Town of Windsor's 2011 WMP (Horizon 2011) did not include an analysis of the potential impacts of operation of the Esposti Park and North Windsor wells for supply pumping only, though it nevertheless concluded that significant impacts could occur as a result of groundwater pumping from these wells. Specifically, the PEIR indicated the following:

> *[I]f operation of the MGP resulted in extraction volumes that exceeded injection volumes, then a net deficit in aquifer volume or lowering of the groundwater table level (overdraft) could occur over time. … Pumping tests at the Esposti Park well site suggest that the shallow and intermediate/ deep aquifers are hydrologically isolated from one another and have limited connectivity. Separation of the shallow and intermediate/deep aquifer suggests that injection of water from the RRWF into the intermediate/deep aquifer and subsequent extraction of that water (from the intermediate/deep aquifer) would not affect shallow aquifer levels (and in turn not affect surface flows in creeks or wells located within the shallow aquifer). … If a stronger connection between the intermediate/deep and shallow aquifers exists (a condition not indicated by field pump tests to date), then pumping from the intermediate/deep aquifer could lower water levels in the shallow aquifer, and effectively lower the local groundwater level, with potentially corresponding effects on local wells and creeks. This could result in impacts to streamflow and groundwater supplies in nearby wells.*

Based on the above information, the Town of Windsor recognized the potential for injection and pumping of the Esposti Park well to result in potential adverse impacts to shallow domestic wells and GDEs. Furthermore, as discussed in Section 4.4.4, in the absence of data from longer-term pumping, the conclusions presented by RMC (2010) regarding the pumping test at the Esposti Park well should not be considered conclusive with respect to the competence of aquitards in the vicinity to isolate the effects of pumping the well from the shallow zone. The PEIR for the 2011 WMP (Horizon 2011) proposed implementation of mitigation measure HYD-3 to avoid or substantially lessen the potentially significant impact identified in the PEIR. Further discussion of HYD-3 is included in Section 7.1.

6.4 WATER SUPPLY AND ENTITLEMENTS

If the Project proceeds and the Site is taken into trust, groundwater extraction to supply the Project would occur under Federally reserved water rights. Although the Tribe would not be required to comply with SGMA and the local GSP, as discussed in Section 6.2, the proposed pumping would be consistent with SGMA and the GSP. The tribe could further choose to voluntarily participate in the sustainable groundwater management activities undertaken by SRPGSA, including coordination of any groundwater related monitoring and mitigation measures.

Figure 20 shows project-induced drawdown would decrease groundwater levels by less than 2 feet at the nearest RMP monitoring well operated by SRPGSA, which is much less than the observed seasonal fluctuation of groundwater levels in the well and would not be distinguishable from those fluctuations. Groundwater levels would remain relatively stable, except during dry years, when planned pumping by the Town of Windsor would increase drawdown by about another 5 feet. The pattern displayed by the forecast cumulative hydrograph is one of additional drawdown during dry and multiple dry years, followed by recovery during normal and wet years. This pattern is a hallmark of sustainable groundwater management.

Based on the available data, the Project is expected to have an adequate and assured water supply, including during dry and multiple dry years.

7 POTENTIAL MONITORING AND MITIGATION MEASURES

The results of the impact analysis discussed in Section 6 indicate no significant impacts from the Project are anticipated. However, potentially significant cumulative impacts to GDEs and shallow domestic wells are possible. Potential impacts to shallow wells are related primarily to the effects of pumping the Town of Windsor Esposti Park and North Windsor wells. Potential impacts to GDEs are possible as a result of the additional drawdown induced by pumping of the Town of Windsor wells during dry years.

As noted in Section 6.3, the PEIR for adoption of the Town of Windsor 2011 WMP recognized the potential for significant impacts to domestic wells and GDEs drawing water from the shallow zone, and stated that "implementation of Mitigation Measure HYD ‐ 3 is required to ensure impacts on groundwater level fluctuations would be less than significant" (Horizon 2011; Town of Windsor Agenda Report 2011). Although the Town has not published a CEQA analysis to evaluate the operation of the Esposti Park and North Windsor wells for groundwater extraction alone, several components of this measure would be applicable to the Town's planned operation of these wells. Mitigation measure HYD-3 includes the following (Horizon 2011, p. 3.9-25, -26, emphasis added in bold to identify potentially applicable sections):

> *To ensure the long-term sustainability of the MGP, the Town shall establish operating rules prior to commencement of the program. The operating rules may be refined over time*

based on additional investigations of the groundwater basin and data analyses, and incorporate the following conditions based on concerns about aquifer connectivity, the maximum amount of water withdrawn from the aquifer, and the maximum amount of water projected for injection into the aquifer. The Town shall establish a long-term monitoring program and a mitigation program to identify and mitigate long-term effects on existing groundwater wells.

1. *Maintaining Long-Term Sustainability of Aquifer: The MGP shall be operated such that, over the long-term, there is no net decrease of the aquifer groundwater elevations and the aquifer is maintained to sustainable elevation conditions that are similar to the current existing conditions. To achieve this long-term sustainability, the total aquifer injections and extractions will be maintained within 20 percent of one another over a 10-year rolling average. Further, should long-term declines in groundwater levels result from MGP operations (outside of the range of natural fluctuation), the Town would increase the ratio of injections to extractions to reverse this trend and bring groundwater levels back up to sustainable levels.*

2. *Aquifer Connectivity: As future sites are investigated to establish other MGP wells and well fields, at least three injection and pump testing events shall be conducted with monitoring of shallow wells within a 1/2-mile radius.* ***If these tests reveal that injections into or extracting from the intermediate/deep aquifer causes a substantial increase or decrease in water levels in the shallow aquifer or in surrounding wells, alterations to surface streamflow, or impacts to natural recharge, the MGP operations shall cease and be reassessed before proceeding with injection or pumping activities. MGP operations shall not proceed until there is a significant body of evidence that existing wells would not be affected.***

3. *Maximum Infiltration into Aquifer: In general, the allowable amount of infiltration into a well in a confined aquifer is controlled by depth to water and the amount of pressure in the system. Increased pressure in the system from infiltrating too much water into a confined aquifer can cause hydraulic fracturing, or break apart formations that separate an intermediate/deep and shallow aquifer system. Huismann and Olsthoorn (1983) provide a method to determine the maximum water level rise based on the injection pressures and the water level rise. This method was applied to the Esposti Park replacement well, which approximated a maximum water level rise of 97 to 145 feet. This method, or a comparable method, shall be used to determine the maximum water level rise for additional wells constructed for the MGP. MGP operation conditions for each individual well shall be operated such that the maximum water level rise is not exceeded.*

4. *Adaptive Management of MGP to Ensure Sustainability:* ***A long-term*** *injection* ***monitoring and testing program to assess sustainable*** *injection and* ***production rates and corresponding operation and maintenance procedures shall be developed prior***

***to initiation** of the MGP. Long-term operating protocols shall be modified annually and as additional wells are added to the program. As a performance standard, the MGP shall be operated such that there is no substantial long-term net deficit in aquifer volume.*

5. *Participation in Santa Rosa Plain Managed Groundwater Program: The Town's continued participation in the Santa Plain Rosa Managed Groundwater Program will help to ensure that the MGP is consistent with overall basin management.*

It is assumed that the Town of Windsor will likely adopt applicable monitoring and mitigation measures adapted from HYD-3 to identify and substantially lessen or prevent potentially significant impacts associated with its operation of the Esposti Park and North Windsor Wells. If such measures are adopted, the Tribe would participate in the development and implementation of these measures in proportion to its contribution to the potentially significant impacts associated with drawdown induced by the Project wells. In the event that the Town of Windsor does not implement a monitoring and mitigation program associated with the operation of the two new municipal wells, the Tribe would implement its own program, as described below.

7.1 BASELINE AND PROJECT MONITORING PROGRAM

7.1.1 GROUNDWATER LEVEL AND STREAM DISCHARGE MONITORING

The Tribe shall implement a groundwater level monitoring program consisting of the following:

- A Groundwater Level Monitoring Workplan shall be developed and implemented to verify the Project drawdown effects on the production aquifer and at the water table and inform the Well Interference Monitoring and Mitigation Program described in Section 7.2 and the ISW and GDE Mitigation Program described in Section 7.3. The GDE Monitoring Plan shall describe the program procedures, schedules, responsibilities, and documentation requirements.
- Monitoring of at least one of the existing on-site supply wells, which shall be repurposed for monitoring purposes to assess groundwater levels in the pumped aquifer beneath the Project site or, if it is not feasible to convert one of the existing supply wells into a monitoring well, installing and monitoring an on-site monitoring well to an equivalent depth.
- Installation of additional monitoring wells in strategic locations to monitor groundwater levels in the shallow aquifer. Locations shall include:
    - On-site, near the Pruitt Creek GDE;
    - On-site, near the southwestern boundary of the site;
    - On-site, near the eastern side of the northern boundary of the site; and
    - Near the perennial pools upstream along Pruitt Creek by Faught Road.

- Installation of gaging stations to monitor stream discharge rates in Pruitt Creek using surface velocity radar or a similar non-invasive technology. Locations shall include:
  - On-site in Pruitt Creek; and
  - In Pruitt Creek at or near the Faught Road bridge.

Monitoring shall begin at least one year prior to initiation of Project pumping and shall continue for a period of least 5 years after pumping of the Town of Windsor's Esposti Park well commences in order to help assess baseline conditions, the relationship between stream discharge and groundwater levels, the vertical connectivity of the aquifer system, and the potential cumulative effects of Town of Windsor and Project pumping on shallow domestic wells, GDEs and ISW.

Groundwater level measurements shall be collected in the spring and fall of each year using an electronic well sounder to assess the depth to groundwater beneath a designated reference point. In addition, recording pressure transducers shall be deployed to assess short term changes in groundwater levels that can be compared to pumping of the on-site supply well(s) or nearby wells operated by the Town of Windsor and other parties.

Stream discharge measurements shall be taken continually and collected using a data logger. The stream profile at the gage locations shall be surveyed and a staff gage and camera system installed to collect water surface levels in addition to surface radar velocity readings from which discharge shall be calculated in cubic feet/second.

Observed groundwater levels shall be compared to predicted groundwater levels presented in the GRIA to help guide the implementation of appropriate well interference, GDE and ISW mitigation measures in cooperation with the Town of Windsor, if required. After at least one year of data collection, information regarding pumping rates, stream discharge rates pumped aquifer groundwater elevations, and water table groundwater elevations shall be used to develop an updated drawdown and surface-groundwater interaction model. The model shall be used to verify the extent of interconnected surface water throughout the year, identify times when aquatic ecosystems in Pruitt Creek are most vulnerable to depletion, evaluate the anticipated range of potential surface water depletion, and establish action thresholds for implementation of the mitigation programs described in Sections 7.2 and 7.3. An annual monitoring report shall be submitted to the BIA by April 1 of the following year for distribution to other responsible agencies, Sonoma County and the Town of Windsor.

7.1.2 GDE VERIFICATION MONITORING

Vegetation stress and riparian habitat degradation is not expected to occur as a result of Project pumping but may occur during dry years as a result of pumping by the Town of Windsor. To verify whether vegetation stress and habitat degradation occurs as a result of non-Project dry year pumping, a GDE verification monitoring program shall be implemented at the expense of the Tribe, including the following:

- A Groundwater Dependent Ecosystem (GDE) Verification Monitoring Workplan shall be developed and implemented to verify whether vegetation stress and habitat degradation is occurring along the riparian area of Pruitt Creek through the Project Site. The GDE Monitoring Plan shall describe the program procedures, schedules, responsibilities, documentation requirements.

- Baseline resource characterization and data acquisition shall be conducted by a qualified biologist in the on-Site portion of the GDE, including documentation of species composition and habitat condition, and documentation of photo points and reference transects.

- Data collection at photo points and transects shall be conducted annually by a qualified biologist.

- Satellite data available from the Landsat or Sentinel program shall be assessed annually and compared to a baseline and to shallow groundwater level trends.

- Baseline data shall be analyzed for a period of at least six representative hydrologic years by using the satellite data to calculate a vegetation index such as NDVI or Leaf Area Index (LAI).

- Annual data shall be analyzed and compared to the baseline data to assess whether there is quantifiable remote sensing evidence of plant stress or reduced vigor.

- The biological and satellite data shall be evaluated, including consideration of groundwater levels in the shallow aquifer, Town of Windsor pumping records and precipitation records in a nearby representative meteorological station to assess whether a loss of vegetation vigor has occurred that may result in habitat degradation and that is attributable to groundwater level changes caused by groundwater pumping.

- An annual monitoring report shall be submitted to the BIA by April 1 of the following year for distribution to other responsible agencies, Sonoma County and the Town of Windsor. If the program verifies that loss of plant vigor that may lead to habitat degradation is occurring, a meeting shall be convened between BIA, Sonoma County and the Town of Windsor to discuss and agree to thresholds for the mitigation actions, including those described in Section 7.3, appropriate changes in the monitoring procedures, parties responsible for program implementation and cost sharing.

7.2 WELL INTERFERENCE DRAWDOWN MITIGATION

The following mitigation measures are provided for consideration to lessen or prevent potentially significant cumulative impacts related to well interference under a scenario in which the Town of Windsor is operating two new municipal wells under dry year and multiple dry year conditions as proposed in the 2020 UWMP (Woodard & Curran 2021).

Should the Town of Windsor determine pursuant to mitigation measure HYD-3 Section 2 in the Town's PEIR for adoption of the 2011 WMP (Horizon 2011), or an equivalent mitigation measure adopted in a subsequent CEQA document for these wells, that aquifer connectivity in the vicinity of the Esposti Park and/or North Windsor wells causes their operation to induce a substantial decrease in water levels in the shallow aquifer or in surrounding wells, then the Tribe shall participate in the development and implementation of an Interference Drawdown Monitoring and Mitigation Plan, and shall pay a share of the mitigation costs that is proportional to its contribution to the shallow aquifer impact being mitigated. The Tribe's obligation to contribute proportionate fair share funding shall be limited to measures to address impacts to existing shallow or domestic water supply wells from groundwater pumping; the Tribe shall have no obligation to participate in or fund other water supply initiatives or infrastructure improvements. Absent implementation of a mitigation plan by the Town of Windsor, the following monitoring and mitigation measures to be implemented by the Tribe are provided for consideration to lessen or prevent potentially significant cumulative impacts related to well interference:

- Property owners and water agencies in the area where predicted drawdown exceeds 5 feet shall be notified by certified letter of the existence of a Well Interference Drawdown Monitoring and Mitigation Program and invited to register any domestic wells in the predicted 5-foot drawdown area and any municipal, industrial, or irrigation wells in the predicted 20-foot drawdown area to participate in the program. To register for the program, well owners will be required to complete a Well Information Questionnaire regarding the construction, use, history and performance of their well, and to sign an Access Agreement that allows access for periodic measurement of water levels and assessment of well conditions and performance. A drawdown monitoring program shall be implemented to assess the extent and distribution of drawdown at the Site and in the vicinity.

- Well owners may submit claims for diminished well capacity or increased well maintenance costs. Such claims shall be evaluated to verify their veracity and whether the capacity loss or increased maintenance cost has occurred as a result of the Project. If well performance is found to be diminished by more than 25 percent or to be no longer adequate to meet historical water demands due to interference drawdown, registered participants will be eligible to receive reimbursement for reasonable and customary costs for well replacement, deepening or rehabilitation, or pump lowering as needed to restore adequate well function. In addition, the cost of additional maintenance attributable to interference drawdown caused by the Project will be eligible for reimbursement. The cost of reimbursement shall be borne by the Tribe.

- As an alternative to reimbursement, the Tribe may, at its sole discretion, elect to connect the claimant to an alternative potable water source at the Tribe's expense.

- Based on review of the extent to which the claim is due to drawdown caused by the Project vs. pumping by the Town of Windsor, the Tribe may request reimbursement from the Town of Windsor for a fair share in proportion to the degree of the Project's contribution to the drawdown that caused the diminished yield or increased maintenance cost.

7.3 GDE AND ISW MITIGATION

The following mitigation measures are provided for consideration to lessen or prevent potentially significant impacts and cumulative impacts related to GDE habitat degradation and/or depletion of ISW that results in potentially significant impacts to aquatic habitat and species.

Should the Town of Windsor determine pursuant to mitigation measure HYD-3 Section 2 in the Town's PEIR for adoption of the 2011 WMP (Horizon 2011), or an equivalent mitigation measure adopted in a subsequent CEQA document for these wells, that operation of the Esposti Park and/or North Windsor wells causes their operation to induce a substantial decrease in water levels in the shallow aquifer, alterations to surface streamflow, impacts to groundwater-dependent vegetation or impacts to natural recharge, then the Tribe shall participate in the development and implementation of a GDE and ISW Mitigation Plan, and shall pay a share of the mitigation costs that is proportional to its contribution to the impact being mitigated. The Tribe's obligation to contribute proportionate fair share funding shall be limited to measures to address impacts to GDEs and/or ISW from local groundwater pumping; the Tribe shall have no obligation to participate in or fund other water supply initiatives or infrastructure improvements. Absent implementation of a mitigation plan by the Town of Windsor, the following mitigation measures to be implemented by the Tribe are provided for consideration to lessen or prevent potentially significant cumulative impacts related to well GDE degradation or ISW depletion:

- If modeling conducted under the Groundwater Level and Stream Discharge Monitoring Program or the GDE monitoring Program indicates that vegetation decline is occurring that is correlated with groundwater level declines, or streamflow is anticipated to be depleted by more than 5% (the approximate error in typical discharge measurements), a Mitigation Plan shall be prepared that establishes thresholds for the following actions: (1) enhanced monitoring; (2) supplemental GDE and/or ISW characterization; and (3) mitigation actions. The Mitigation Plan shall be approved by BIA, NOAA Fisheries (if appropriate) and other responsible agencies.
- Level 1: Enhanced monitoring shall be implemented if one of the following occurs: (1) ambient groundwater level decline at the water table exceeds 2 feet; (2) groundwater level drawdown at the water table is greater than predicted in the GRIA: (3) post dry-year groundwater level recovery is slower than predicted; and/or (4) the extent of surface groundwater connection along Pruitt Creek is greater than the likely extent assumed in the GRIA. In the event one or more of these trigger conditions is identified, the monitoring program shall be enhanced in consultation with BIA and the other responsible agencies. Enhancement could include, but may not be limited to installation of additional monitoring wells or moisture sensors, additional water level or flow measurements, and/or additional fish or vegetation monitoring. The purpose of the enhanced monitoring will be to collect additional data to identify potential adverse trends that could lead to significant impacts.
- Level 2: Supplemental characterization investigations shall be implemented if (1) a decline in GDE vigor is documented; (2) if interconnected surface water depletion is predicted to exceed 5% (the commonly assumed error in discharge gauge measurements); and/or (3) updated modeling

indicates potentially adverse impacts could occur, but significant data gaps are identified. Investigations would focus on better understanding the likelihood and nature of potential impacts and could include, but may not be limited to, biological resource characterizations, habitat assessment and succession evaluation, fisheries investigations, and surface-groundwater interaction investigations.

Mitigation shall be implemented if one of the following occurs: (1) GDE vigor decline is significant and correlated with groundwater level trends; (2) potentially adverse depletion of ISW is predicted to occur; and/or (3) a decline in aquatic habitat or adverse impacts to fish are observed and correlated with declining groundwater levels. Mitigation options considered would include habitat enhancement projects, flow replacement by reclaimed water, and other potential mitigation measures selected in consultation with BIA and other responsible agencies.

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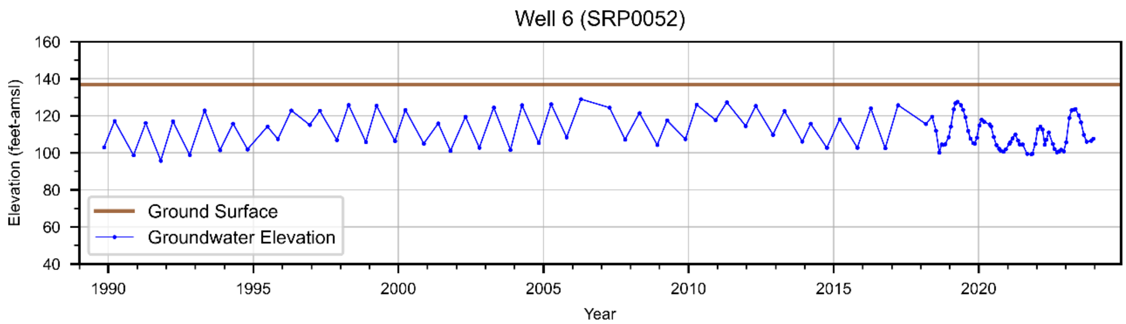
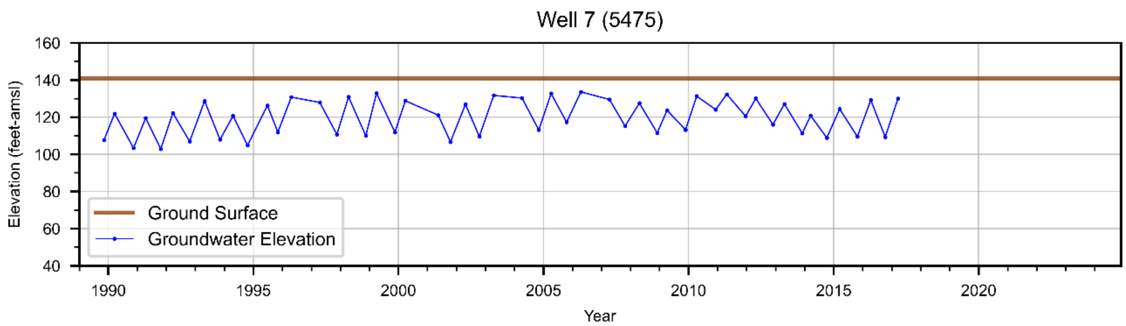
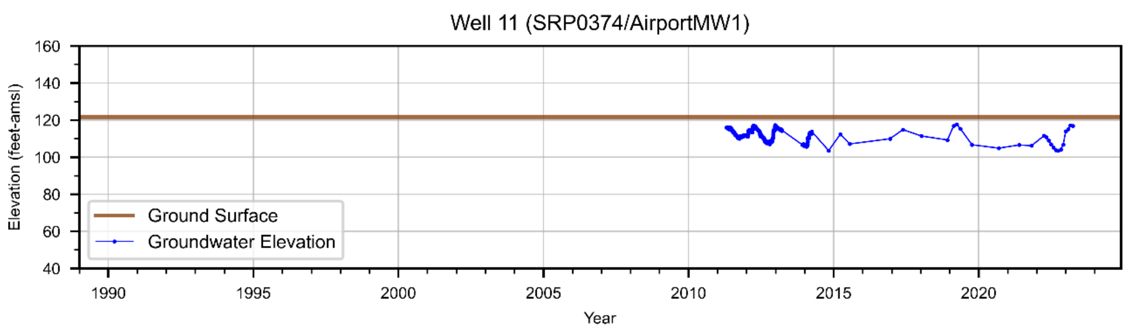
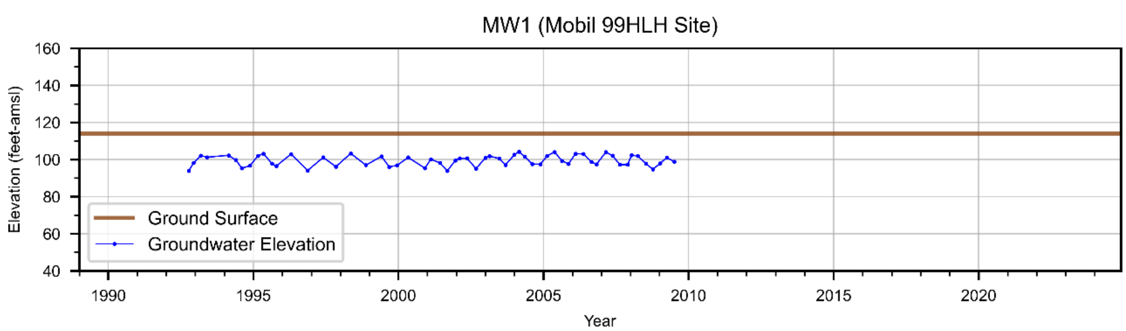
LIST OF FIGURES

