Groundwater Recharge in Sierra Valley

Managed Aquifer Recharge (MAR) or groundwater recharge is the process of intentionally adding water to a groundwater aquifer to enhance groundwater storage. As part of the effort to implement the Sierra Valley Groundwater Sustainability Plan (GSP) and effectively manage regional groundwater resources, the Sierra Valley Groundwater Management District (SVGMD) has evaluated and is in the process of implementing recharge opportunities using surface water supplies in the Sierra Valley Subbasin.

Existing water rights are an important consideration when proposing to divert surface water for recharge. Surface waters in Sierra Valley are subject to a 1939 court decree, administered by a state appointed Watermaster. Much of the water available within the Basin has been allocated to users with these existing water rights. Therefore, recharge can only occur when existing water rights will not be affected. Most existing water rights within the Subbasin are effective during the irrigation season and start on March 15th each year, however some water rights are year-round. Recharge projects will be conducted in the winter months from December 1 to March 15th, so as not to infringe on water rights during irrigation season. Additionally, recharge projects will consider all applicable year-round water rights to protect downstream beneficial users.

Despite water rights restrictions, the State Water Resources Control Board (State Board) recognizes the need for water to combat issues of drought driven by ongoing and future climate change[1]. The State Board therefore created two options for streamlined water permitting that would allow diversion of streamflow for recharge under specific flow conditions (referred to as Streamlined Permit Methods 1 and 2). Method 1 allows diversion of up to 20% of streamflow for recharge if the flow of the stream exceeds the 90th percentile flow rate (calculated based on a 30-year historic flow record) for a given day. Method 2 allows diversion of water for recharge in order to address flooding-related threats to public health and safety.

Background

Because of the subsurface clay layer in much of the Sierra Valley Basin, the most viable recharge opportunities are located in the peripheral regions of the Basin. Specifically, in the northeast area near Little Last Chance Creek and the southeast area near Smithneck Creek, soils consist of highly porous alluvium material that can quickly move recharge to the deep aquifer. Therefore, for the 2024-2025 winter season (December 1 to March 15th), the SVGMD has identified three potential recharge locations along the periphery of the basin, as shown in the overview map below, that could facilitate recharge to the deep aquifer to enhance beneficial uses such as irrigation, domestic water supply, and fish and wildlife sustainability:

1. **Diversion along Little Last Chance Creek to a nearby field.**
2. **Diversion along Staverville Creek to a diversion ditch and nearby field.**
3. **Ephemeral drainage to Smithneck Creek Tributary**

All three projects above fall under Method 1, the 90/20 restriction, however the SVGMD will continue to evaluate recharge areas that could qualify for either Method 1 or Method 2 Streamlined Permits. The

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[1] *Primary climate-change related issue: precipitation is increasingly occurring in the form of rain rather than snow in winter months, thereby preventing the development of sufficient winter snowpack for spring and summer water supply via snowmelt.*

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90/20 restriction is designed to limit diversions to only occur during extreme flood events; therefore, it is essential to have permits complete before any flood events happen (particularly in the event of any extreme flood events) and redirect as much excess streamflow as possible into the aquifer. The SVGMD obtained grant funding from the California Department of Water Resources and the California Department of Fish and Wildlife to implement recharge for projects in the southeast quadrant of the Basin (Bullets 2 and 3 above) and obtained grant funding from the Plumas County Watershed Forum to implement groundwater recharge and irrigation efficiency work in the northeast quadrant of the Subbasin. These recharge projects are shown in the Overview Map (Figure 1) and described below.