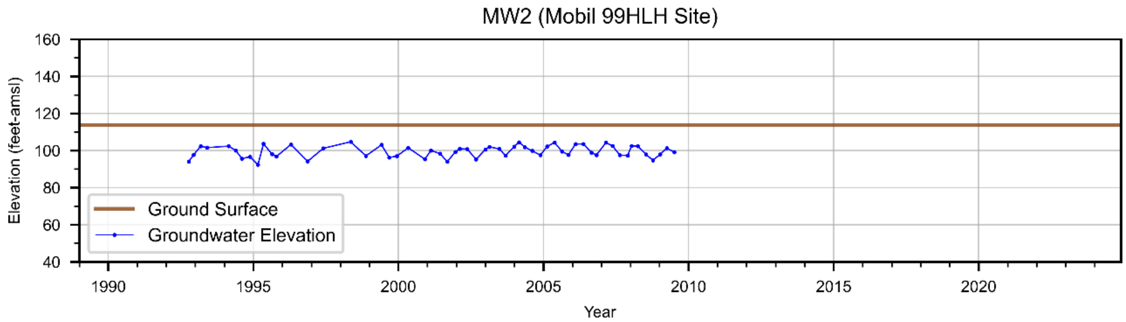
ATTACHMENT 1 – SHALLOW MONITORING WELL HYDROGRAPHS







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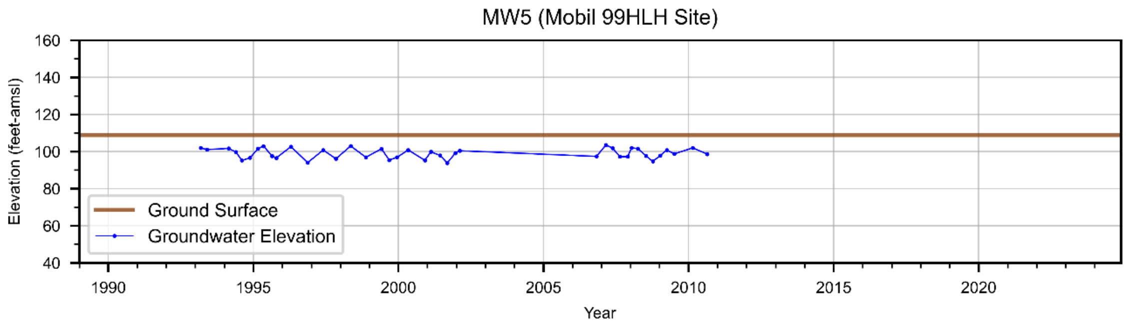
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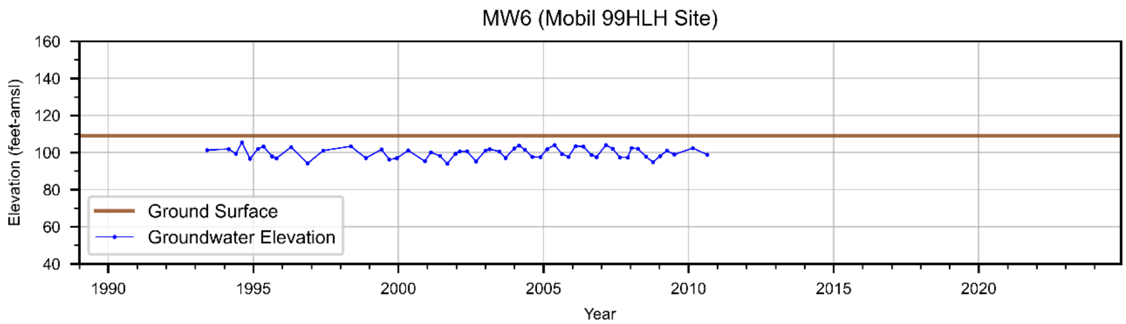
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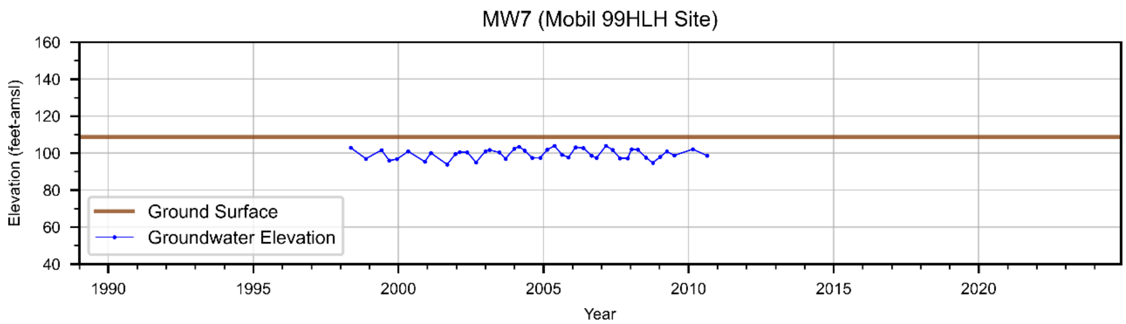
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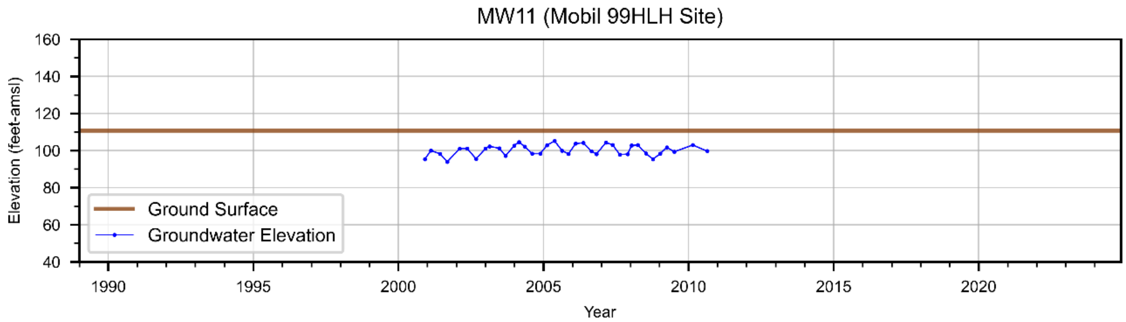
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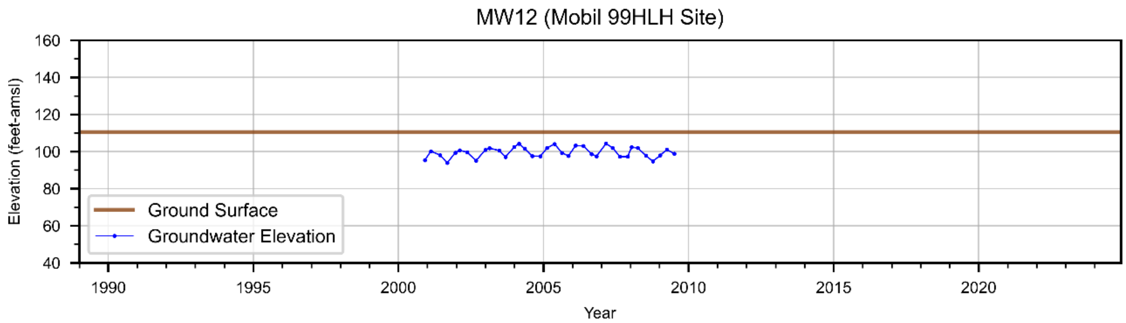
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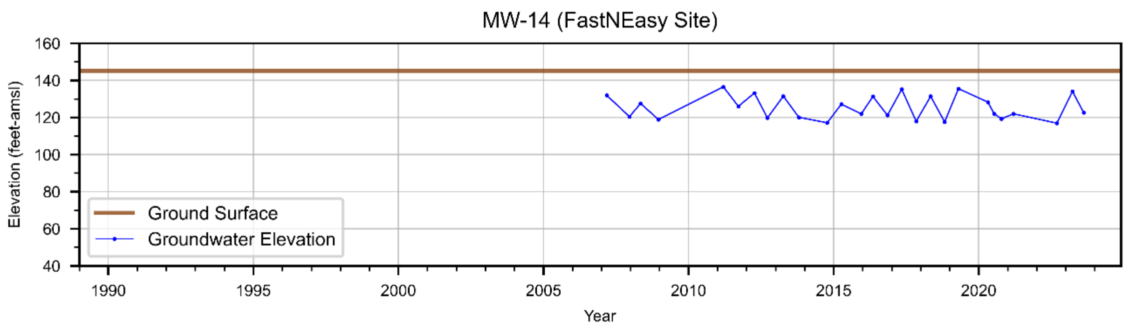
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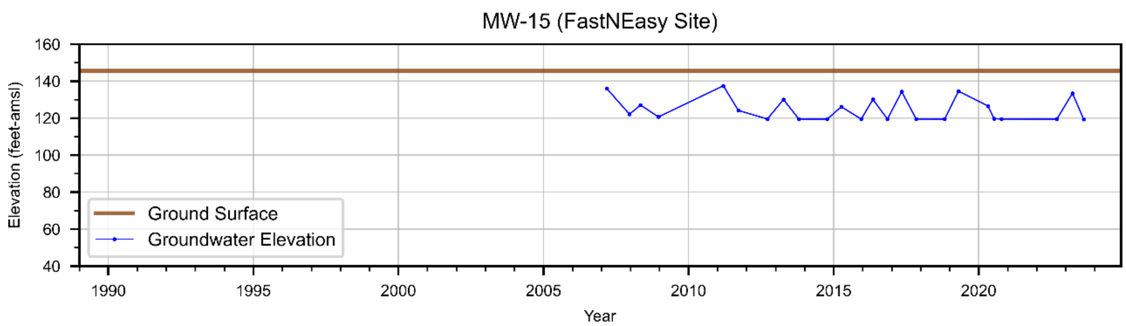
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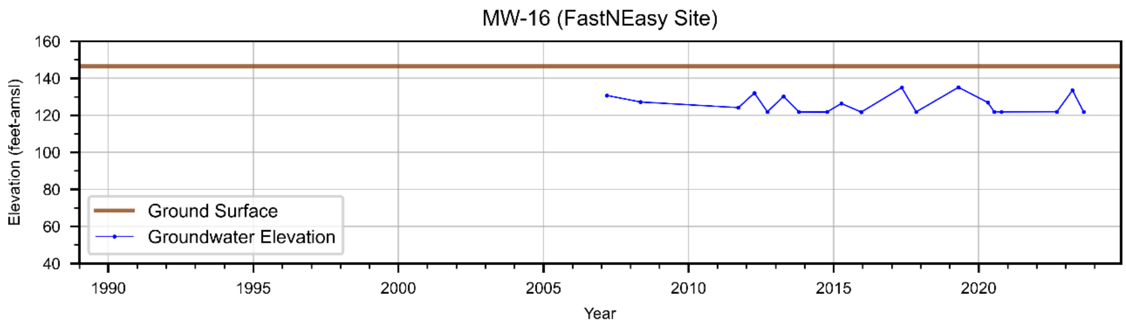
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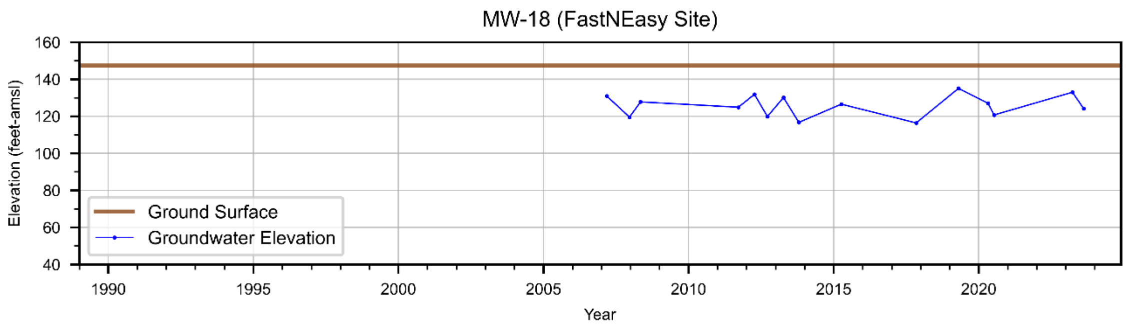
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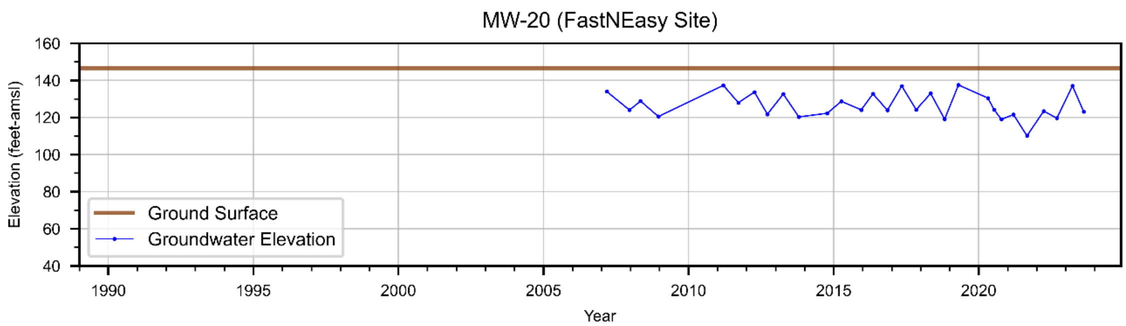
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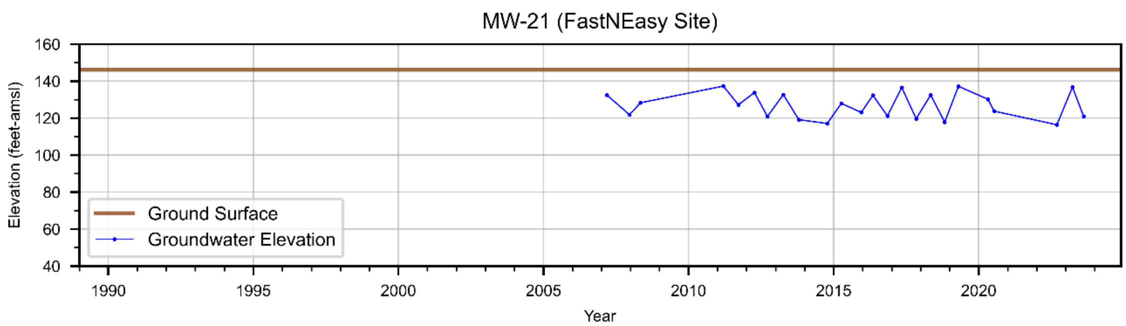
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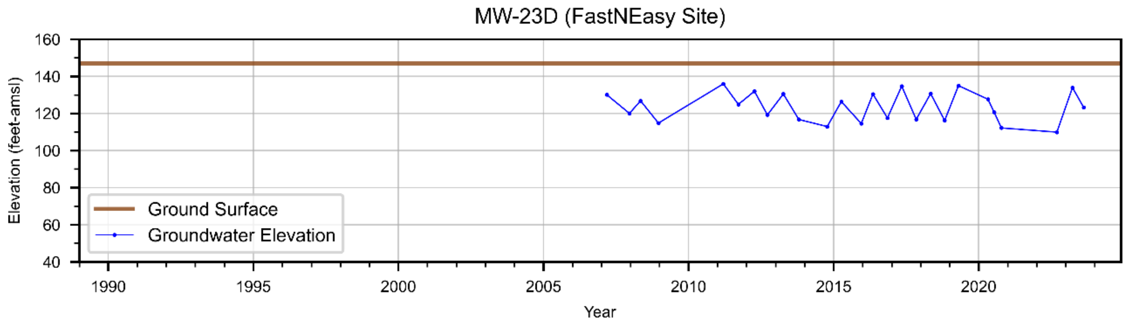
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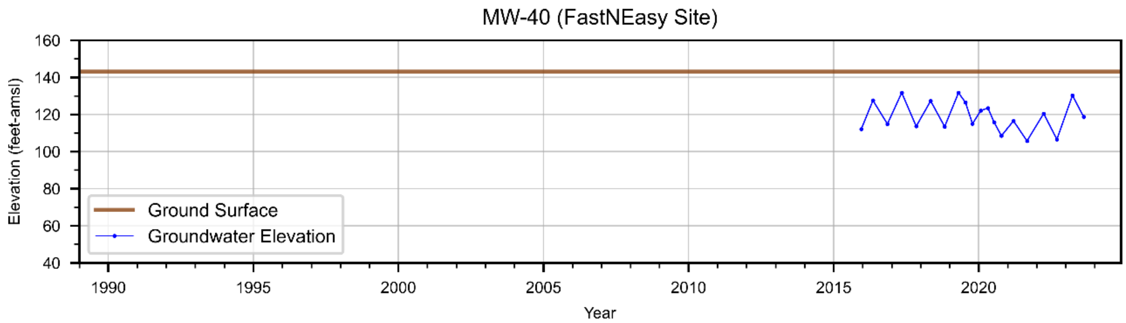
MW-40 (FastNEasy Site)
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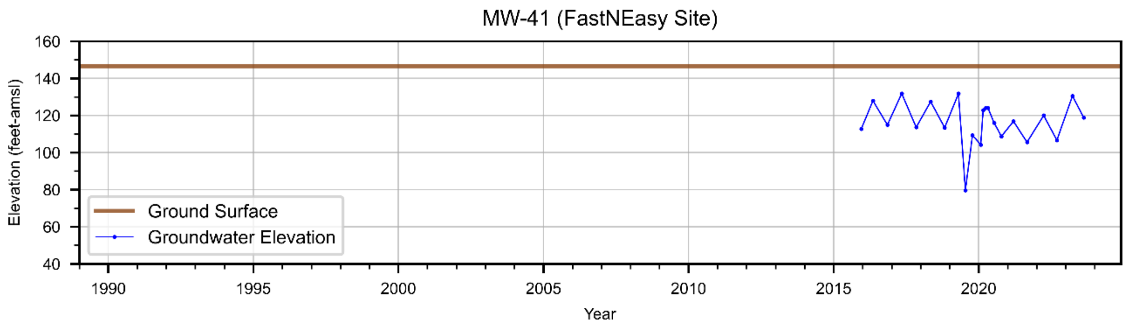
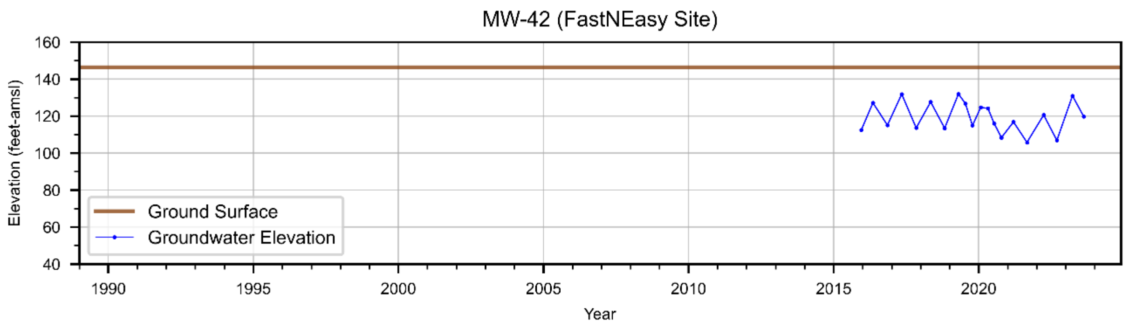
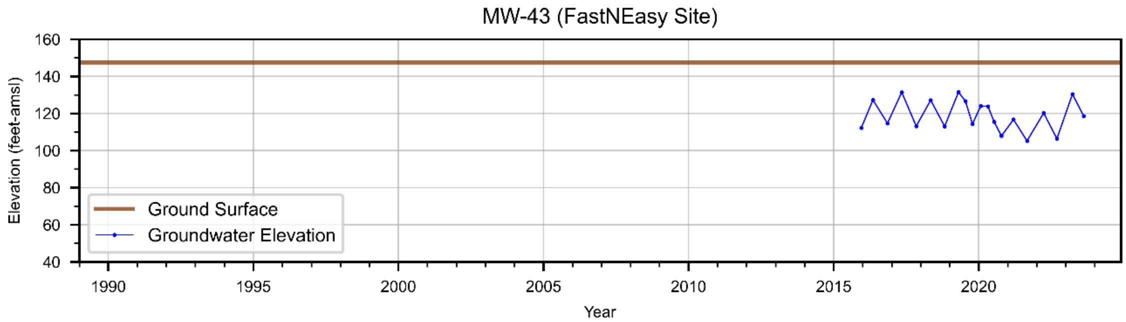
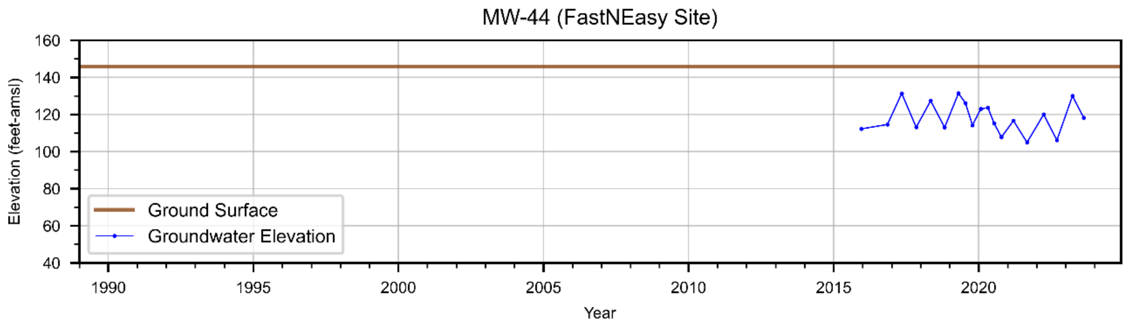
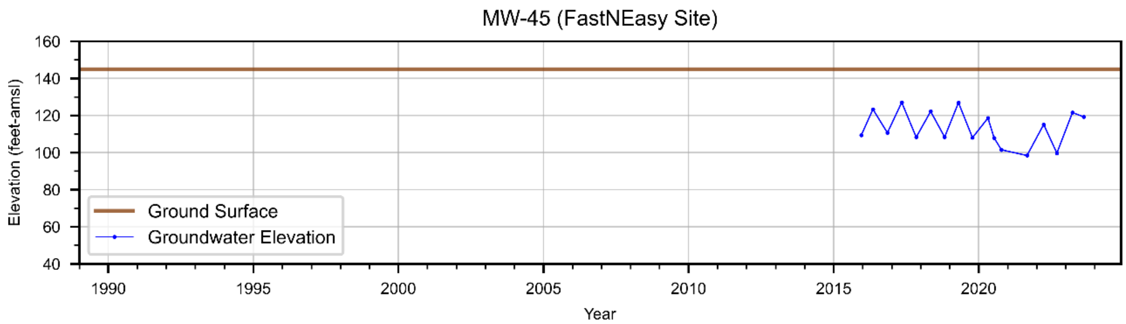
Ground Surface
Groundwater Elevation

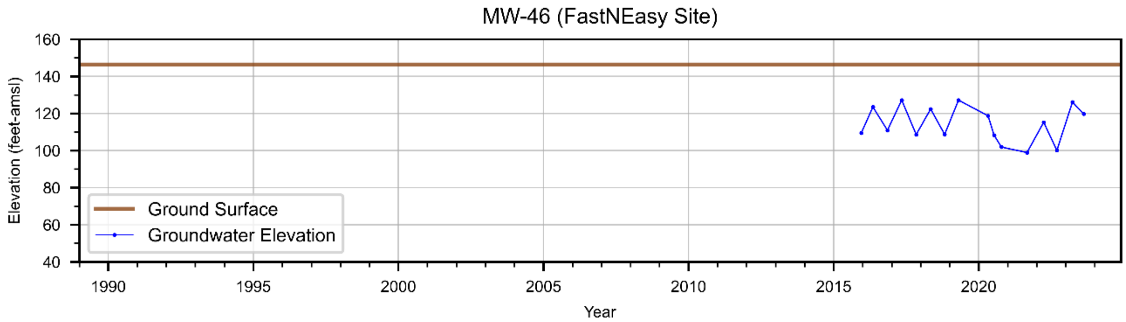

MW-41 (FastNEasy Site)
Elevation (feet-amsl)
160
140
120
100
80
60
40
1990
1995
2000
2005
2010
2015
2020
Year
Ground Surface
Groundwater Elevation

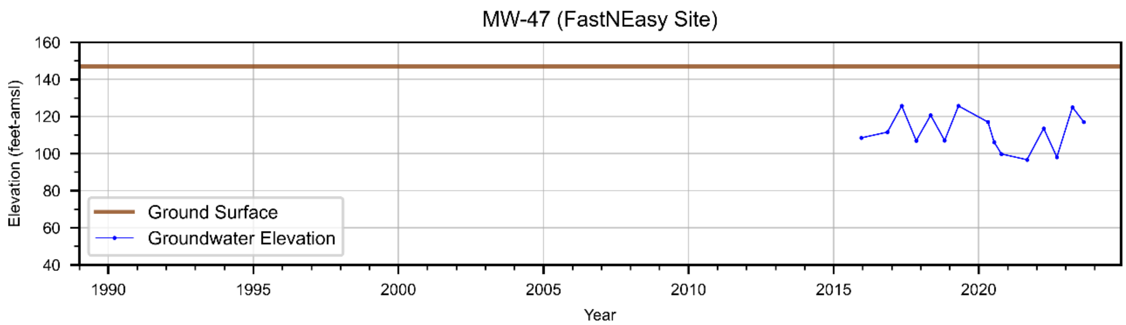

MW-42 (FastNEasy Site)
Elevation (feet-amsl)
160
140
120
100
80
60
40
1990
1995
2000
2005
2010
2015
2020
Year
Ground Surface
Groundwater Elevation


MW-43 (FastNEasy Site)
Elevation (feet-amsl)
Year
Ground Surface
Groundwater Elevation


MW-44 (FastNEasy Site)
Elevation (feet-amsl)
Year
Ground Surface
Groundwater Elevation


MW-45 (FastNEasy Site)
Elevation (feet-amsl)
Year
Ground Surface
Groundwater Elevation


MW-46 (FastNEasy Site)
Elevation (feet-amsl)
160
140
120
100
80
60
40
Ground Surface
Groundwater Elevation
1990
1995
2000
2005
2010
2015
2020
Year


MW-47 (FastNEasy Site)
Elevation (feet-amsl)
160
140
120
100
80
60
40
Ground Surface
Groundwater Elevation
1990
1995
2000
2005
2010
2015
2020
Year

ATTACHMENT 2 – BORING LOGS

ATTACHMENT 3 – MEASURED AND PREDICTED GROUNDWATER LEVELS FOR SELECT WELLS

References: HydroScience (2023); USGS (2006); State of California (2023); Town of Windsor Water Master Plan (WMP) (2019)

SHILOH CASINO AND RESORT

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 1

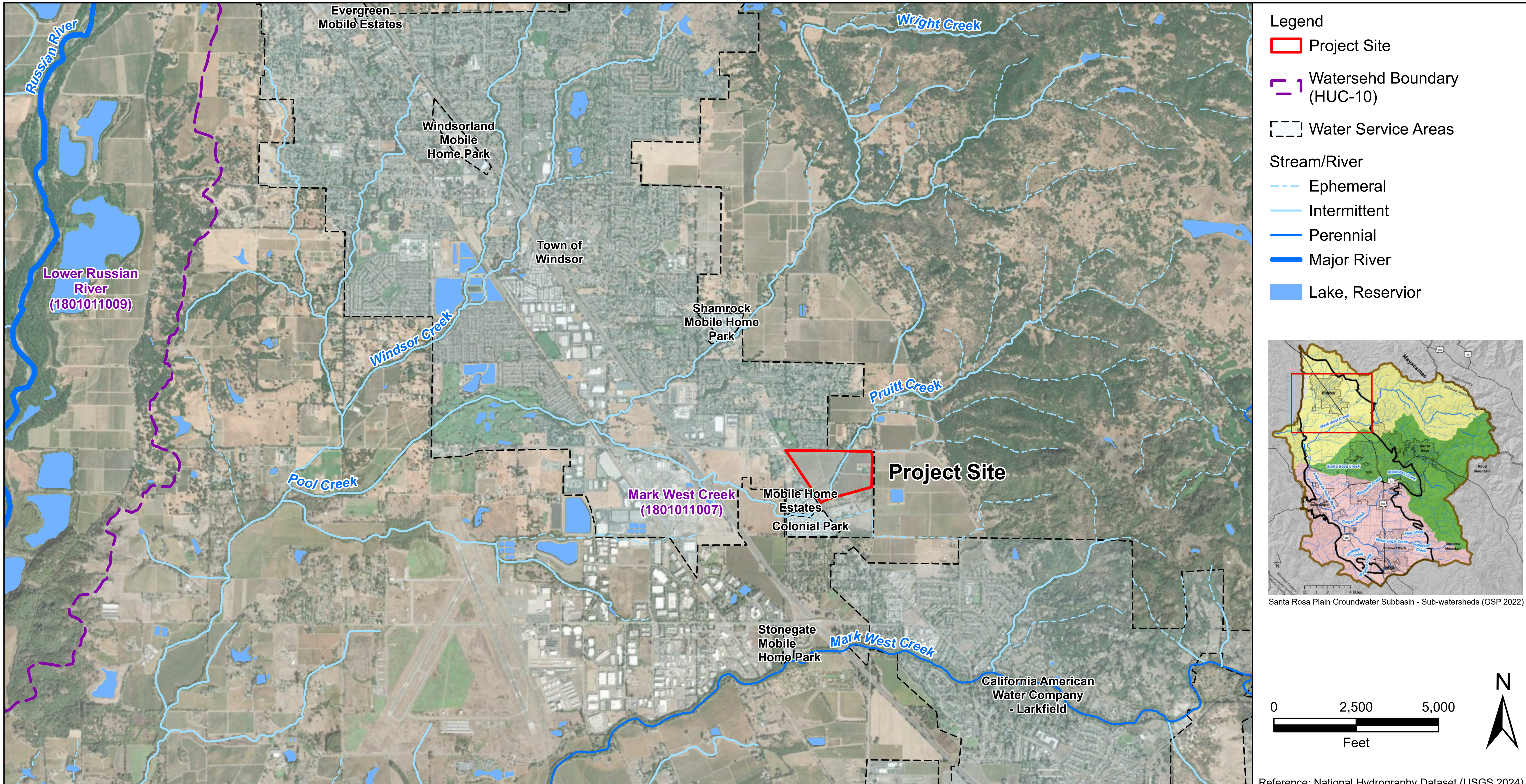
SITE LOCATION

DATE: MAR 20, 2024

By: WRG | For: MT

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig01_SiteLocation



SHILOH CASINO AND RESORT

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 2

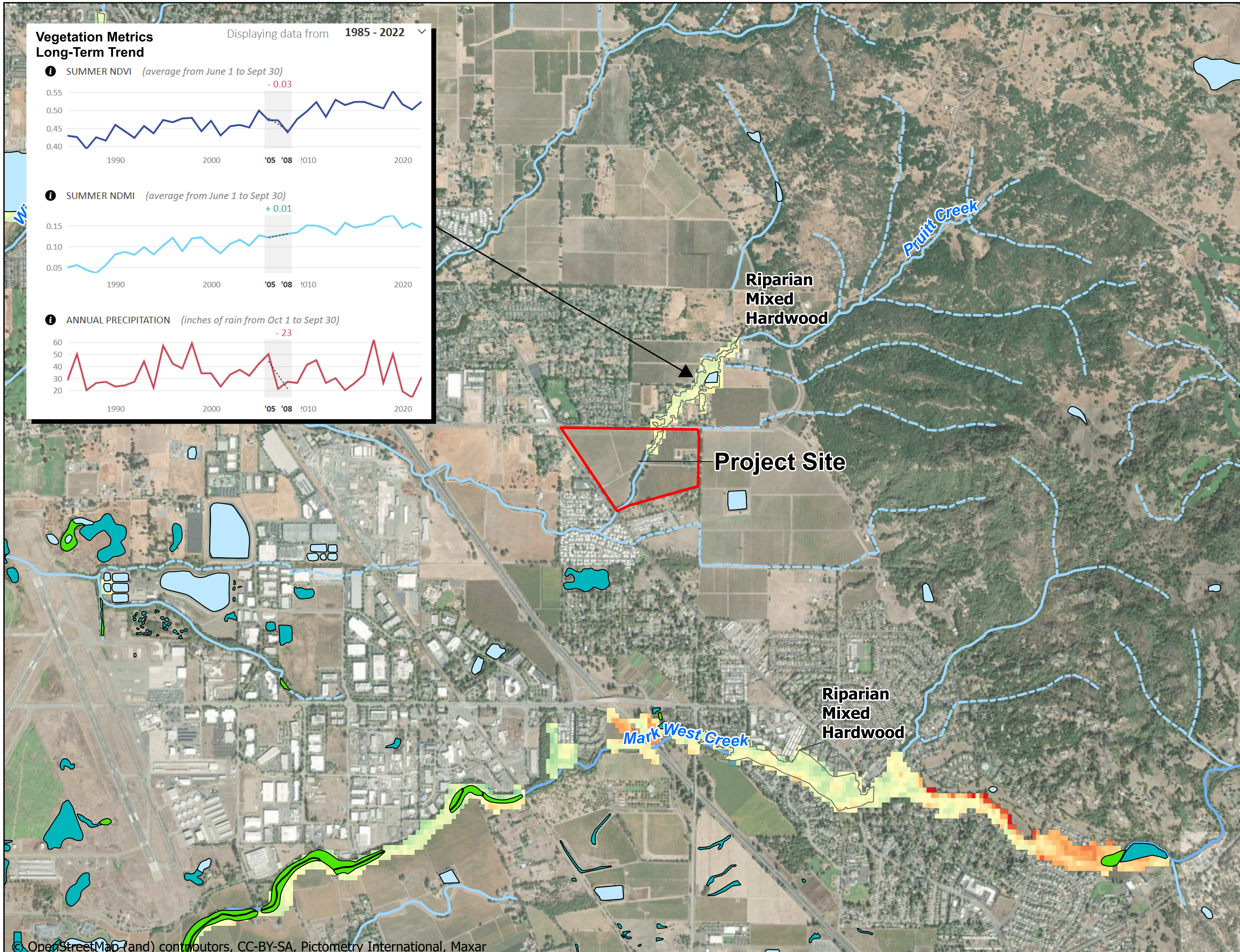
HYDROLOGIC SETTING

DATE: MAR 19, 2024

By: WRG For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig02_HydroSetting



Legend

- Project Site

Streams/Rivers

- Ephemeral
- Intermittent
- Perennial

Wetland Type

- Freshwater Forested/Shrub Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Vegetation Type

- Riparian Mixed Hardwood

Normalized Difference Vegetation Index (NDVI)

Trend (2008 - 2022)

- Large increase
- Moderate increase
- Little or no change
- Moderate decrease
- Large decrease

0 1,750 3,500
Feet

N

References: National Wetlands Inventory (USFWS 2024); NCCAG and GDE Pulse (TNC 2024); USGS (2024)

SHILOH CASINO AND RESORT

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 3

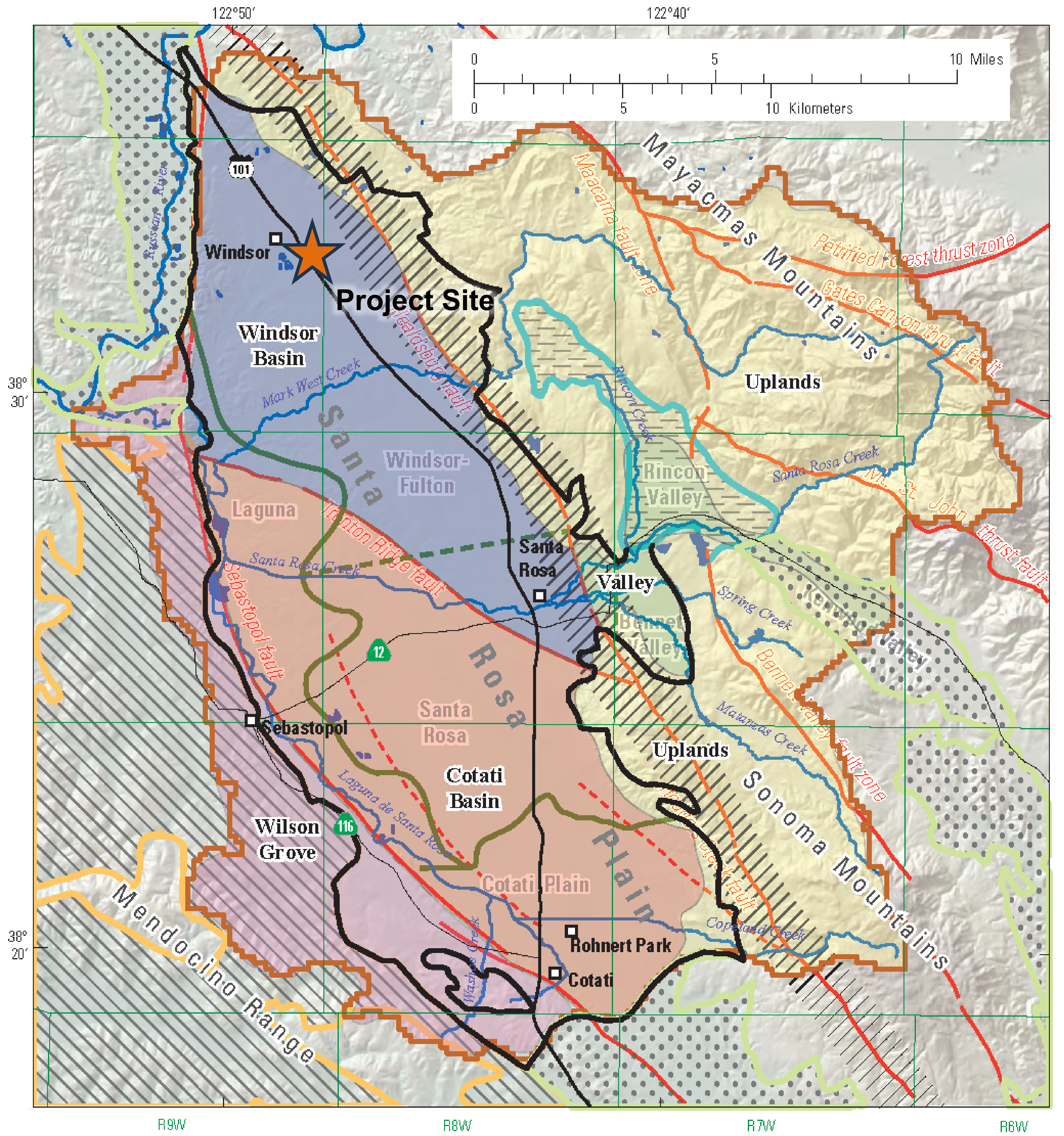
GROUNDWATER DEPENDENT ECOSYSTEMS

DATE: MAR 19, 2024

By: WRG For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig03_GDEs



EXPLANATION

Groundwater subbasin

- Santa Rosa Plain
- Wilson Grove Formation Highlands
- Rincon Valley
- Other subbasins

Groundwater storage unit

- Windsor Basin
- Cotati Basin
- Wilson Grove
- Valley
- Uplands

Rodgers Creek fault zone

Inferred fault

Groundwater storage unit [after Cardwell (1958). Dashed lines, approximate boundaries not explicitly defined by Cardwell (1958).]

Santa Rosa Plain watershed boundary

Santa Rosa Plain Groundwater Subbasin (no. 1-055), Sonoma County, California. Figure 24 from USGS SIR 2013-5118, Chapter B.

SHILOH CASINO AND RESORT
KOI NATION OF NORTHERN CALIFORNIA

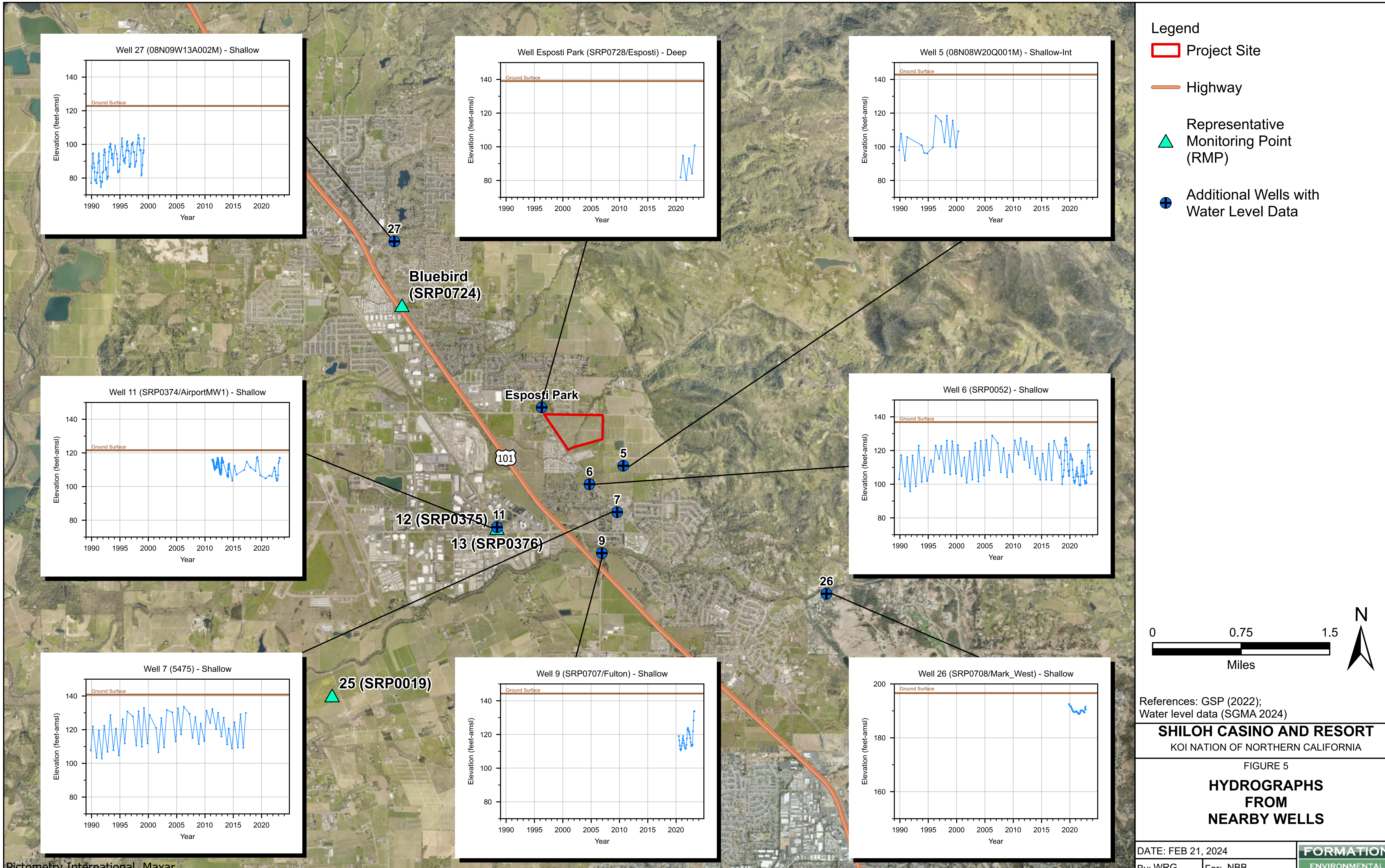
FIGURE 4

HYDROGEOLOGIC SETTING

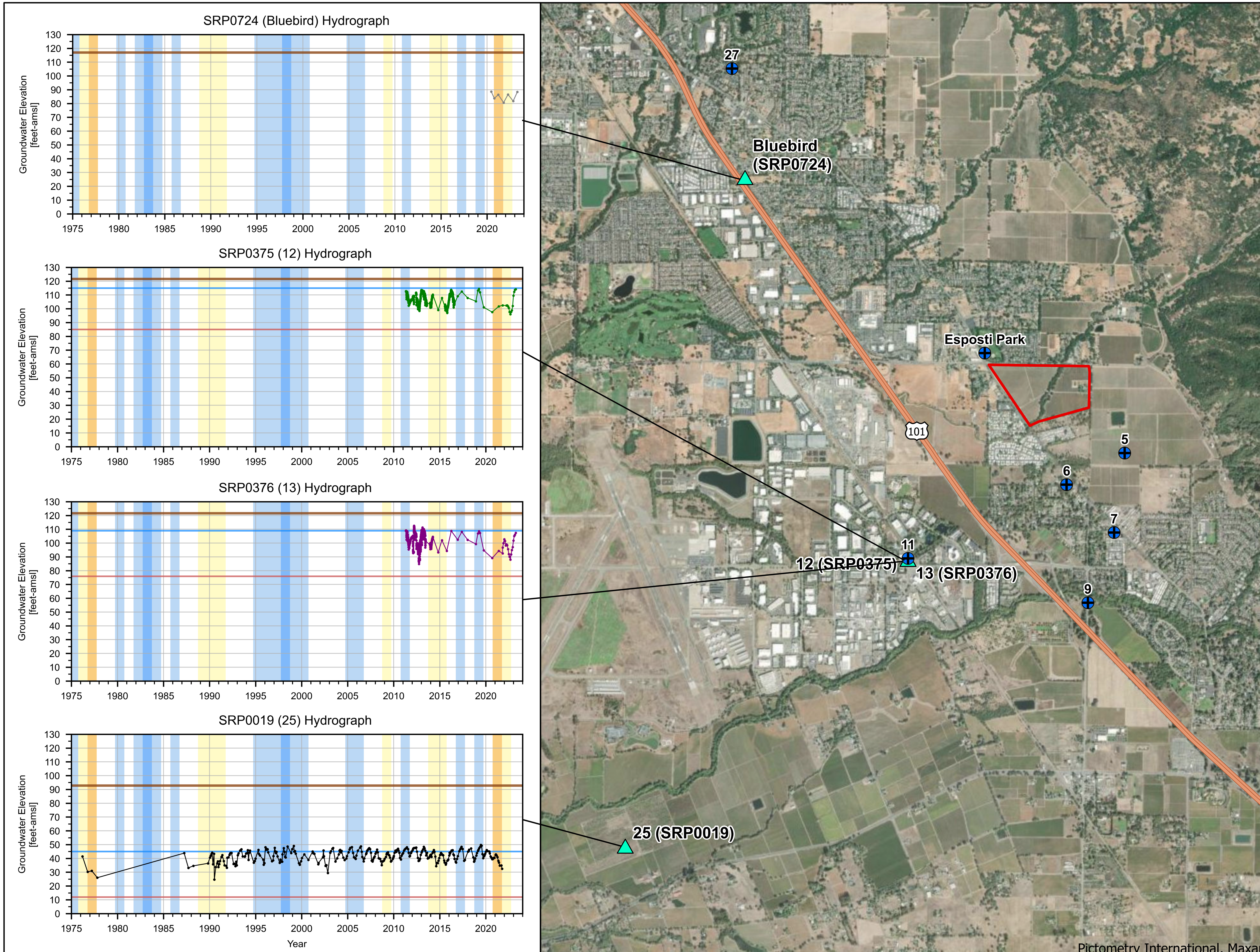
DATE: JAN 22, 2024
BY: WRG
FOR: NBB

FORMATION ENVIRONMENTAL

"M:\Acorn Environmental\Koi Nation Shiloh Resort & Casino\Tasks\Task 5 Memo\Figures\11x17P_Fig05_HydrogeoSetting.pptx"



Well 27 (08N09W13A002M) - Shallow
Well Esposti Park (SRP0728/Esposti) - Deep
Well 5 (08N08W20Q001M) - Shallow-Int
Well 11 (SRP0374/AirportMW1) - Shallow
Well 6 (SRP0052) - Shallow
Well 7 (5475) - Shallow
Well 9 (SRP0707/Fulton) - Shallow
Well 26 (SRP0708/Mark_West) - Shallow
Ground Surface
Elevation (feet-amsl)
Year
Bluebird (SRP0724)
Esposti Park
12 (SRP0375)
13 (SRP0376)
25 (SRP0019)
27
11
5
6
7
9
26
101
Pictometry International, Maxar
Legend
Project Site
Highway
Representative Monitoring Point (RMP)
Additional Wells with Water Level Data
0
0.75
1.5
Miles
N
References: GSP (2022); Water level data (SGMA 2024)
SHILOH CASINO AND RESORT
KOI NATION OF NORTHERN CALIFORNIA
FIGURE 5
HYDROGRAPHS FROM NEARBY WELLS
DATE: FEB 21, 2024
By: WRG
For: NBB
FORMATION ENVIRONMENTAL



Map Legend

- Project Site
- Highway
- Representative Monitoring Point (RMP)
- Additional Wells with Water Level Data

Hydrograph Legend

- Ground Surface
- Minimum Threshold
- Measurable Objective

Water Year Classification

- Very Wet
- Wet
- Normal
- Dry
- Very Dry

0 2,500 5,000
Feet

N

References: Water year classification from GSP (2022); Water level data (SGMA 2024)