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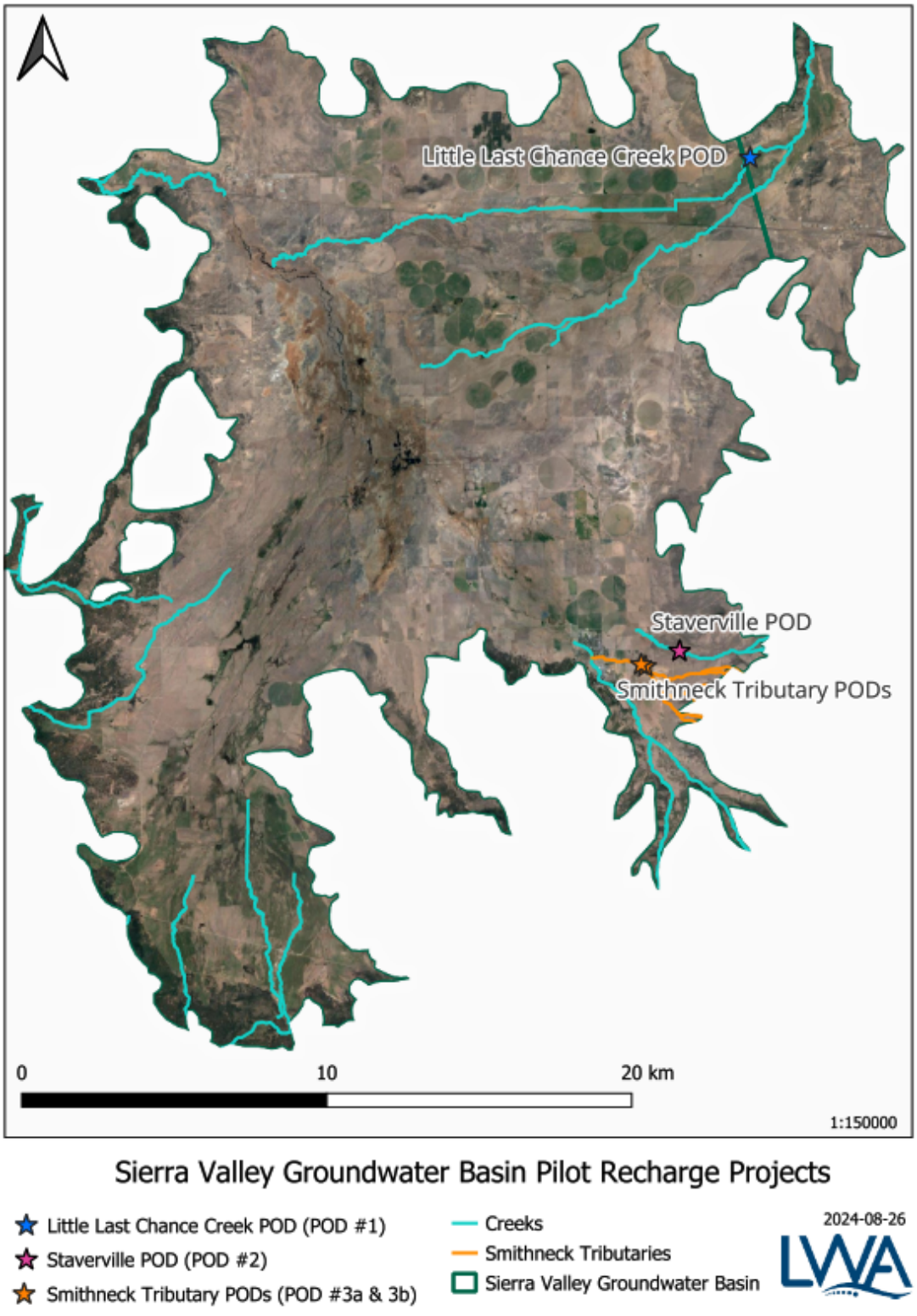

Figure 1. Whole Basin Overview

SVGMD Recharge Project Descriptions

1. Little Last Chance Creek

The Little Last Chance Creek recharge project seeks to use an existing POD and diversion structure along Little Last Chance Creek (Figure 2) to divert streamflow to a recharge area west of the creek (Figures 3 and 4). Both the check structure and the recharge field area are owned by Bryan Williams, who has agreed to allow recharge to occur on his property during the winter months between December 1 and March 15th. Any recharge has the potential to alleviate groundwater depletion in the northeast quadrant of the Sierra Valley Groundwater Subbasin. This area of the Subbasin in particular has experienced some land subsidence over time due to over pumping for irrigation, driven by an overall lack of sufficient groundwater recharge to support regional irrigation needs (Sierra Valley Groundwater Sustainability Plan).