SHILOH CASINO AND RESORT

KOI NATION OF NOTHERN CALIFORNIA

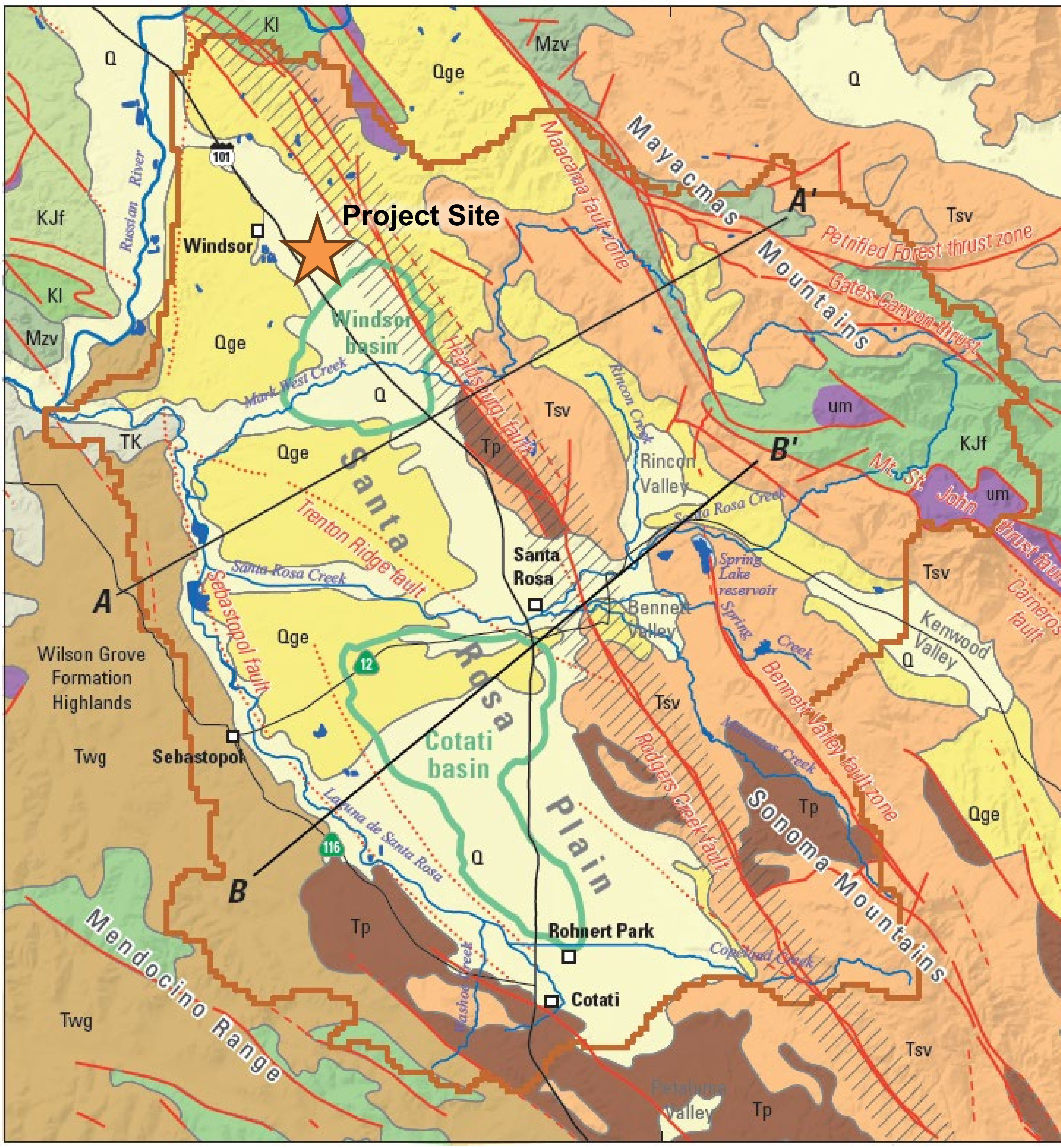
FIGURE 6

RMP WELL HYDROGRAPHS

DATE: OCT 14, 2024	
By: WRG	For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig06_RMS_hydrographs



GEOLOGIC UNIT

Cenozoic

Sedimentary rocks

Quaternary

- Q — Recent alluvium, landslide, and sand dune deposits

Plio-Pleistocene and Pliocene

- Qge — Glen Ellen Formation

Pliocene and Miocene

- Twg — Wilson Grove Formation
- Tp — Petaluma Formation

Volcanic rocks

Pliocene and Miocene

- Tsv — Sonoma Volcanics

Mesozoic

Sedimentary and metasedimentary rocks

Tertiary-Cretaceous

- TK — Coastal belt rocks

Cretaceous

- Kl — Lower Cretaceous marine
- KJf — Franciscan Complex

Plutonic, metavolcanic, and mixed rocks

- um — Ultramafic rocks
- Mzv — Volcanic and metavolcanic

Water

Santa Rosa Plain watershed boundary

Fault—Dashed where approximately located, dotted where concealed

Rodgers Creek fault zone

Location of deep basins as defined the –14 milligal isostatic gravity contour of Langenheim and others (2006)

A–A' Line of geologic section shown on figures 2, 25

0 5 10 Miles

0 5 10 Kilometers

Santa Rosa Plain Watershed, Sonoma County, California. Figure 1 from USGS SIR 2013-5118, Chapter B.

SHILOH CASINO AND RESORT
KOI NATION OF NORTHERN CALIFORNIA

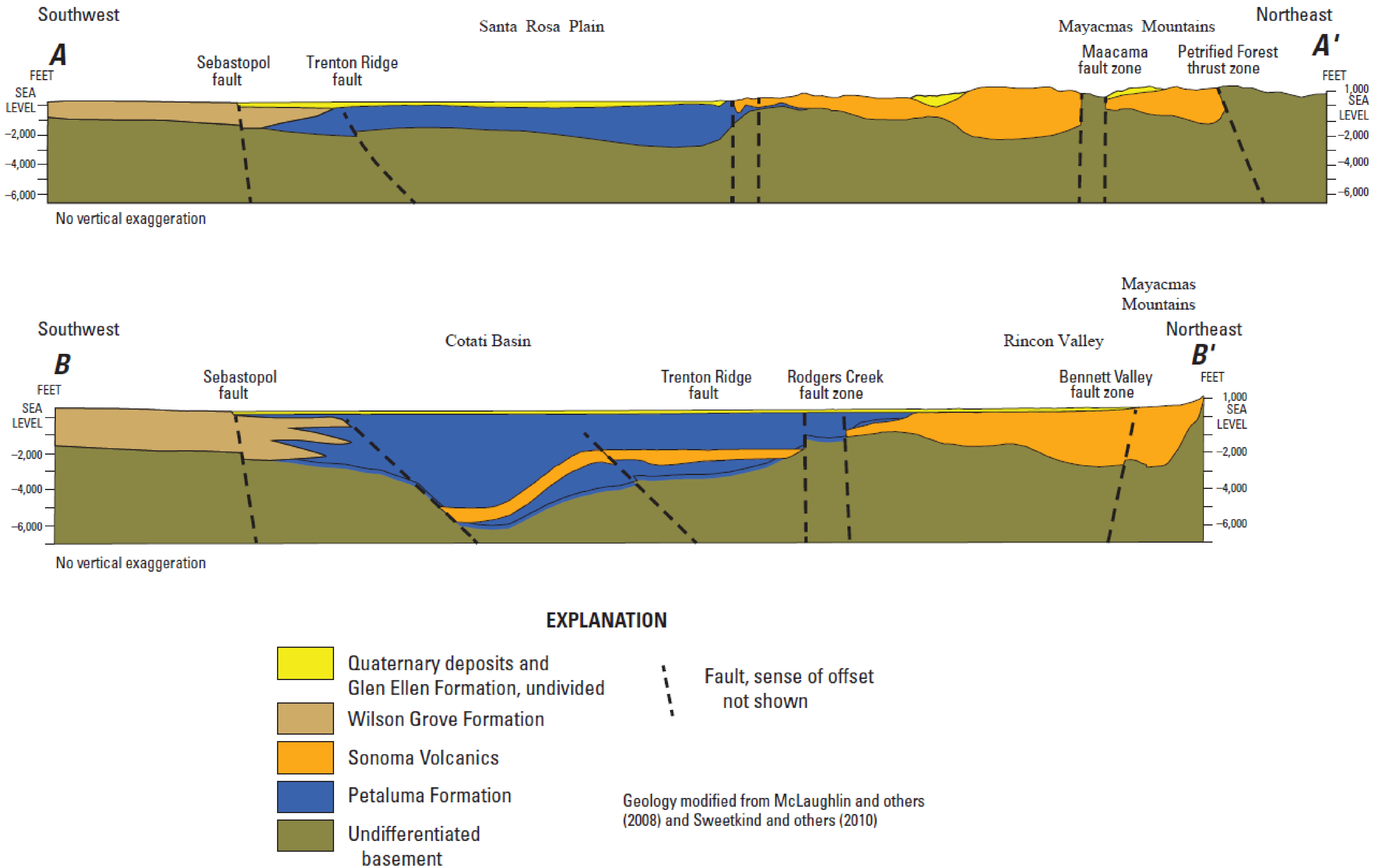
FIGURE 7

GEOLOGIC SETTING

DATE: FEB 14, 2024
BY: CFJ | FOR: NBB

FORMATION ENVIRONMENTAL

"M:\Acorn Environmental\Koi Nation Shiloh Resort & Casino\Tasks\Task 5 Memo\Figures\11x17P_Fig06_GeologicSetting.pptx"



Modified from: Santa Rosa Plain Watershed, Sonoma County, California.
USGS SIR 2013-5118. Chapter B. Figure 1.

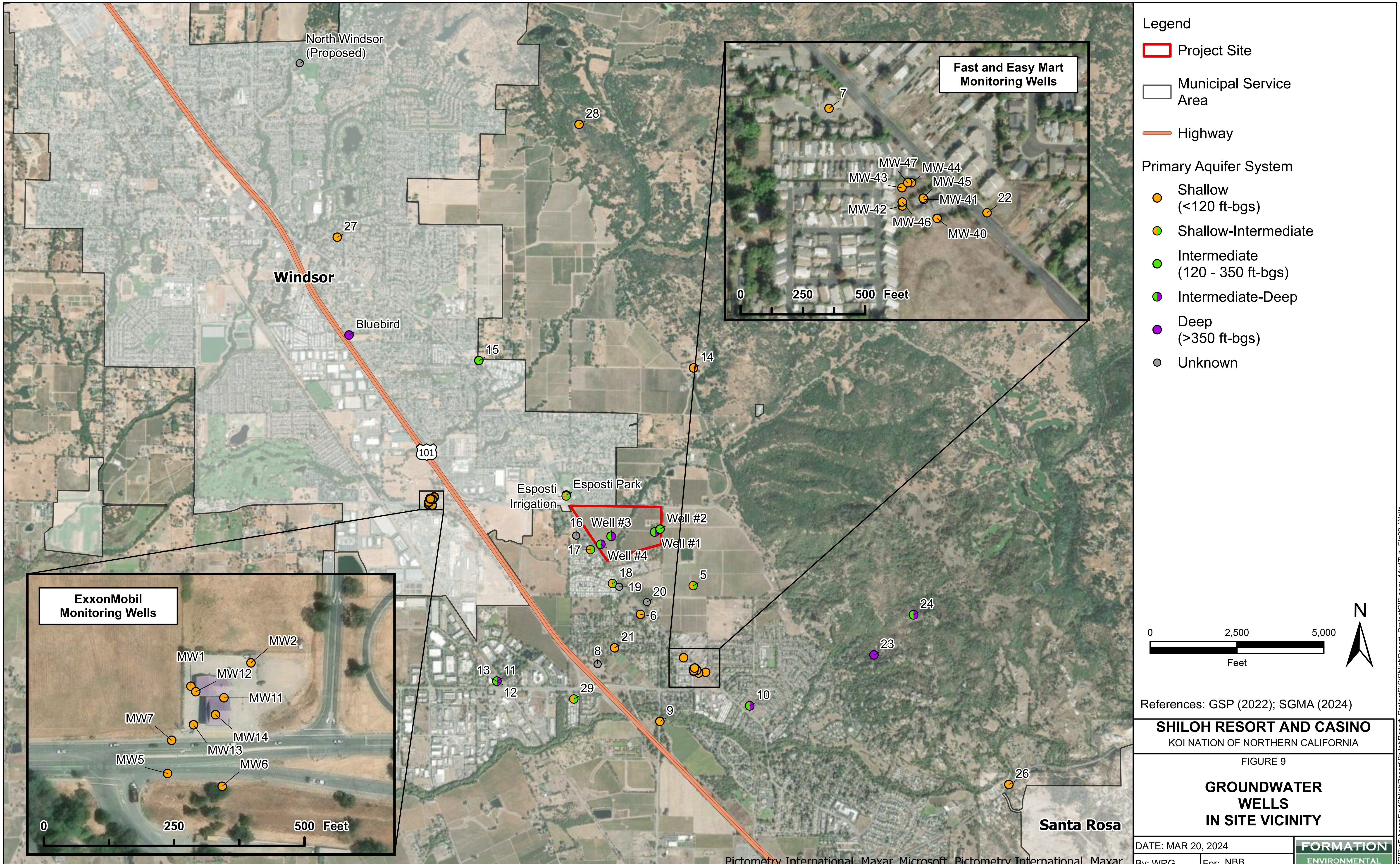
SHILOH CASINO AND RESORT
KOI NATION OF NORTHERN CALIFORNIA

FIGURE 8

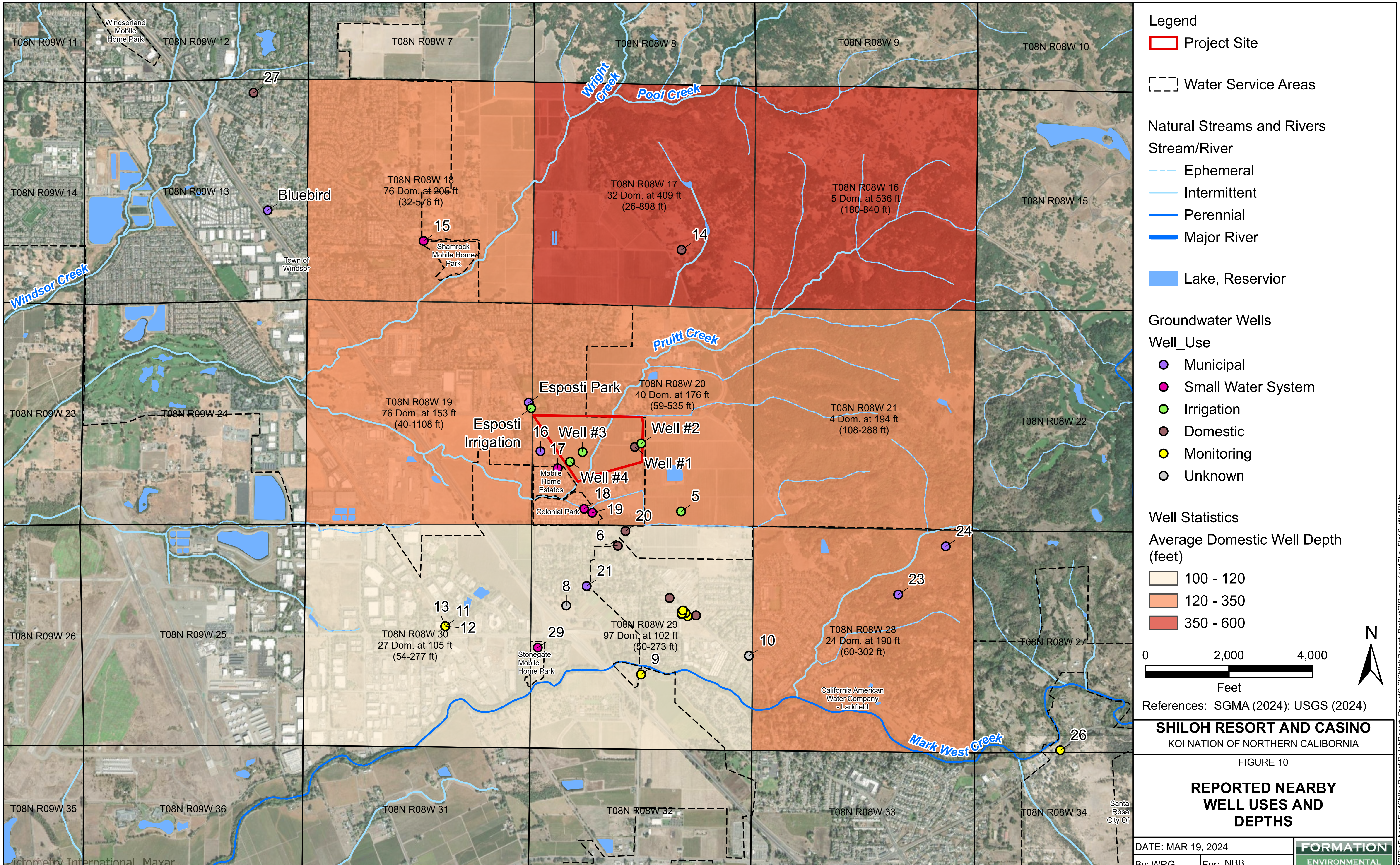
REGIONAL GEOLOGIC CROSS SECTIONS

DATE: FEB 14, 2024
BY: CFJ
FOR: NBB

FORMATION ENVIRONMENTAL



Legend
Project Site
Municipal Service Area
Highway
Primary Aquifer System
Shallow (<120 ft-bgs)
Shallow-Intermediate
Intermediate (120 - 350 ft-bgs)
Intermediate-Deep
Deep (>350 ft-bgs)
Unknown
0 2,500 5,000
Feet
N
References: GSP (2022); SGMA (2024)
SHILOH RESORT AND CASINO
KOI NATION OF NORTHERN CALIFORNIA
FIGURE 9
GROUNDWATER WELLS IN SITE VICINITY
DATE: MAR 20, 2024
By: WRG
For: NBB
FORMATION ENVIRONMENTAL
Fast and Easy Mart Monitoring Wells
7
MW-47
MW-44
MW-43
MW-45
MW-41
22
MW-42
MW-46
MW-40
0 250 500 Feet
ExxonMobil Monitoring Wells
MW2
MW1
MW12
MW11
MW7
MW14
MW13
MW5
MW6
0 250 500 Feet
North Windsor (Proposed)
28
27
Windsor
Bluebird
15
14
101
Esposti Irrigation
Esposti Park
16
Well #3
Well #2
Well #1
17
Well #4
18
19
20
5
6
24
21
8
23
13
11
12
29
10
9
26
Santa Rosa
Pictometry International, Maxar, Microsoft, Pictometry International, Maxar

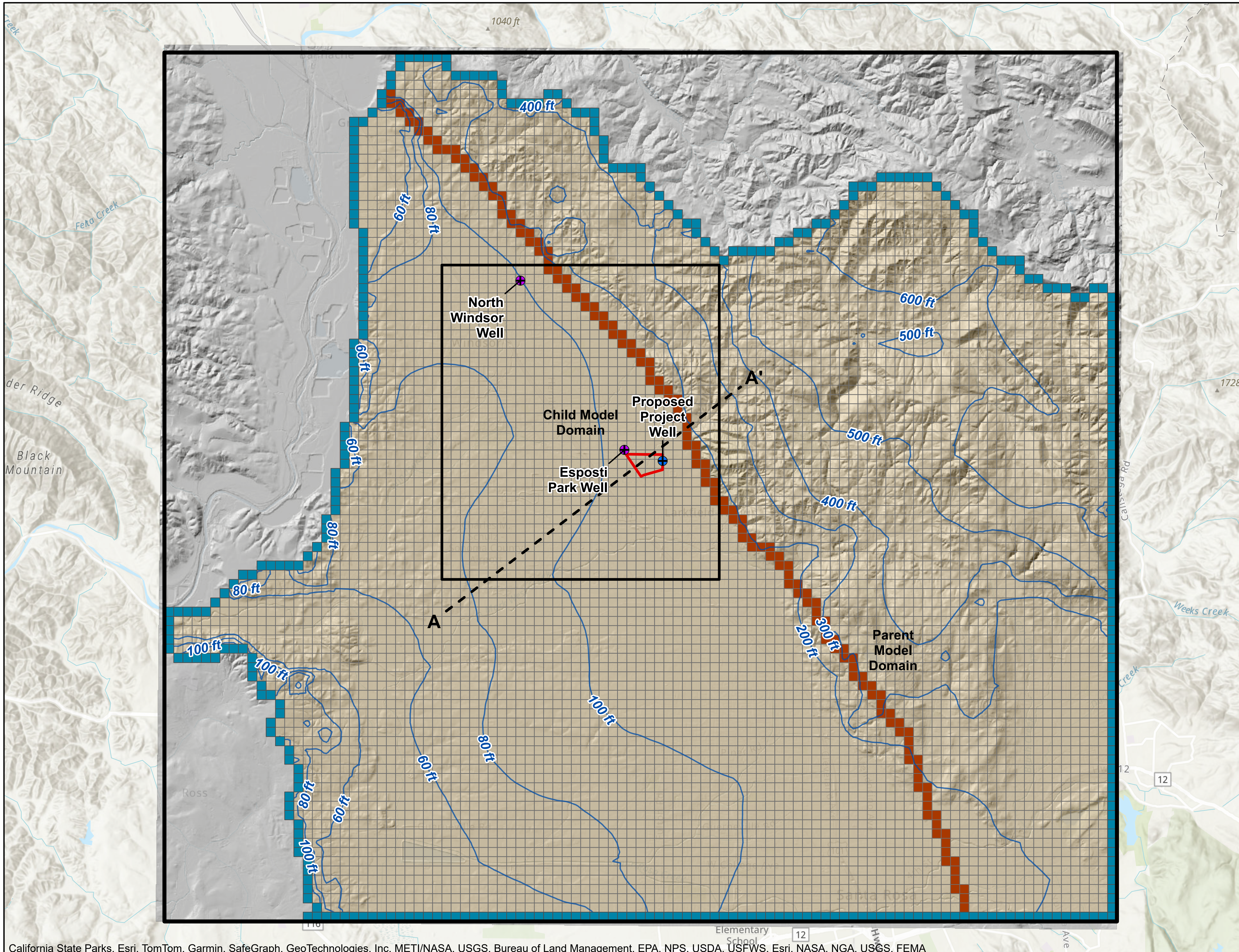


SHILOH RESORT AND CASINO
KOI NATION OF NORTHERN CALIFORNIA

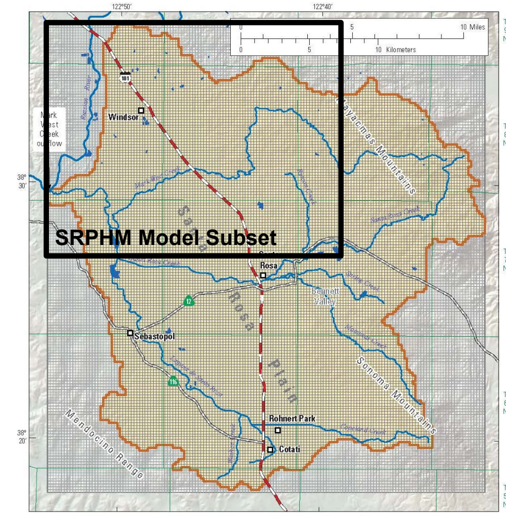
FIGURE 10

REPORTED NEARBY WELL USES AND DEPTHS

DATE: MAR 19, 2024
By: WRG
For: NBB
FORMATION ENVIRONMENTAL



Legend



References: Santa Rosa Plain Hydrologic Model (Woolfenden and Nishikawa 2014); USGS (2024)

SHILOH RESORT AND CASINO

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 11

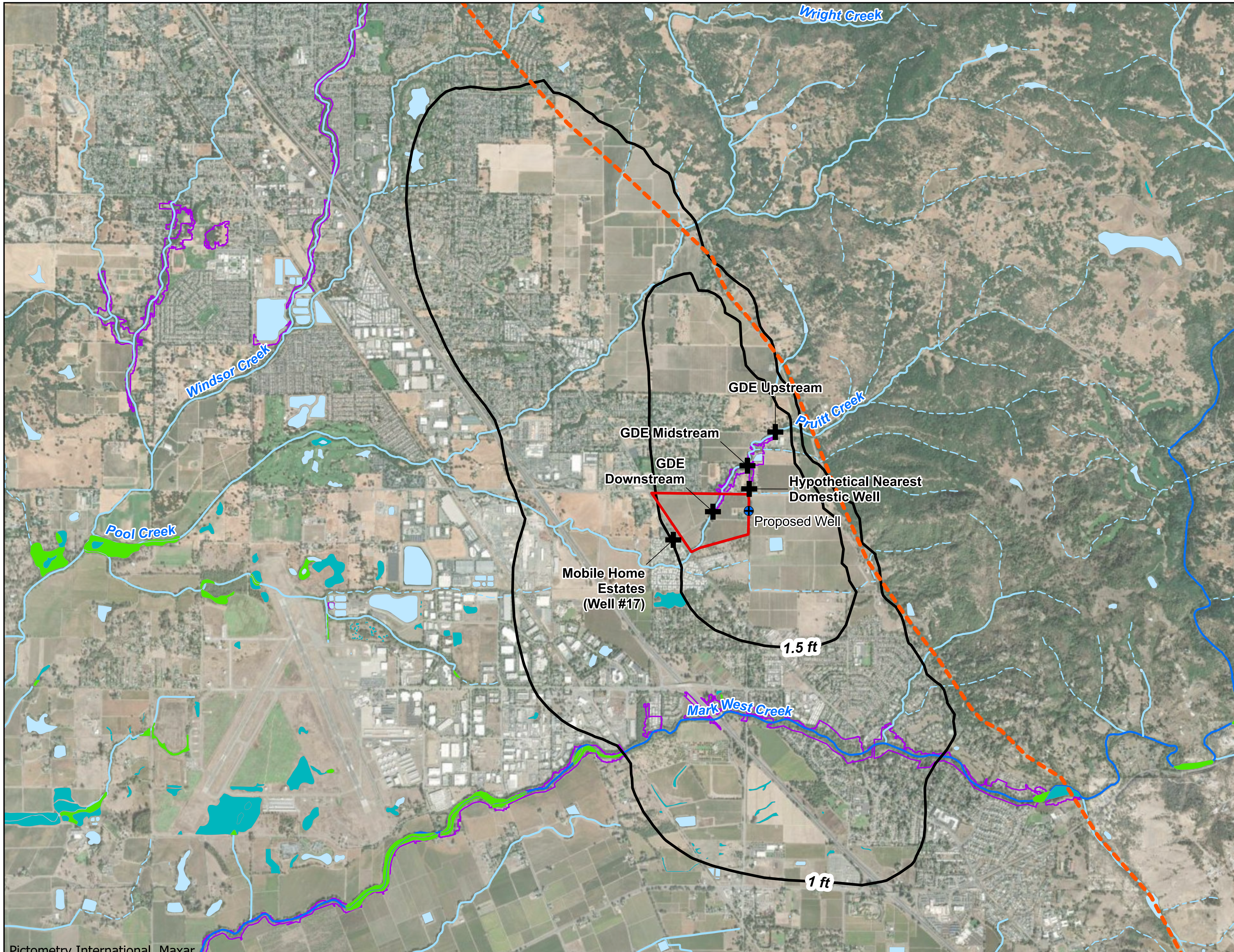
MODEL DOMAIN AND BOUNDARY CONDITIONS

DATE: FEB 21, 2024

By: WRG For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig11_ModelDomain



Legend

Groundwater Dependent Ecosystems (GDEs)

Vegetation Type

- Riparian Mixed Hardwood

Wetland Type

- Estuarine and Marine Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Emergent Wetland
- Freshwater Pond

Natural Streams and Rivers

- Ephemeral
- Intermittent
- Perennial
- Major River

- Healdsburg Fault Trace
- Layer 1 Drawdown Contour
- Observation Points
- Proposed Project Well
- Project Boundary

0 2,500 5,000
Feet

N

References: National Wetlands Inventory (USFWS 2024); NCCAG (TNC 2024); USGS (2024)

SHILOH RESORT AND CASINO
KOI NATION OF NORTHERN CALIFORNIA

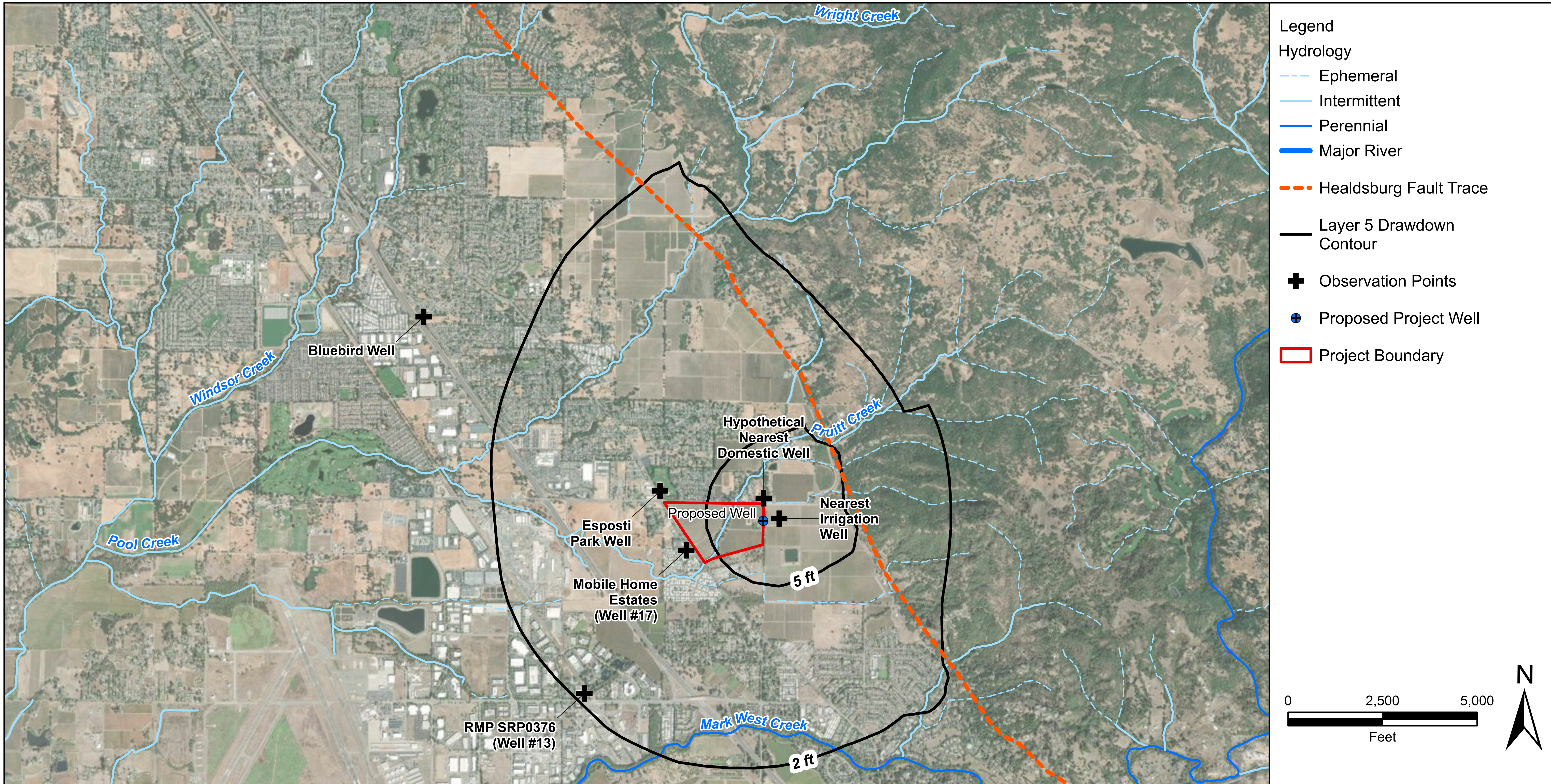
FIGURE 14

PREDICTED 50-YEAR DRAWDOWN AT WATER TABLE (ALTERNATIVE A)

DATE: MAR 20, 2024
By: WRG For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig14_Drawdown_projL1



References: USGS (2024)

SHILOH RESORT AND CASINO

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 15

PREDICTED 50-YEAR DRAWDOWN IN DEEP WATER-BEARING ZONE (ALTERNATIVE A)

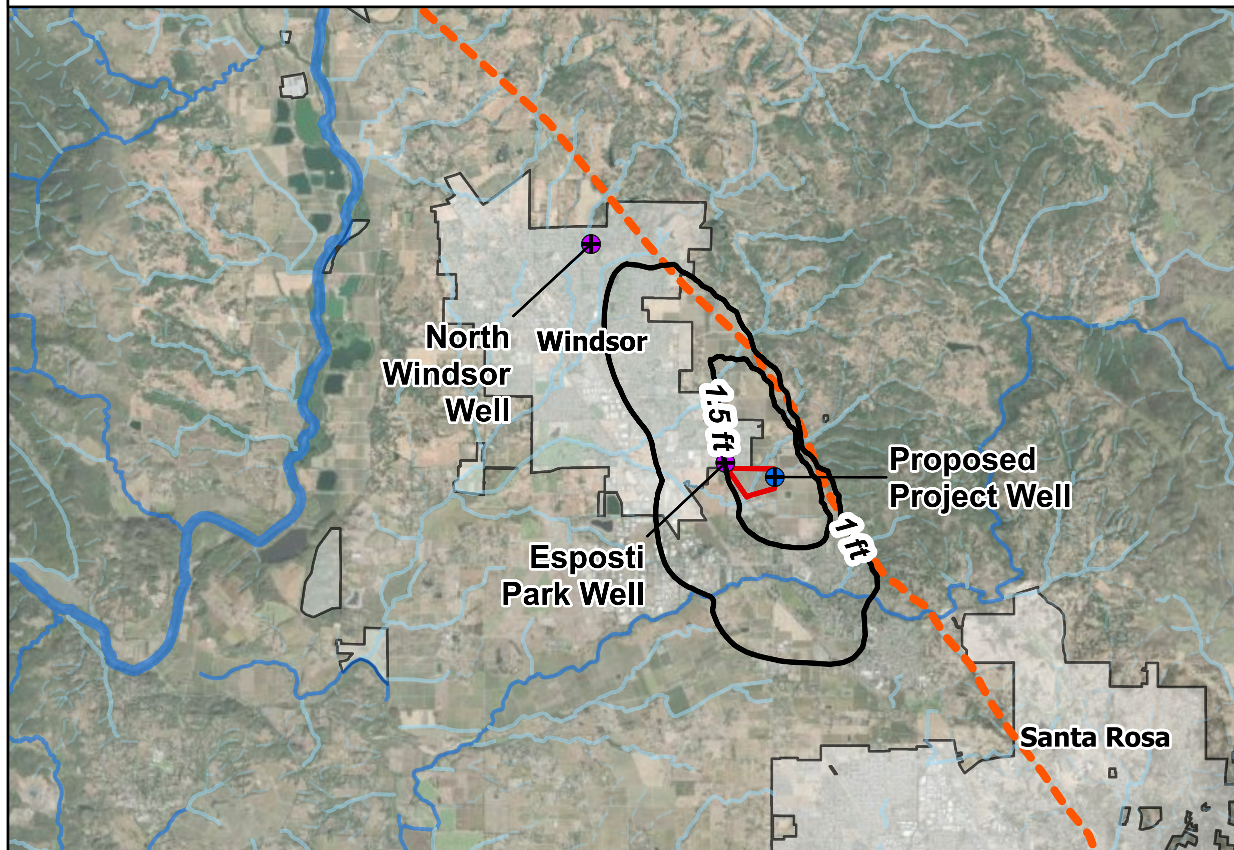
DATE: MAR 20, 2024

By: WRG | For: NBB

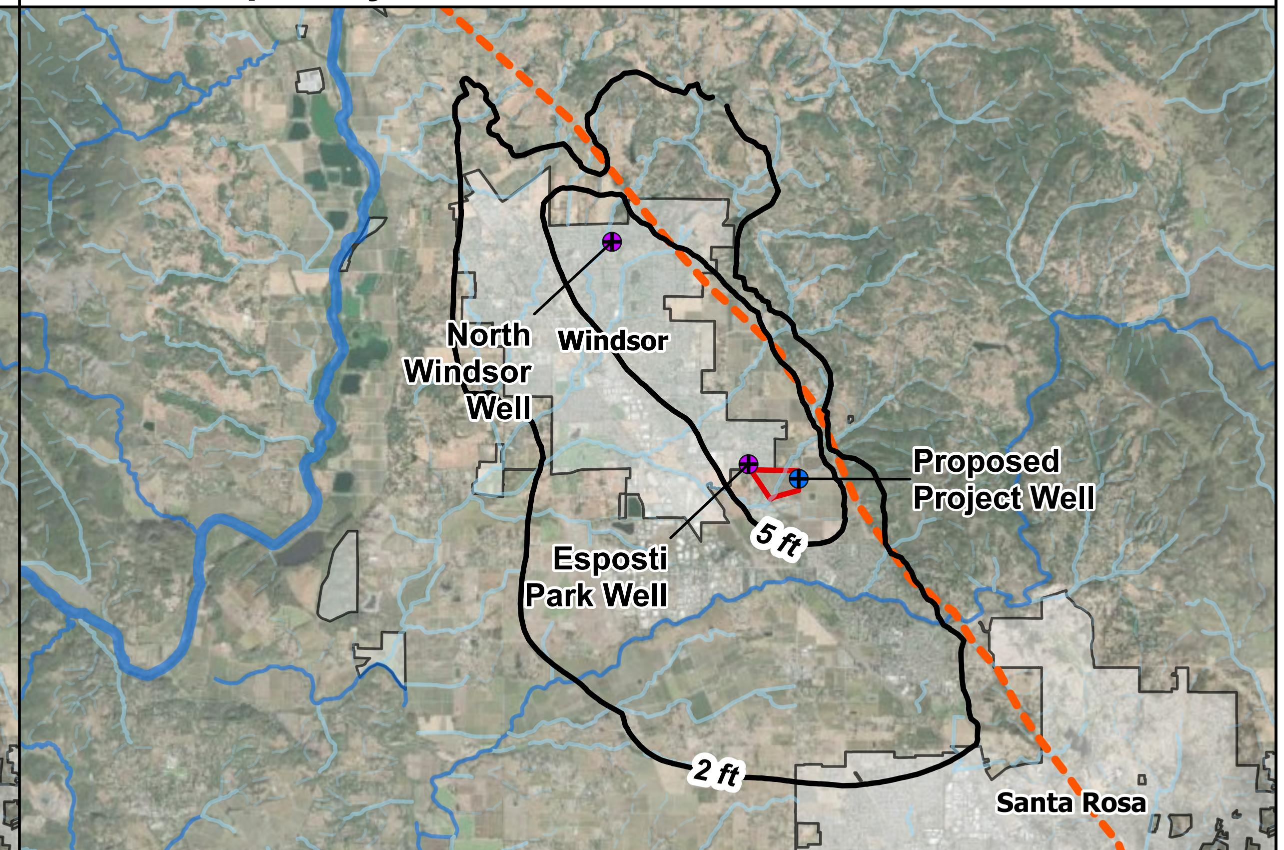
FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig15_Drawdown_projL5

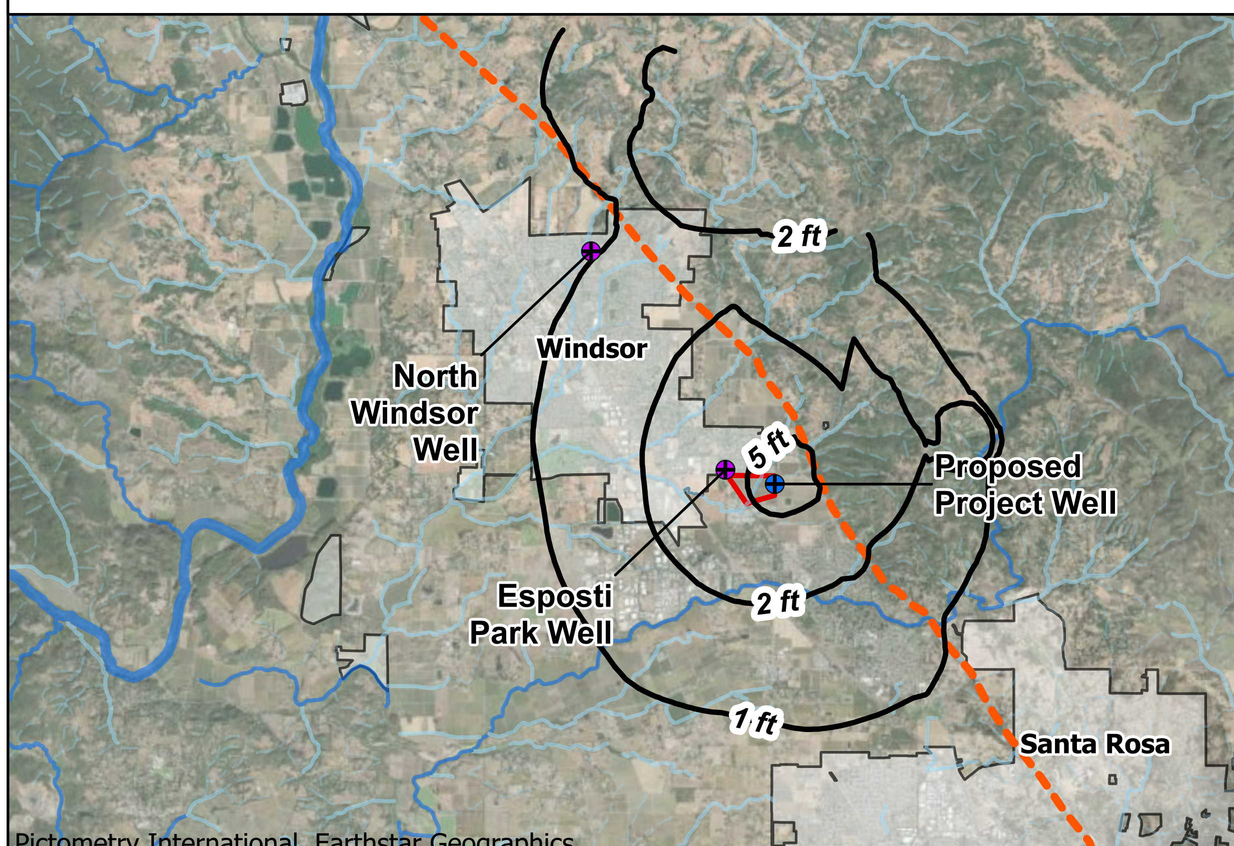
Layer 1 Predicted Cumulative Drawdown After 50 Years



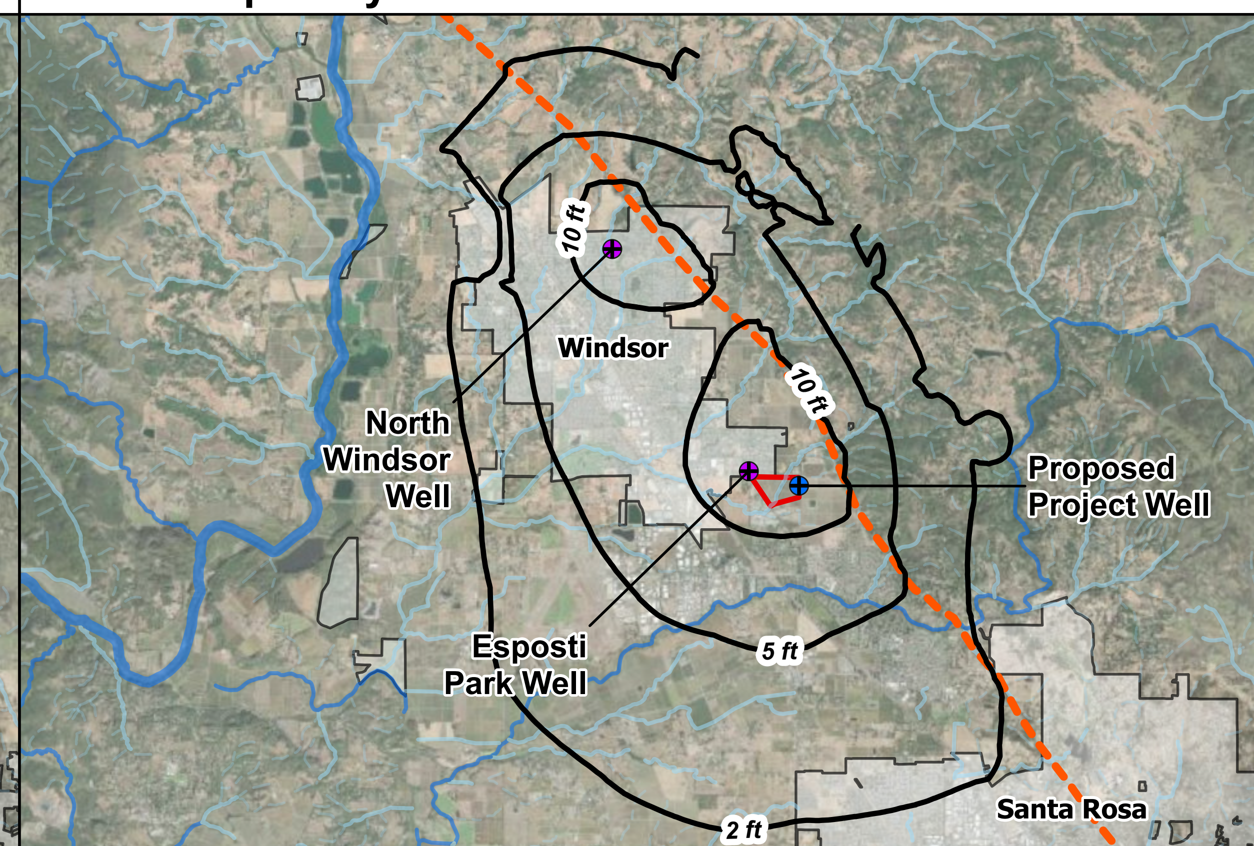
Layer 1 Predicted Maximum Cumulative Drawdown After Multiple Dry Years



Layer 5 Predicted Cumulative Drawdown After 50 Years



Layer 5 Predicted Maximum Cumulative Drawdown After Multiple Dry Years



Legend

- Project Boundary
- Municipal Boundary

Stream/River

- Ephemeral
- Intermittent
- Perennial
- Major River

Simulated Groundwater Wells

- Municipal
- Proposed (Alternative A)
- Drawdown Contour
- Healdsburg Fault

Observation Point Locations

0 2 4
Miles

N

References: USGS (2024)

SHILOH RESORT AND CASINO

KOI NATION OF NORTHERN CALIFORNIA

FIGURE 16

PREDICTED CUMULATIVE DRAWDOWN (ALTERNATIVE A)

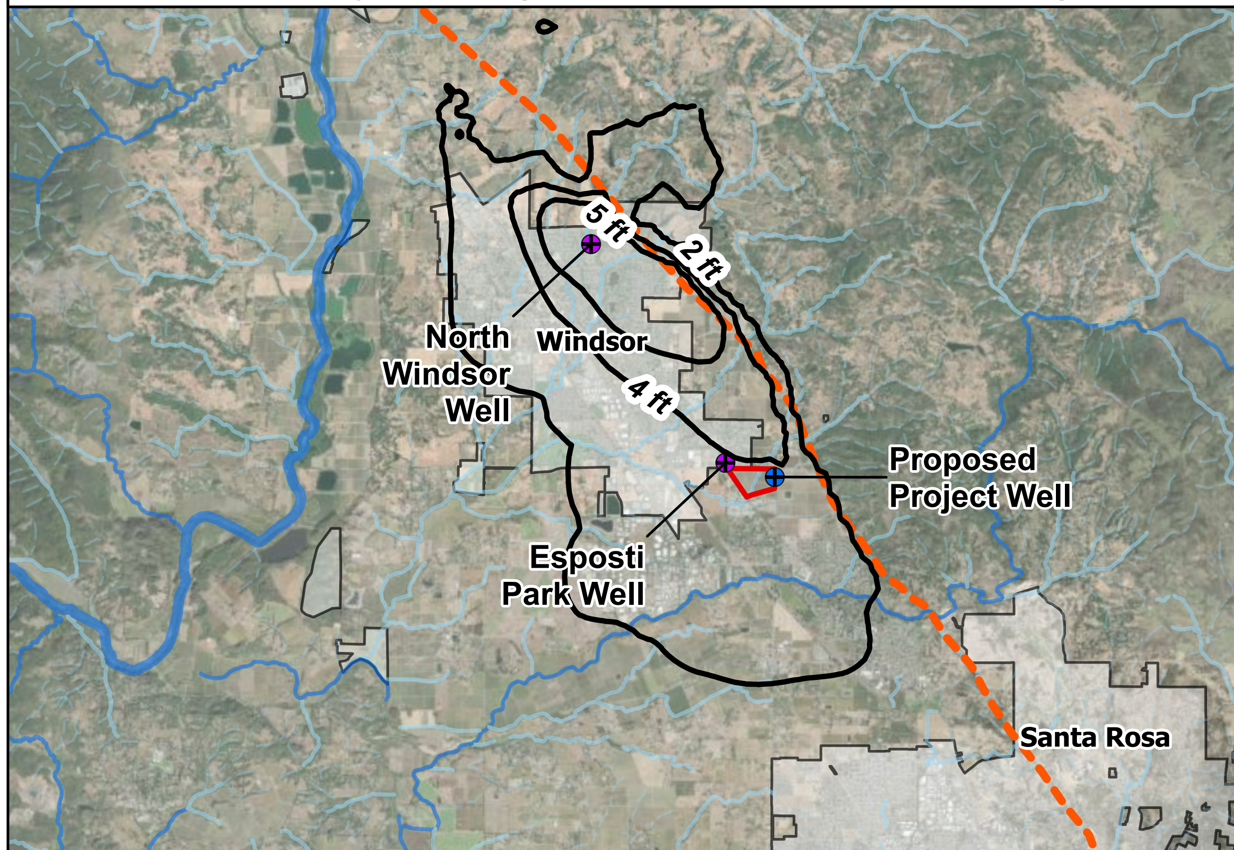
DATE: MAR 20, 2024

By: WRG | For: NBB

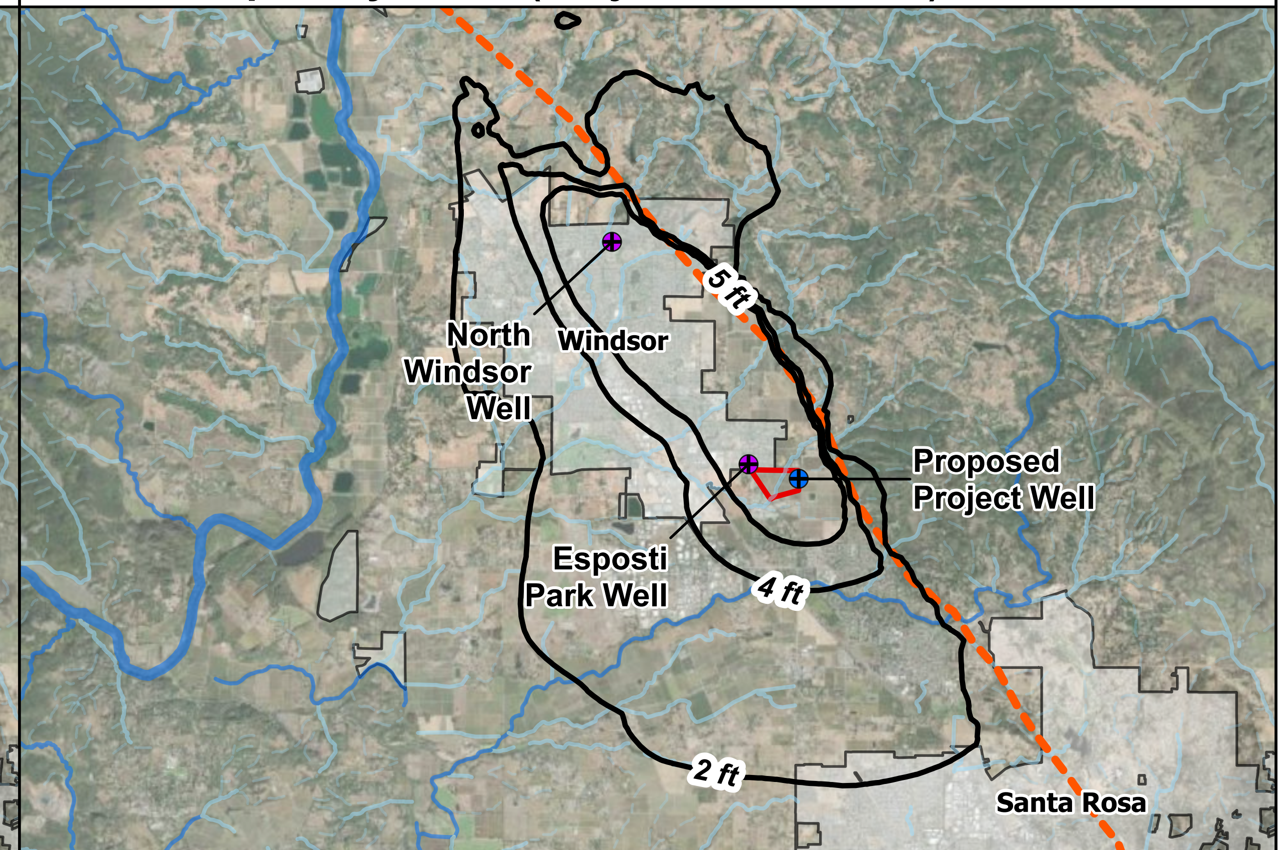
FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig16_CumulativeImpacts

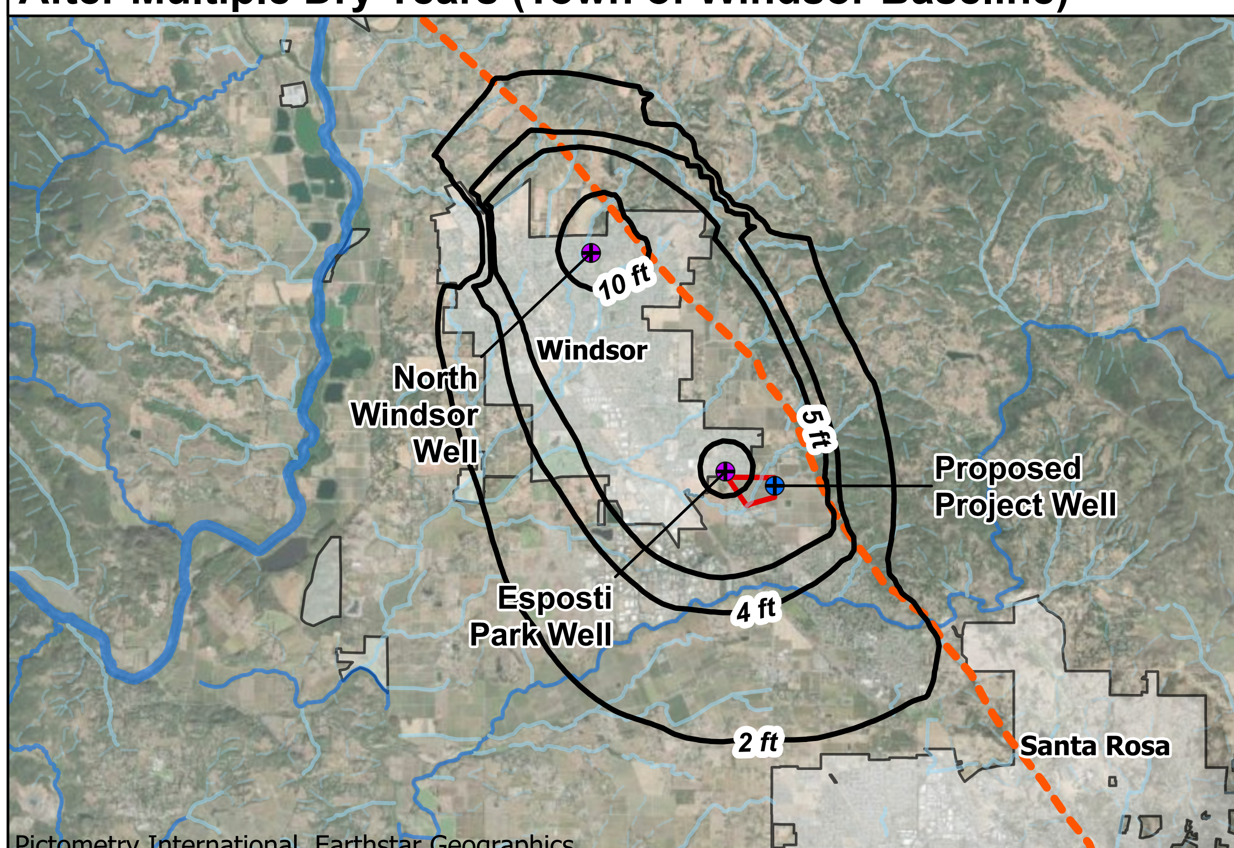
Layer 1 Predicted Maximum Cumulative Drawdown After Multiple Dry Years (Town of Windsor Baseline)



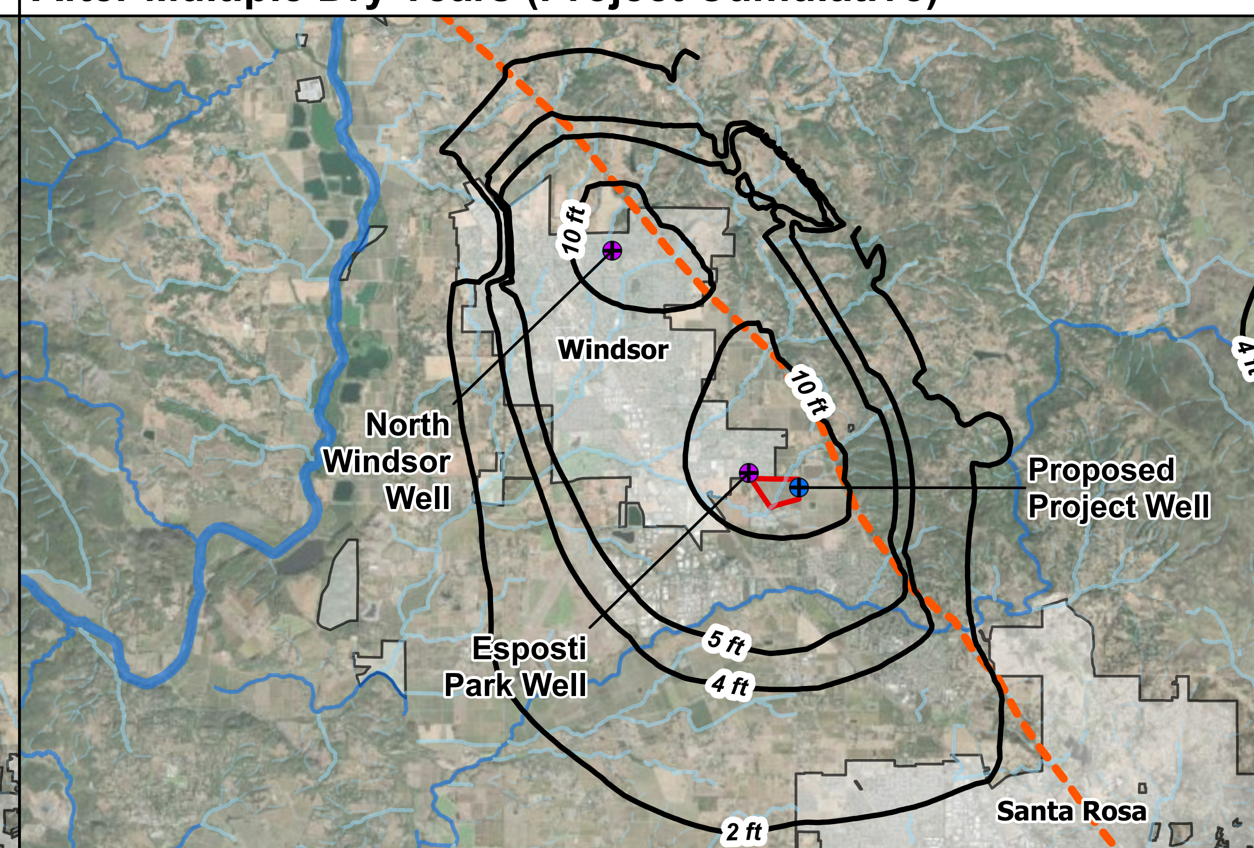
Layer 1 Predicted Maximum Cumulative Drawdown After Multiple Dry Years (Project Cumulative)



Layer 5 Predicted Maximum Cumulative Drawdown After Multiple Dry Years (Town of Windsor Baseline)



Layer 5 Predicted Maximum Cumulative Drawdown After Multiple Dry Years (Project Cumulative)



Legend
- Project Boundary
- Municipal Boundary

Stream/River
- Ephemeral
- Intermittent
- Perennial
- Major River

Simulated Groundwater Wells
- Municipal
- Proposed (Alternative A)
- Healdsburg Fault
- Drawdown Contour

Observation Point Locations

0 2 4
Miles
N

References: USGS (2024)

SHILOH RESORT AND CASINO
KOI NATION OF NORTHERN CALIFORNIA

FIGURE 17

PREDICTED CUMULATIVE DRAWDOWN AFTER MULTIPLE DRY YEARS (TOWN OF WINDSOR BASLINE VS PROJECT CUMULATIVE)

DATE: MAR 20, 2024
By: WRG For: NBB

FORMATION ENVIRONMENTAL

S:\GIS\a5\AcornEnv\ShilohResort\ShilohResort_ProjectGIS\ShilohResort_ProjectGIS.aprx 11x17Ln_Fig17_BaselineVCumulative

ORIGINAL
File with DWR

Well 1

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 475786

Owner's Well No. 3560
Date Work Began 11-4-96, Ended 11-7-96
Local Permit Agency Sonoma
Permit No. WEL96-0495 Permit Date 10-30-96

DWR USE ONLY — DO NOT FILL IN
08N08W20
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to	Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	Topsoil
3	17	Clay
17	19	Sandy Clay
19	65	Brown Clay
65	74	Gravel
74	89	Brown Clay
89	94	Gravel/Sand
94	115	Clay
115	124	Gravel
124	135	Clay
135	145	Gravel/Sand
145	163	Clay
163	180	Gravel
180	198	Clay
198	210	Gravel
210	230	Clay
230	240	Gravel
240	245	Clay
245	247	Gravel/Sand
247	260	Clay
260	358	Volcanics
358	360	Clay

Layer 2

Layer 3a - clay likely extends beyond 360 feet bgs based on nearby Well 3 boring log

TOTAL DEPTH OF BORING 360 (Feet)
TOTAL DEPTH OF COMPLETED WELL 360 (Feet)

WELL OWNER

WELL LOCATION
Address 5780 Old Redwood Hwy.
City ~~Windsor, CA 95492~~ SANTA ROSA
County Sonoma
APN Book 059 Page 300 Parcel 001
Township ___ Range ___ Section ___
Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH
NORTH
WEST EAST
SOUTH
Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)
___ MONITORING
WATER SUPPLY
X* Domestic
___ Public
X Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotary Air FLUID ___

WATER LEVEL & YIELD OF COMPLETED WELL
DEPTH OF STATIC WATER LEVEL 70 (Ft.) & DATE MEASURED 11-7-96
ESTIMATED YIELD* 300 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2.75 (Hrs.) TOTAL DRAWDOWN 200 (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to	Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	100	15"	X				F48PVC	8	200	
100	260	"		X			"	"	"	1/32
260	360	12.2		X			"	"	"	"

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to	Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50		X		
50	360			X	8/16 sand

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Fisch Bros. Drilling, Inc. 941
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

5001 Gravenstein Hwy. No. Sebastopol, CA 95472
ADDRESS CITY STATE ZIP

Signed Ed Fisch by c.l. hughes 11-8-96 399226
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

STATE OF CALIFORNIA

WELL COMPLETION REPORT

No. 814086

DWR USE ONLY — DO NOT FILL IN

08N08W19

STATE WELL NO. STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

OWNER'S WELL No. 3925

Date Work Began 12/17/98 Ended 12/29/98

Local Permit Agency Sonoma

Permit No. WEL98-0459 Permit Date 10/5/98

Well 3

GEOLOGIC LOG

ORIENTATION Vertical Degree of Angle ____

DEPTH FROM SURFACE DEPTH TO FIRST WATER ____ (ft.) BELOW SURFACE

Ft.	Ft.	DESCRIPTION
0	3	Brown Clay
3	30	Light Brown Clay w/Cemented Gravels
30	90	Cemented Gravels
90	125	Sandy Blue Clay
125	160	Cemented Gravels
160	200	Cemented Gravels & Blue Clay
200	290	Mostly Cemented Gravels & Some Blue Clay
290	315	Blue Clay
315	430	Harder Cemented Volcanic Gravels w/Some Clay
430	450	Blue Clay
450	550	Harder Cemented Volcanic Gravels w/Some Clay
550	600	Blue Clay
		ESTIMATED YIELD & DRAWDOWN:
		470 GPM 180'
		600 GPM 260'
		CASING CONTINUED FROM BELOW:
430	450	20" Blank F480 PVC 12" 200
450	550	20" Screen F480 PVC 12" 200 Factory
550	560	20" Blank F480 PVC 12" 200
560	600	Test Hole - Not Cased

Layer 2

Layer 3a

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 560 (Feet)

WELL OWNER

WELL LOCATION

Address 190 Shiloh Rd.

City Windsor County Sonoma

Apn Book 059 Page 300 Parcel 001

or Township S Range E Section ____ 1/4 ____ 1/4

or Latitude ____ Deg. ____ Min. ____ Sec. NORTH Longitude ____ Deg. ____ Min. ____ Sec. WEST

LOCATION SKETCH

ACTIVITY NEW WELL PLANNED USE(S) Irrigation Water

DRILLING METHOD ROTARY MUD FLUID

DEPTH OF STATIC WATER LEVEL 80 (Ft.) & DATE MEASURED Dec 28, 1998

ESTIMATED YIELD * * (G.P.M.) & TEST TYPE Airlift

TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN Above Left (FT.)

*May not be representative of a well's long-term yield.

CASING

DEPTH FROM SURFACE Ft.	To Ft.	BORE-HOLE DIA.	TYPE	Material / Grade	Dia.	Gauge	Slot size
0	120	20	Blank	F480 PVC	12	200	
120	160	20	Screen	F480 PVC	12	200	Factory
160	200	20	Blank	F480 PVC	12	200	
200	290	20	Screen	F480 PVC	12	200	Factory
290	310	20	Blank	F480 PVC	12	200	
310	430	20	Screen	F480 PVC	12	200	Factory

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	To Ft.	Seal Material	Filter Pack (Type / Size)
0	30	Bentonite	
30	600	20 yds Gravel	1/4 X 1/8
		20 yds Gravel	3/8
		Mixed	

Attachments

no Geologic Log

no Well Construction Diagram

no Geophysical Logs

no Soil Water Chemical Analyses

no Other

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Fisch Bros. Drilling, Inc.

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

5001 Gravenstein Hwy No. Sebastopol CA 95472

Signed Steve Unterseher Carol Hughes 12-30-98 399226

WELL DRILLER / AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

The free Adobe Reader may be used to view and complete this form However software must be purchased to complete save and reuse a saved form

File Original with DWR

Page 1 of 3

Owner s Well Number Esposti Park #1

e Work Began 02/24/2010 Date Work Ended 3/27/2010

al Permit Agency Sonoma County Permit and Resource Management Dept.

Permit Number WEL 09 0438 Permit Date 1/20/10

State of California

Well Completion Report

Refer to Inst ct on Pamphlet

No e0113306

DWR Use Only – Do Not Fill In

08N08W19

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Mud Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet to Feet		Description Describe material grain size color etc
		SEE ATTACHED

Total Depth of Boring 1040 Feet

Total Depth of Completed Well 670 Feet

Well Owner

Well Location

Address 6000 Old Redwood Hwy

City Windsor County Sonoma

Latitude 38 Deg 31 Min 35 Sec N Longitude 122 Deg 46 Min 46 Sec W

Datum NAD83 Decimal Lat Decimal Long

APN Book 163 Page 172 Parcel 018

Township Range Section

Location Sketch

(Sketch must be drawn by hand afte form s pr nted)

North

West East

See Attached

South

Activity

- ⦿ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

GEOLOGIC LOG

Planned Uses

- ⦿ Water Supply
  - ☐ Domestic ☑ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ○ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 21 (Feet below surface)

Depth to Static Water Level 43 (Feet) Date Measured 04/10/2010

Estimated Yield 400 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 79 (Feet)

May not be representative of a well s long term yield

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	380	17	Blank	Low Carbon Steel		10		
380	420	17	Screen	304 Stainless Steel		10		0 125
420	430	17	Blank	304 Stainless Steel		10		
430	450	17	Screen	304 Stainless Steel		10		0 125
450	460	17	Blank	304 Stainless Steel		10		
460	470	17	Screen	304 Stainless Steel		10		0 125

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	370	Cement	
370	371	Bentonite	
371	670	Filter Pack	1/4

Attachments

- ☑ Geologic Log
- ☑ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☑ Other Site Map

Attach add t onal nfo mat on, f it e sts

Certification Statement

I the undersigned certify that this report is complete and accurate to the best of my knowledge and belief

Name Tom Moreland for WDC Exploration and Wells

Person F rm or Corporat on

9580 County Road 93 B Zamora CA 95695

Address City State Zip

Signed [signature] 7 23 10 283326

C-57 Licensed Water Well Contractor Date Signed C 57 License Number

DWR 188 REV 1/2006

IF ADDITIONAL SPACE IS NEEDED USE NEXT CONSECUTIVELY NUMBERED FORM e0113306

WELL CONSTRUCTION DIAGRAM

Esposti Park Test Hole

E PUR llc

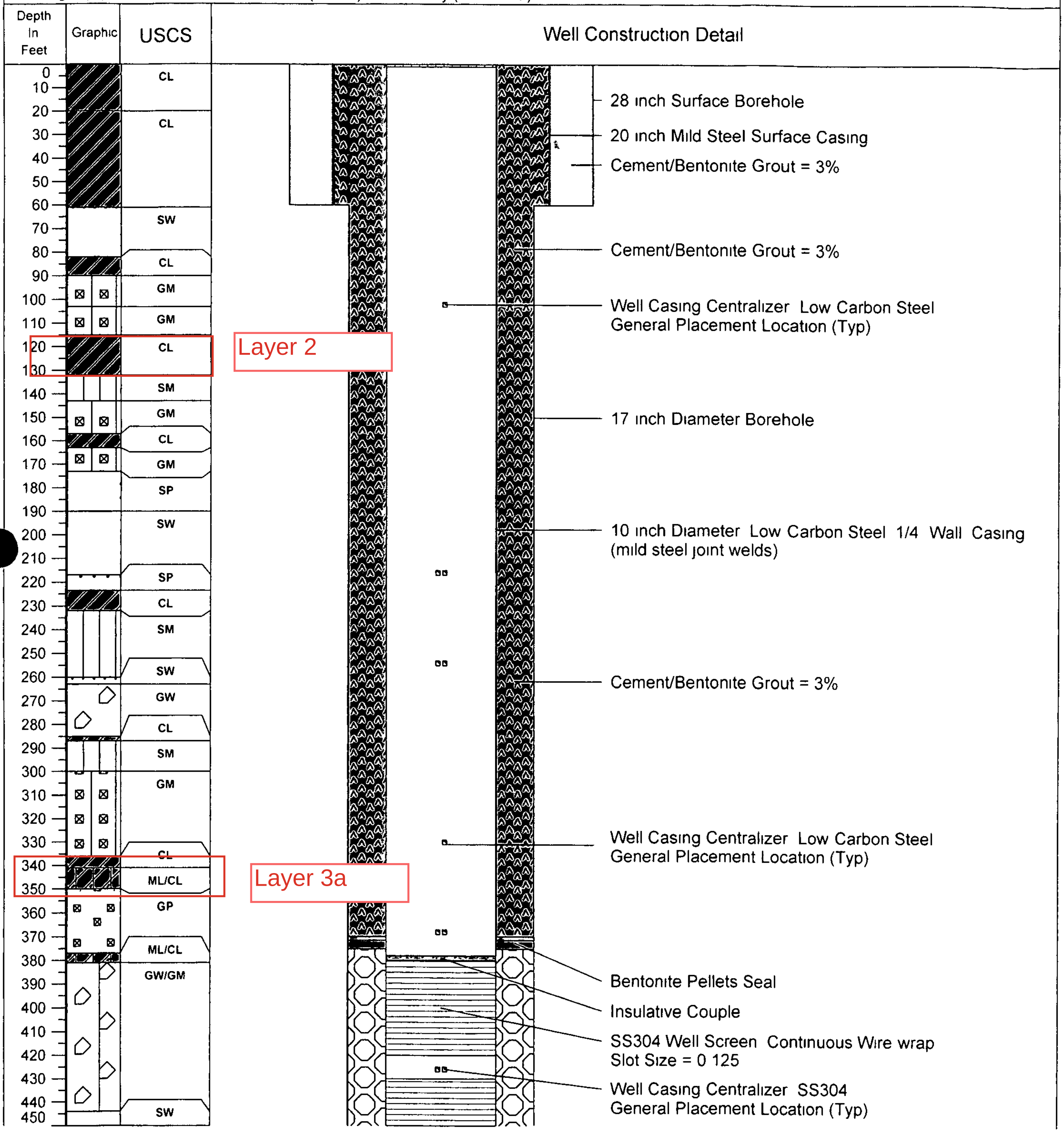
Project	Well Installation
Location	Windsor CA
E PUR PN	E102 001 01 Task 200
Logged by	B Gulbranson J Buchowski G Moore
Surface Conditions	Grass Covered
Sampler Type	Grab from Cyclone

Start Date	2/24/2010
End Date	3/27/2010
Latitude	N 38 31 35 4
Longitude	W 122 46 46 5

Drilling Company WDC Exploration and Wells

Driller Gary Eldred Greg Gallio John Chaves

Drilling Equipment Reverse Circulation Air (0 965) Mud Rotary (965 1040)



Sanitary Seal	Cement/Bentonite Grout	0 to 60	feet bgs	Surface Casing	0 to 60	feet bgs
Annular Seal	Cement/Bentonite Grout	0 to 370	feet bgs	Screened Interval	380 420 430 450 460-470 480 510, 545 565, 615 655	feet bgs
Filter Pack	SRI 1/4 inch Gravel	375 to 670	feet bgs	Casing Diameter	10 0 inches	
Monument Type	Concrete Pedestal w/ Temp Locking Steel Cap			Total Well Depth	670 0 feet	

20113300

E PUR llc

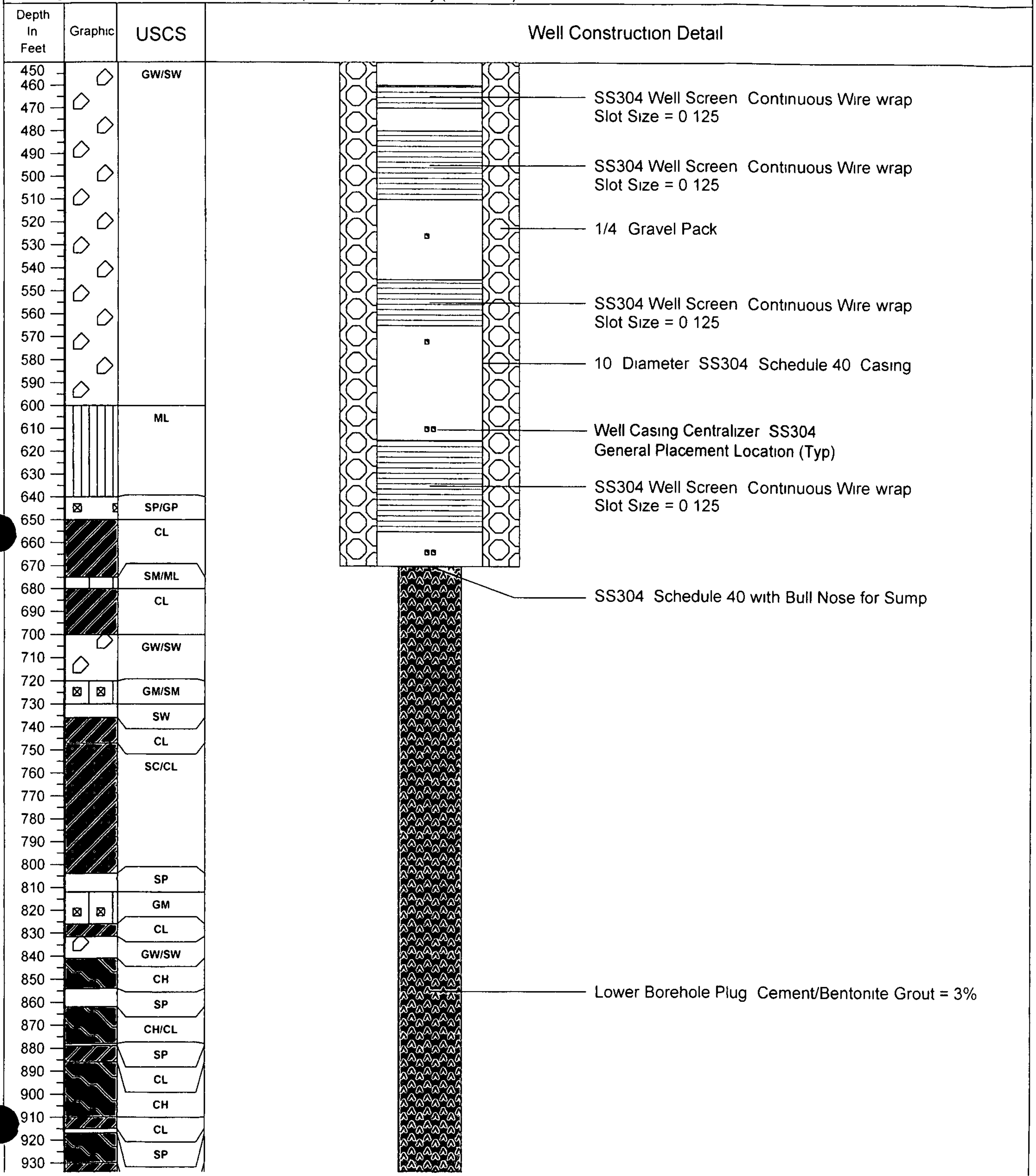
Project	Well Installation
Location	Windsor CA
E PUR PN	E102 001 01 Task 200
Logged by	B Gulbranson J Buchowski G Moore
Surface Conditions	Grass Covered
Sampler Type	Grab from Cyclone

WELL CONSTRUCTION DIAGRAM

Esposti Park Test Hole

Start Date	2/24/2010
End Date	3/27/2010
Latitude	N 38 31 35 4
Longitude	W 122 46 46 5

Drilling Company WDC Exploration and Wells
Driller Gary Eldred Greg Gallio John Chaves
Drilling Equipment Reverse Circulation Air (0 965) Mud Rotary (965 1040)



ED113306

WELL CONSTRUCTION DIAGRAM

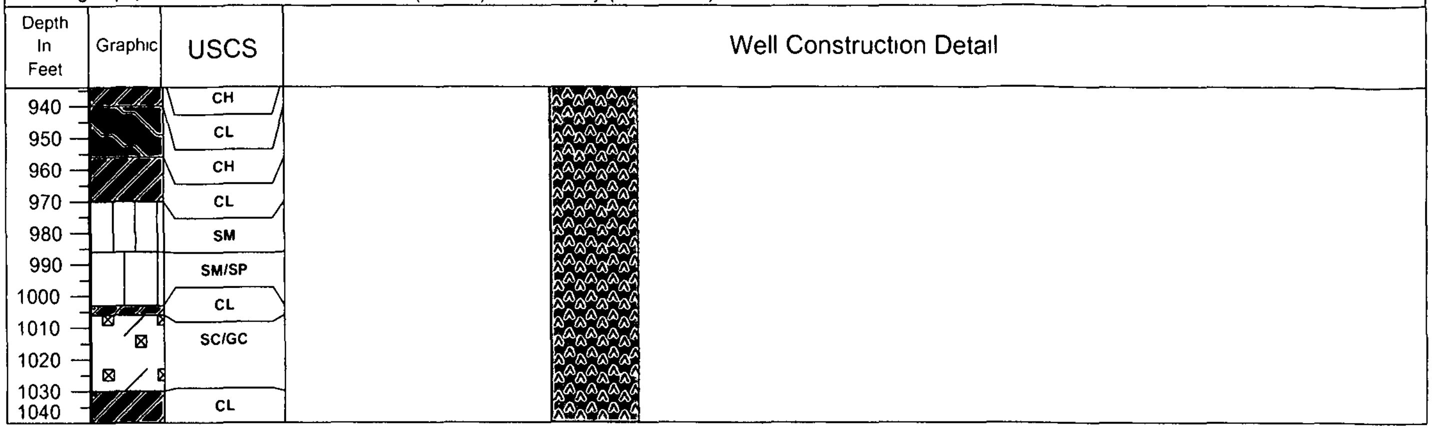
Esposti Park Test Hole

E PUR, llc

Project	Well Installation
Location	Windsor CA
E PUR PN	E102 001 01 Task 200
Logged by	B Gulbranson J Buchowski G Moore
Surface Conditions	Grass Covered
Sampler Type	Grab from Cyclone

Start Date	2/24/2010
End Date	3/27/2010
Latitude	N 38 31 35 4
Longitude	W 122 46 46 5

Drilling Company WDC Exploration and Wells
Driller Gary Eldred Greg Gallio John Chaves
Drilling Equipment Reverse Circulation Air (0 965) Mud Rotary (965 1040)



ORIGINAL
File with DWR

Well 13

Page 1 of 1
Owner's Well No 1
Date Work Began 2-28-11 Ended 3-4-11
Local Permit Agency Sonoma Cty Permit & Res Management Dept
Permit No WEL10-0345 Permit Date 12-22-10

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No 0962771

DWR USE ONLY — DO NOT FILL IN
08N08W30
STATE WELL NO /STATION NO
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Mud Rotary FLUID Hi-Yield Gel

DEPTH FROM SURFACE Ft	to Ft	DESCRIPTION (Describe material, grain size, color, etc)
0	10	Silty clay with gravel
10	20	Small gravel
20	30	Small gravel with clay
30	40	Silty clay w/ intermittent gravel
40	50	Small gravel with clay
50	60	Course gravel
60	70	Small gravel
70	80	Course gravel with clay
80	90	Small gravel
90	100	Small gravel with clay
100	130	Small gravel with clay
130	140	Course sand
140	160	Small gravel with clay
160	170	Clay with small gravel
170	180	Small gravel
180	200	Course sand with clay
200	210	Course sand
210	220	Clay with sand and gravel
220	240	Course sand
240	250	Small sand with silt and clay
250	300	Sand with silt and clay
300	330	Course sand with grey silt and clay lenses
330	360	Course sand
360	370	Course sand w/gray silt & clay
370	400	Grey silt with clay lenses

Layer 2

Layer 3a

TOTAL DEPTH OF BORING 365 (Feet)
TOTAL DEPTH OF COMPLETED WELL 365 (Feet)

WELL OWNER

WELL LOCATION
Address 1315 Airport Blvd
City Santa Rosa, CA 95403
County Sonoma
APN Book 059 Page 350 Parcel 025
Township ___ Range ___ Section ___
Lat ___ N DEG MIN SEC Long ___ W DEG MIN SEC

LOCATION SKETCH
NORTH
WEST EAST
SEE ATTACHED
SOUTH
Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE***

ACTIVITY (✓)
X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING X
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL
DEPTH TO FIRST WATER ___ (Ft) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 12' (Ft) & DATE MEASURED ___
ESTIMATED YIELD ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs) TOTAL DRAWDOWN ___ (Ft)
May not be representative of a well's long term yield

CASING (S)

	DEPTH FROM SURFACE Ft	to Ft	BORE HOLE DIA (Inches)	BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
A	0	340	12	X				PVC	2"	SCH 80	
	340	360	12		X			PVC	2"	SCH 80	020
B	0	120		X				PVC	2"	SCH 80	
	120	140			X			PVC	2"	SCH 80	020
C	0	40		X				PVC	2"	SCH 80	
	40	60			X			PVC	2"	SCH 80	020

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft	to Ft	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
See Attached					

ATTACHMENTS (✓)
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other Annular Seal
ATTACH ADDITIONAL INFORMATION IF IT EXISTS

CERTIFICATION STATEMENT
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief
NAME Bertram Drilling, Inc
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
510 Klenck Lane Billings MT 59101
ADDRESS CITY STATE ZIP
Signed [signature] 3/10/11 703688
C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV 05-03 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM OSP 03 78836

FIGURE 1: BORING LOG: Bluebird

Bluebird Replacement Well Test Hole

E-PUR,llc

Project	Well Installation
Location:	Windsor, CA
E-PUR PN:	E102-001-01, Task 200
Logged by:	B. Gulbranson, J. Buchowski, G. Moore
Surface Conditions:	Grass Covered
Sampler Type:	Grab

Start Date:	2/6/2010
End Date:	5/5/2010
Latitude:	N 38° 53' 91"
Longitude:	W 122° 80' 13"

Drilling Company: WDC Exploration and Wells
Driller: J. Chavez
Drilling Equipment: Reverse Circulation Air (0'-795'), Mud Rotary (795'-867')

Depth In Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220

USCS	Description
SC	Clayey SAND (SC) - varicolored (tan to brown, clear to frosted quartz with some red-pink), poorly sorted, fine to coarse sand, subrounded to subangular; clay soft, plastic; trace varicolored (tan to brown), fine to coarse gravel
CL	Sandy CLAY (CL) - mostly soft, plastic clay with fine to coarse sand, trace fine to coarse gravel; trace quartz, little volcanics of clear to frosted white, pink, red, brown, black (obsidian)
GC	GRAVEL (GC) - varicolored, poorly sorted fine to coarse gravel; little clay; poorly sorted coarse to medium, subangular to subrounded sand; rare obsidian clast
CL	Sandy CLAY (CL) - mostly dry, stiff clay; few varicolored, poorly sorted coarse sand, trace fine angular to subrounded sand; trace quartz sand; trace cobble; gravel layer from 41.0 feet to 42.5 feet
SW	Gravelly SAND (SW) - varicolored, coarse to medium, subrounded to angular sand; minor fine gravel; no sample (no return circulation) from 110 feet to 120 feet (sand?)
CL	CLAY (CL) - varicolored (gray to tan), stiff clay; varicolored (tan, pale, buff, orange) fine to coarse, subangular to angular gravel; moderately well sorted coarse sand; rare green fine gravel
GP	Gravel and Sand (GP) - varicolored (predominately dark green but some gray) coarse gravel; medium to coarse, subangular to subrounded sand; clay layer from 170 to 171 which clogged bit
CL	Sandy CLAY (CL) - dense gray clay with sand
CL	Sandy CLAY (CL) - dense brown clay with sand
SW/GW	Gravelly SAND to Sandy GRAVEL (SW/GW) - predominately gray-green but some varicolored, fine to coarse, angular to subangular sand; coarse gravel; repeating coarse to fine bedding

Layer 2

Depth	Sample ID
180	BBT01-20100209-180
220	BBT01-20100210-220

Well: See Well Construction Diagram for More Detail

Surface Seal:	Sanitary Seal (Grout)	0 to 60	feet bgs
Annulous Seal:	Grout	0 to 665	feet bgs
Filter Pack:	SRI 1/4 inch Gravel	675 to 765	feet bgs
Monument Type:	Temporary well cap	to	feet bgs

Screened Interval:	695 to 745 feet bgs
Casing Diameter:	10.0 inches
Total Boring Depth:	867.0 feet
Total Well Depth:	765.0 feet

E PUR,llc

Project: Well Installation
Location: Windsor, CA
E-PUR PN: E102-001-01, Task 200
Logged by: B. Gulbranson, J. Buchowski, G. Moore
Surface Conditions: Grass Covered
Sampler Type: Grab

FIGURE 1: BORING LOG: Bluebird
Bluebird Replacement Well Test Hole

Start Date: 2/6/2010
End Date: 5/5/2010
Latitude: N 38° 53' 91"
Longitude: W 122° 80' 13"

Drilling Company: WDC Exploration and Wells
Driller: J. Chavez
Drilling Equipment: Reverse Circulation Air (0'-795'), Mud Rotary (795'-867')

Depth In Feet	Sample Interval	Sample ID	Graphic	USCS	Description	Well
230						
240						
250						
260						
270						
280						
290						
300						
310						
320		BBT01-20100216-320				
330						
340		BBT01-20100216-340				
350				CL	Sandy CLAY (CL) - light gray clay; sand; trace cobble	
360		Layer 3a		SP/SW	SAND (SP/SW) - green gray, mostly fine sand, little medium sand, rounded to subrounded; trace coarse sand; volcanics	
370				CL	Sandy CLAY (CL) - dark gray clay, some sand; trace cobble	
380				SP	Sand (SP) - varicolored, mostly fine sand, little medium sand, subrounded to rounded	
390				CL	Sandy CLAY (CL) - dark gray clay; sand; mostly fine sand layer from 394 feet to 395.5 feet	
400				SP	SAND (SP) - poorly sorted, fine to coarse sand, subangular to rounded, abundant fine, well rounded quartz sand; gray to buff clast	
410				CL	Sandy CLAY (CL) - dark gray clay; fine sand; mostly fine sand layer 418 feet to 419 feet	
420				GM/GP	SAND and GRAVEL (GM/GP) - varicolored (buff, gray, red, orange, pink) fine to coarse, angular sand; some moderately poorly sorted, fine, subrounded to subangular gravel; predominately volcanics (contains trace ash)	
430						
440		BBT01-20100216-440				
450				CL	Sandy CLAY (CL) - varicolored gray to tan, stiff, clay; little fine to coarse, subangular to angular sand and gravel	
460						

Project	Well Installation
Location:	Windsor, CA
E-PUR PN:	E102-001-01, Task 200
Logged by:	B. Gulbranson, J. Buchowski, G. Moore
Surface Conditions:	Grass Covered
Sampler Type:	Grab

FIGURE 1: BORING LOG: Bluebird
Bluebird Replacement Well Test Hole

Start Date:	2/6/2010
End Date:	5/5/2010
Latitude:	N 38° 53' 91"
Longitude:	W 122° 80' 13"

Drilling Company: WDC Exploration and Wells
Driller: J. Chavez
Drilling Equipment: Reverse Circulation Air (0'-795'), Mud Rotary (795'-867')

Depth In Feet	Sample Interval	Sample ID	Graphic	USCS	Description	Well
470				SM	Silty SAND (SM) - varicolored (predominately dark) medium sand with some coarse sand; varicolored, poorly sorted, fine to coarse gravel; abundant, gray, friable (ash)	
480				SP	SAND (SP) - sand with minor gravel; no ash	
510				CL	CLAY (CL) - mostly soft gray clay; some gray but increasing in green sand; little fine to coarse gravel	
520				SW	Gravelly SAND (SW) - varicolored (gray, red, orange, and green), moderately poorly sorted, predominately fine to medium sand with some coarse sand, subrounded to subangular, with some varicolored (gray, green) fine to coarse gravel; trace “clumps” of gray clay (probably thin layers; clay “clumps” turn from gray to brown 560 feet to 575 feet	
580				CL	CLAY (CL) - soft gray clay	
590				SM	SAND (SM) - mostly gray-green, predominately fine but some medium to coarse, subrounded to subangular sand; few gray soft clay/silt; few gray, fine, gravel	
610				SC/CL	Sandy CLAY (SC/CL) - gray clay; some fine to coarse, poorly sorted sand; few fine gravel but some black, coarse, “chert like” clasts	
655				SM	Silty SAND (SM) - light gray, fine, predominately well rounded quartz sand; trace clay/silt layers; abundant ash tuff	
690				CH	CLAY (CH) - dark gray, plastic, clay; little fine, rounded to subangular sand layers, some quartz; abundant ash tuff including fine sand at base with iron staining of quartz	
700	700	BBT01-20100220-700		SW/SM	SAND (SW/SM) - varicolored (predominately dark gray to green gray to brown), poorly to moderately sorted, coarse to fine, subrounded to subangular sand; little brown, fine gravel; abundant friable ash; rare smokey black obsidian	
710						

Project	Well Installation		
Location:	Windsor, CA		
E-PUR PN:	E102-001-01, Task 200		
Logged by:	B. Gulbranson, J. Buchowski, G. Moore		
Surface Conditions:	Grass Covered	Start Date:	2/6/2010
Sampler Type:	Grab	End Date:	5/5/2010
		Latitude:	N 38° 53' 91"
		Longitude:	W 122° 80' 13"

FIGURE 1: BORING LOG: Bluebird

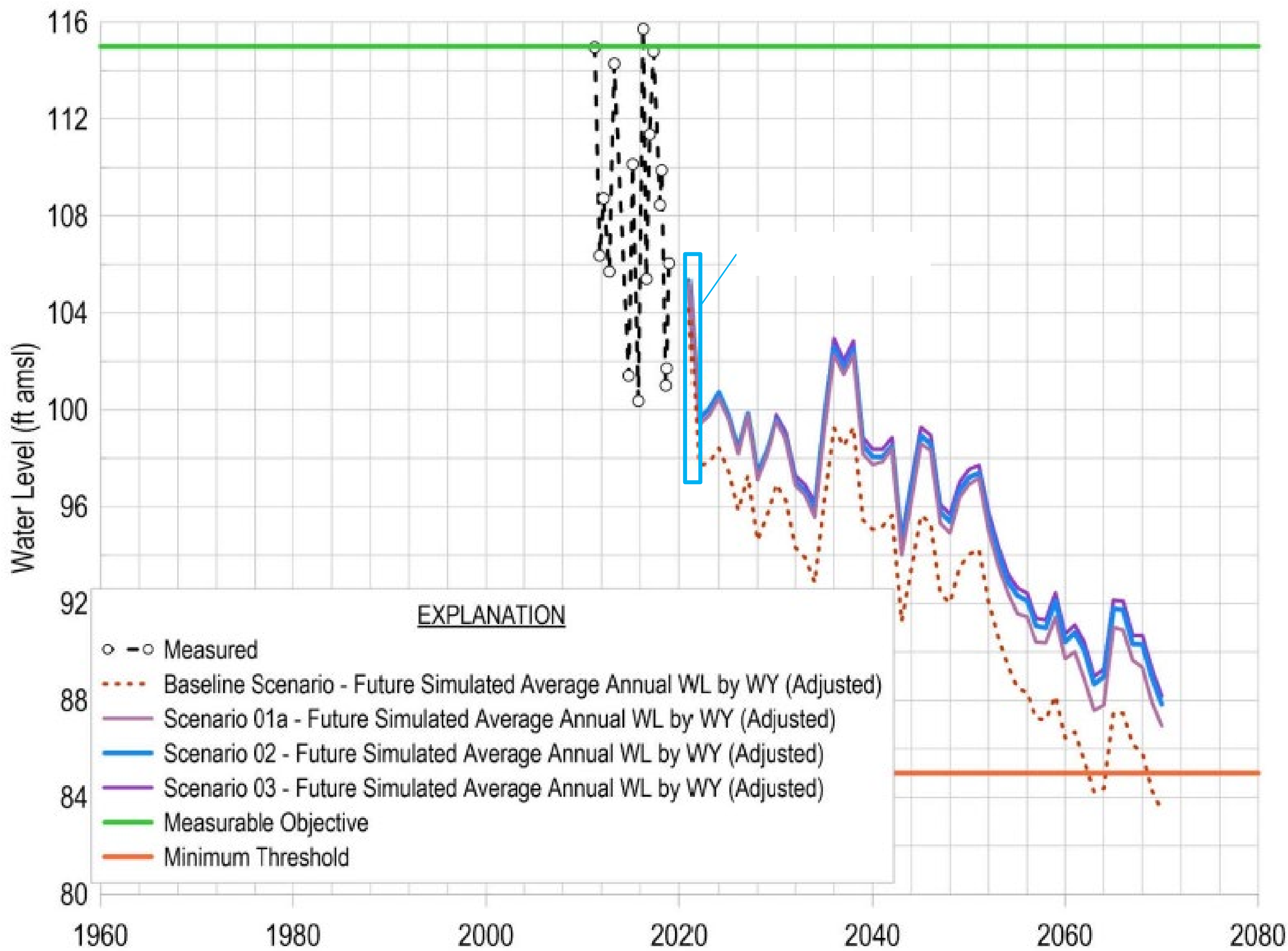
Bluebird Replacement Well Test Hole

Drilling Company: WDC Exploration and Wells

Driller: J. Chavez

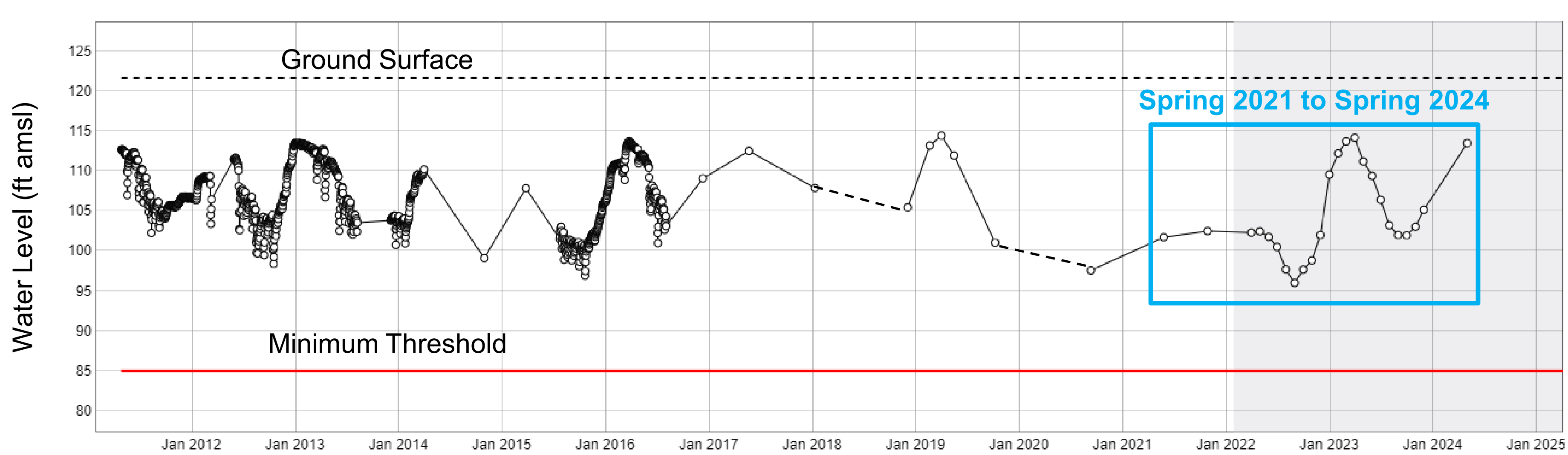
Drilling Equipment: Reverse Circulation Air (0'-795'), Mud Rotary (795'-867')

Depth In Feet	Sample Interval	Sample ID	Graphic	USCS	Description	Well
710						
720						
730						
740						
750				CL	CLAY (CL) - dark gray clay, plastic, strong desiccant; well rounded to angular, fine sand; fine sand layer with fine gravel 767 feet to 768 feet	
760						
770						
780						
790				SW	Gravelly SAND (SW) - varicolored (predominately pale dark green and clear/frosted white quartz with some medium dark gray, trace red-yellow), poorly sorted, fine to coarse, subangular to angular trace subrounded sand; little gray, subrounded gravel; rare obsidian, some ash tuff	
800				CL	Sandy CLAY (CL) - gray/brown, soft, clay; interbedded, varicolored (but predominately light to dark green), fine to medium, rounded to subrounded sand; abundant red, white, orange chert, milky quartz; trace obsidian; trace ash	
810						
820				CL	Sandy CLAY (CL) - light gray, clay; interbedded, light gray, sand; abundant obsidian some quartz, chert, and salmon pink quartzite (drills extremely hard); welded ash	
830						
840						
850						
860				CL	CLAY (CL) - dark gray green, clay (ash); fine sand with abundant obsidian, some chert, rhyolite, dacite, andesite; welded ash Bottom of Boring	

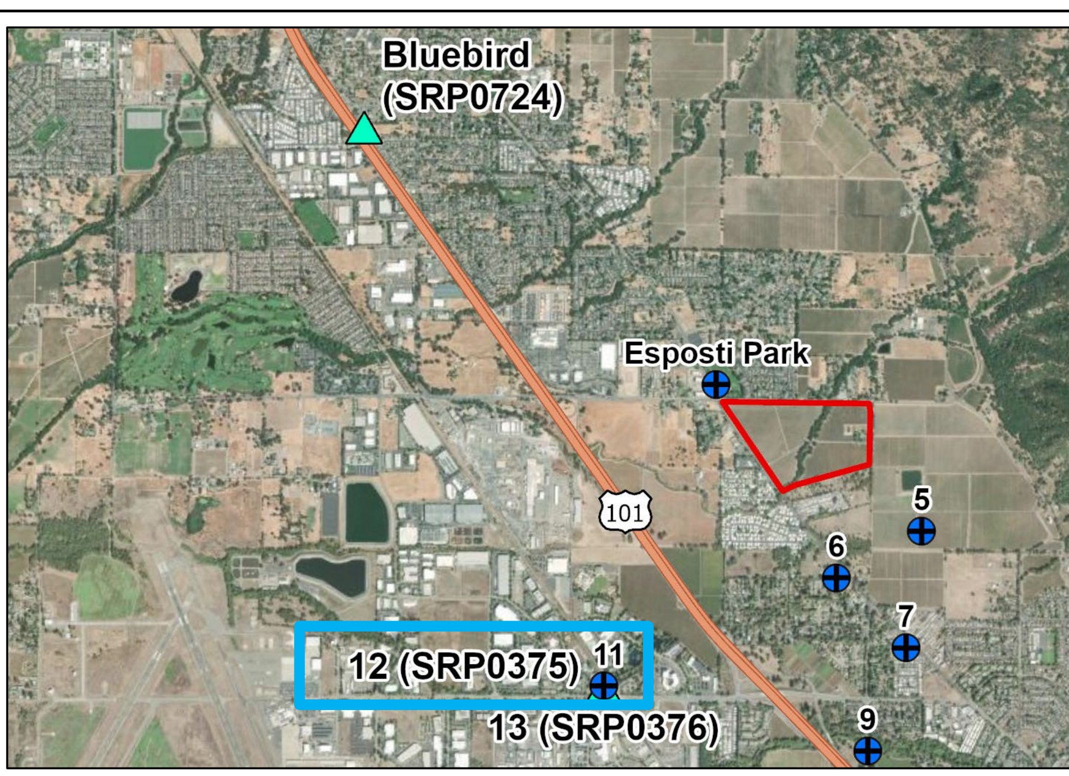


Modified from Santa Rosa Plain Groundwater Sustainability Agency (Appendix 6-B)

Measured Groundwater Levels – SRP0375 (Well 12)



Modified from SGMA Data Viewer Website



Legend

Project Site

Highway

Representative Monitoring Point (RMP)

Additional Wells with Water Level Data

Notes:

1. ft amsl = feet above mean sea level

SHILOH CASINO AND RESORT

WINDSOR, CA

FIGURE 1

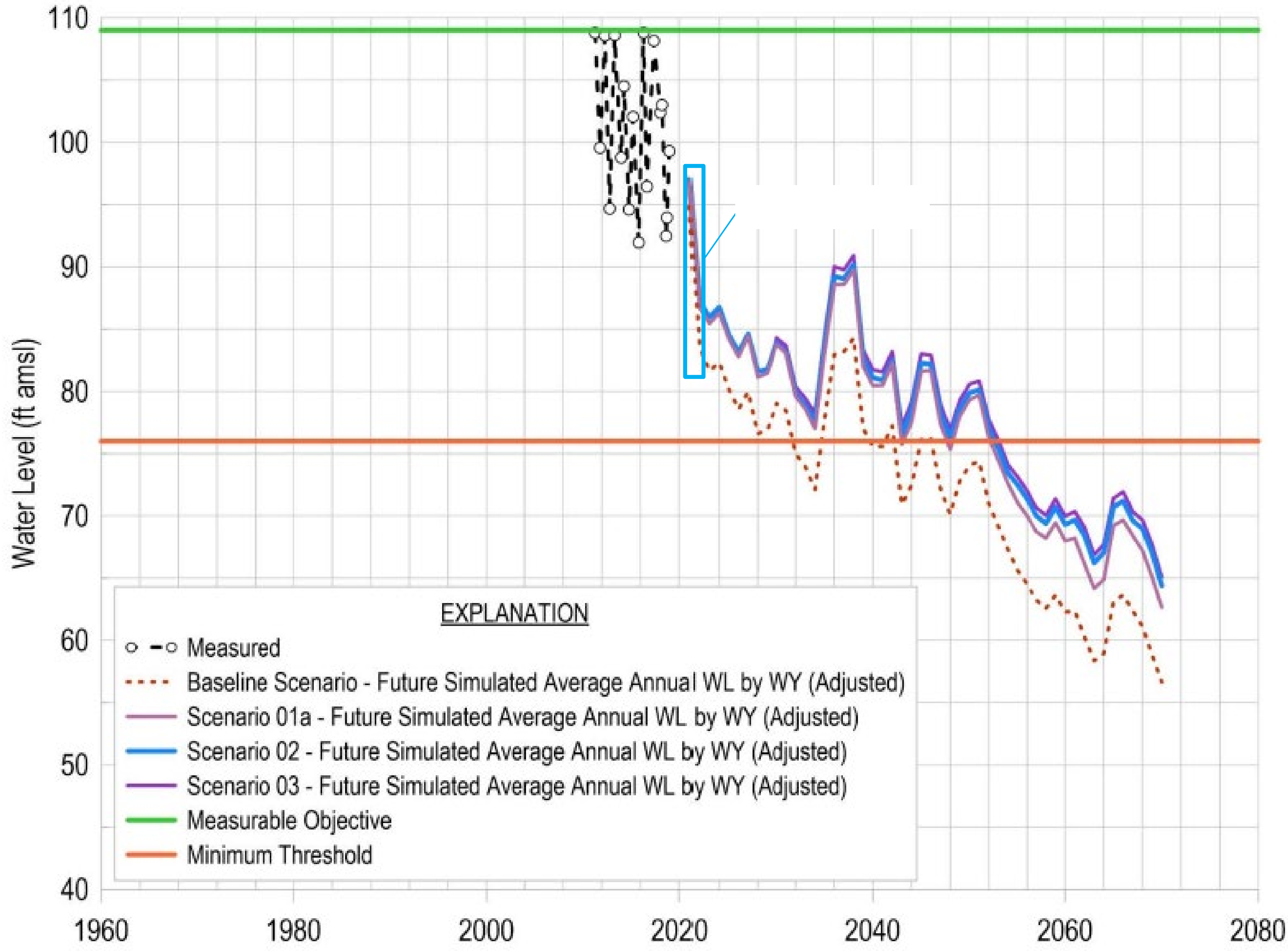
SRP0375 (Well 12) Hydrographs Predicted vs. Measured (Intermediate Zone)

DATE: OCT 2024

BY: NBB | FOR: MT

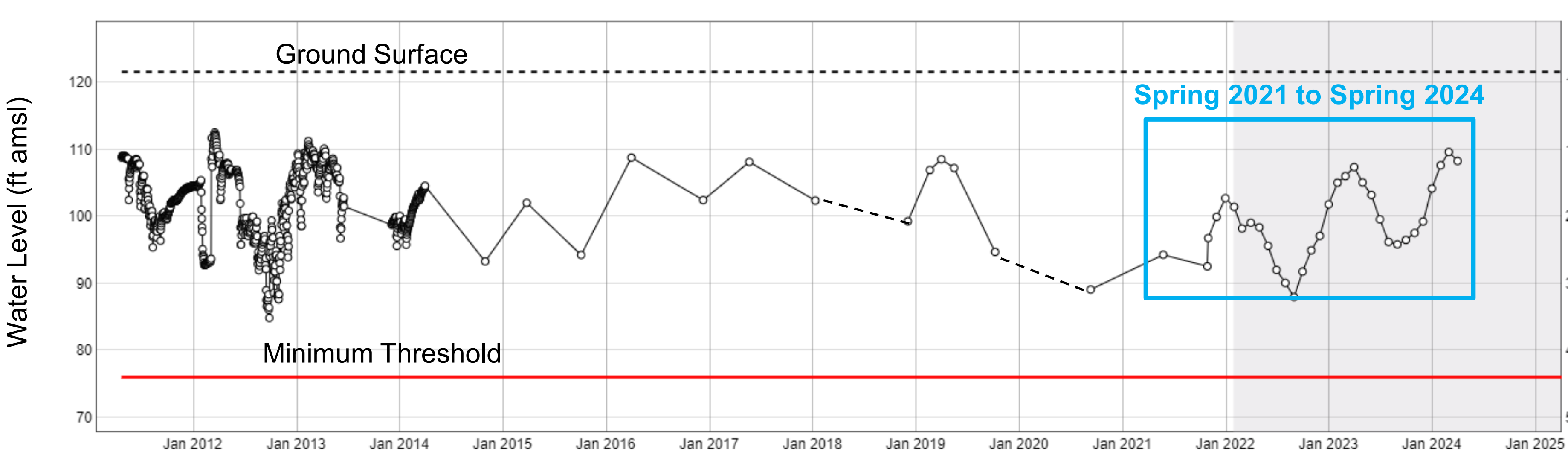
FORMATION ENVIRONMENTAL

"M:\Acorn Environmental\Koi Nation Shiloh Resort & Casino\Tasks\Task 6 Responses to Comments\Public Review Draft EIS\Response Matrix\11x17P_Figs_1_to_3 for comment responses.pptx"



Modified from Santa Rosa Plain Groundwater Sustainability Agency (Appendix 6-B)

Measured Groundwater Levels – SRP0376 (Well 13)



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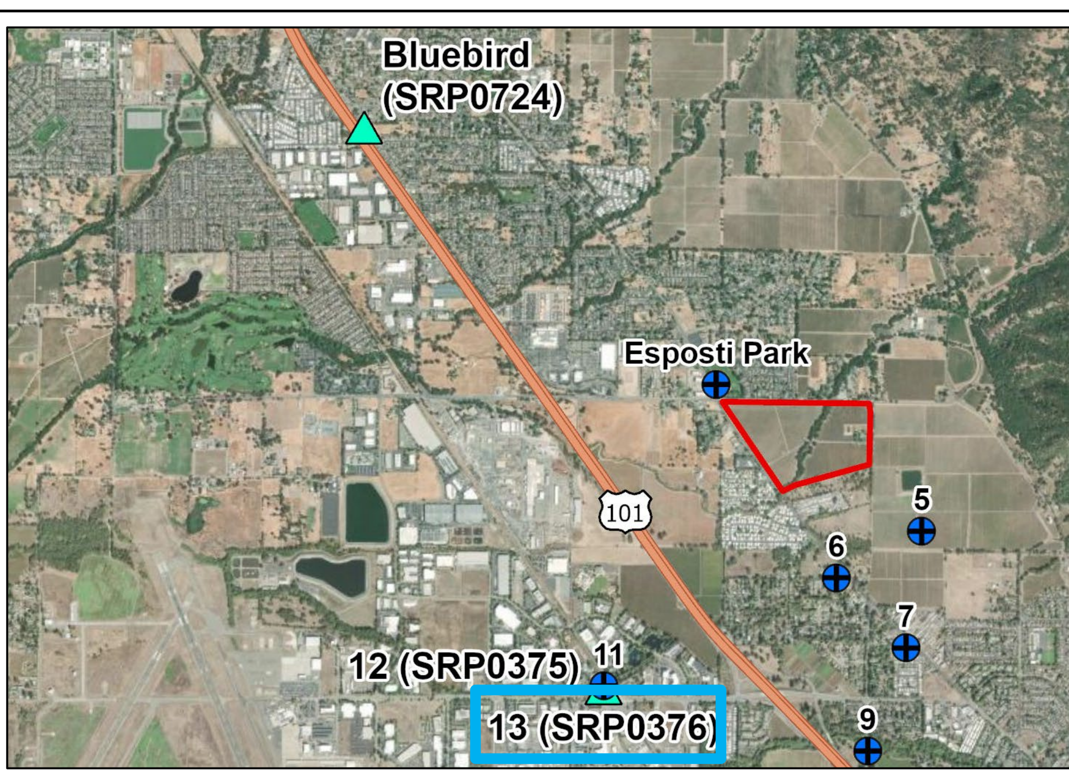


Legend
- Project Site
- Highway
- Representative Monitoring Point (RMP)
- Additional Wells with Water Level Data

Notes:
1. ft amsl = feet above mean sea level

SHILOH CASINO AND RESORT
WINDSOR, CA

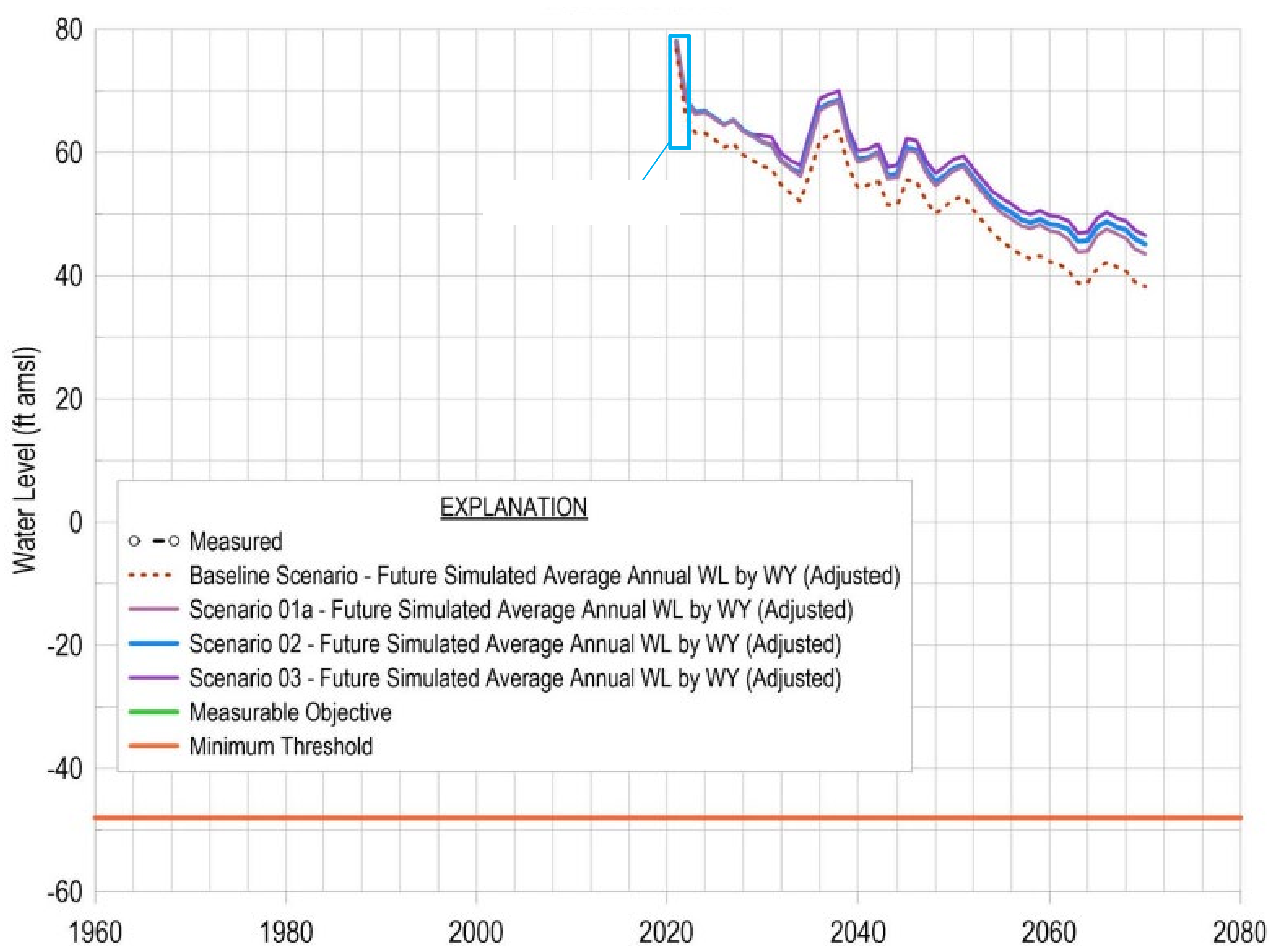
FIGURE 2

SRP0376 (Well 13) Hydrographs Predicted vs. Measured (Deep Zone)

DATE: OCT 2024	
BY: NBB	FOR: MT

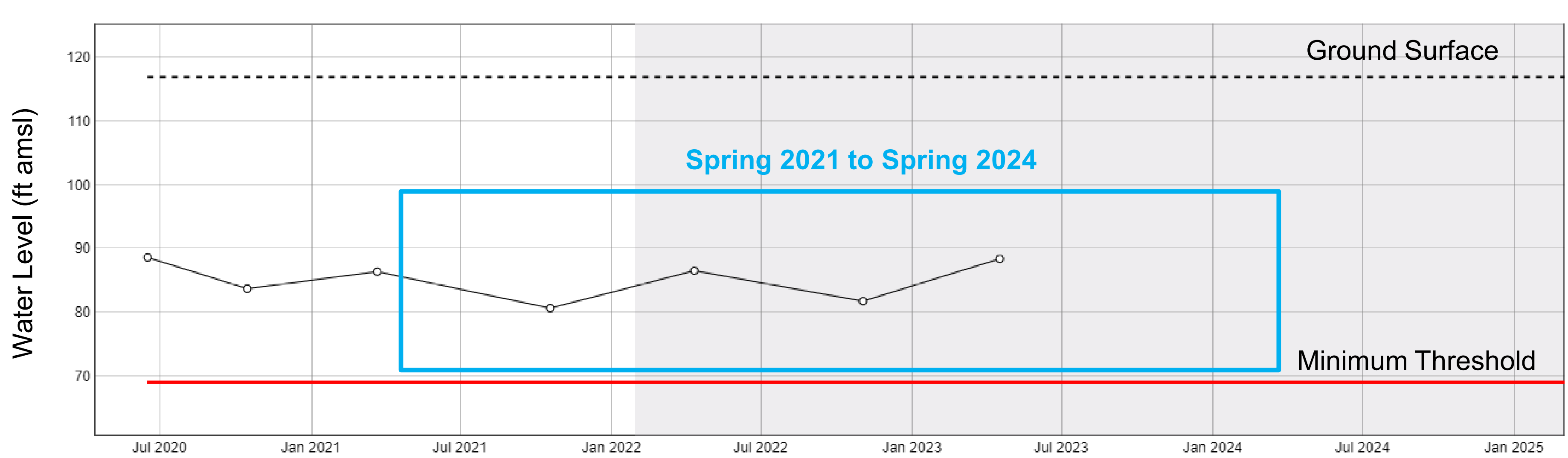
FORMATION ENVIRONMENTAL

"M:\Acorn Environmental\Koi Nation Shiloh Resort & Casino\Tasks\Task 6 Responses to Comments\Public Review Draft EIS\Response Matrix\11x17P_Figs_1_to_3 for comment responses.pptx"

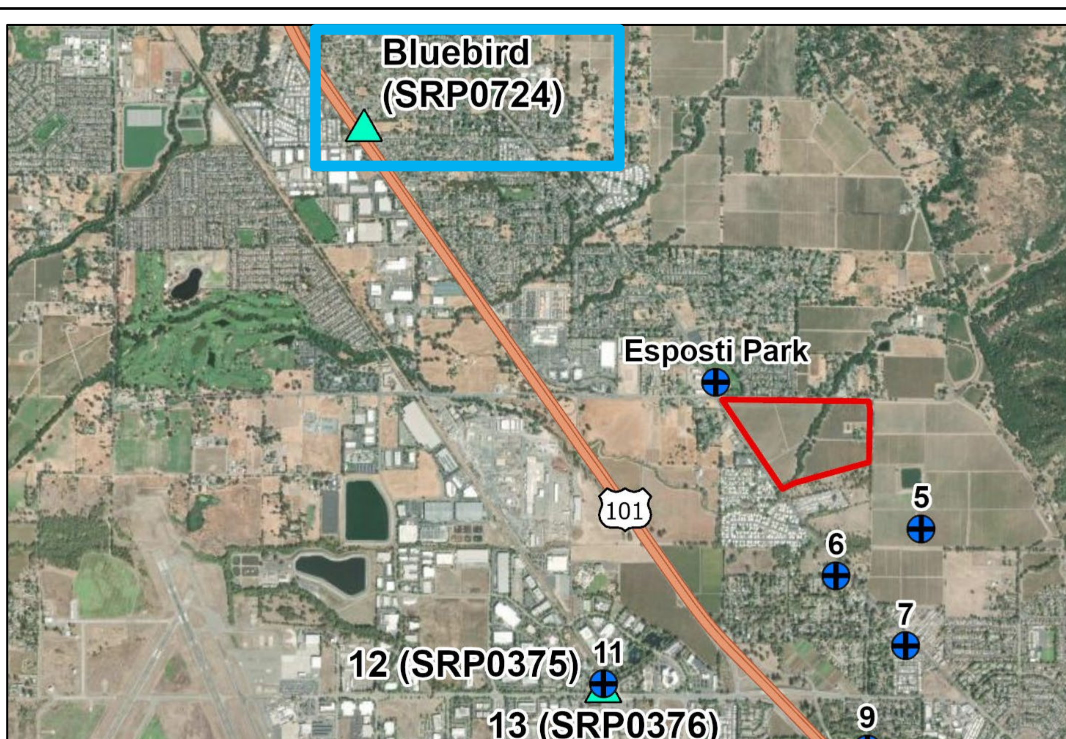


Modified from Santa Rosa Plain Groundwater Sustainability Agency (Appendix 6-B)

Measured Groundwater Levels – SRP0724 (Bluebird)



Modified from SGMA Data Viewer Website



Legend
Project Site
Highway
Representative Monitoring Point (RMP)
Additional Wells with Water Level Data

Notes:
1. ft amsl = feet above mean sea level

SHILOH CASINO AND RESORT
WINDSOR, CA

FIGURE 3

SRP0724 (Bluebird) Hydrographs Predicted vs. Measured (Deep Zone)

DATE: OCT 2024
BY: NBB
FOR: MT

FORMATION ENVIRONMENTAL