The project proposes to install temporary piping (~12" in diameter) and lay it from the point of diversion (POD) to the recharge area as shown in the map below (blue line). The pipe inflow point would be set into the pool above the diversion structure, and would be screened to protect any fish or aquatic species. The inlet suction piping would have a fish screen with a minimum open area of 10 square feet to reduce approach velocities to 0.4 ft/s per NOAA Appendix D. The screen would have approximately 0.125" perforations with 42% open area. There are four different infiltration basins that are being considered within the recharge area (i.e. smaller subsections of the overall recharge area mapped below). The head difference from the creek to the highest infiltration basin is 212' which would require a *temporarily installed* high head pump. The lowest head difference is 56'. In the event recharge is supplied to the lower recharge basin at an elevation of 5021' from the Point of Diversion on the West Branch of Little Last Chance Creek (elevation 4965'), approximately 25 horsepower (HP) would be required to lift the water through a 12" pipe. However, if the higher recharge basin at elevation 5177' is selected approximately 100 HP of pumping capability would be required. The pumps used would be *temporary* self-priming pumps of either a vertical turbine or horizontal centrifugal configuration. A suction hose approximately 50' in length and 12" diameter would extend from the West Branch of Little Last Chance Creek to the pump location. The pump would be diesel or gas powered. In the event the higher discharge basin is used, the 100 HP requirement may be met by using a number of pumps placed in a parallel fashion to meet the total flow requirement. It is estimated that the flow rate would be 3 cfs (1346.4 gpm) or less, but the exact amount would be determined based on the needs of other water users and as determined by the Last Chance Creek Water District. The flow rate may also vary depending on the allowable infiltration rates.

Every day within the diversion period (Dec. 1- March 15), the field team will assess streamflow along Little Last Chance Creek using the closest stream gage (which is operated by DWR; values reported here). If flow within the previous 24 hours exceeds the historic 90th percentile flow rate for that given day, then the 90/20 criteria for diversion has been met. The field team must then evaluate criteria set forth by the Oroville Dam and by the Last Chance Creek Water District[2] . If all three conditions have been met (indicating protection of all downstream water users), recharge will be initiated lasting 24 hours, and the

[2] Specific criteria set forth by Oroville Dam and the Water District can be provided over email upon request.

above steps will be repeated the following morning. If criteria are not met, the pump will be turned off and recharge will stop.

Figure 2. Little Last Chance Creek diversion structure

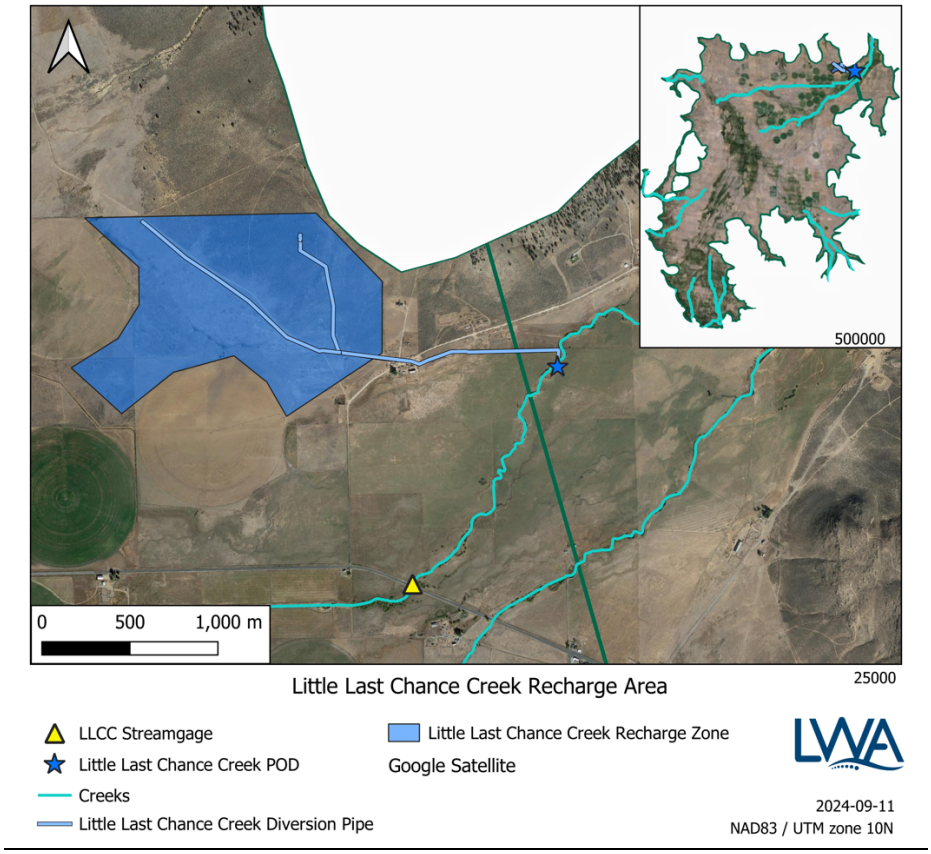

Figure 3. Little Last Chance Creek Recharge Area

SVGMD Recharge Project Descriptions

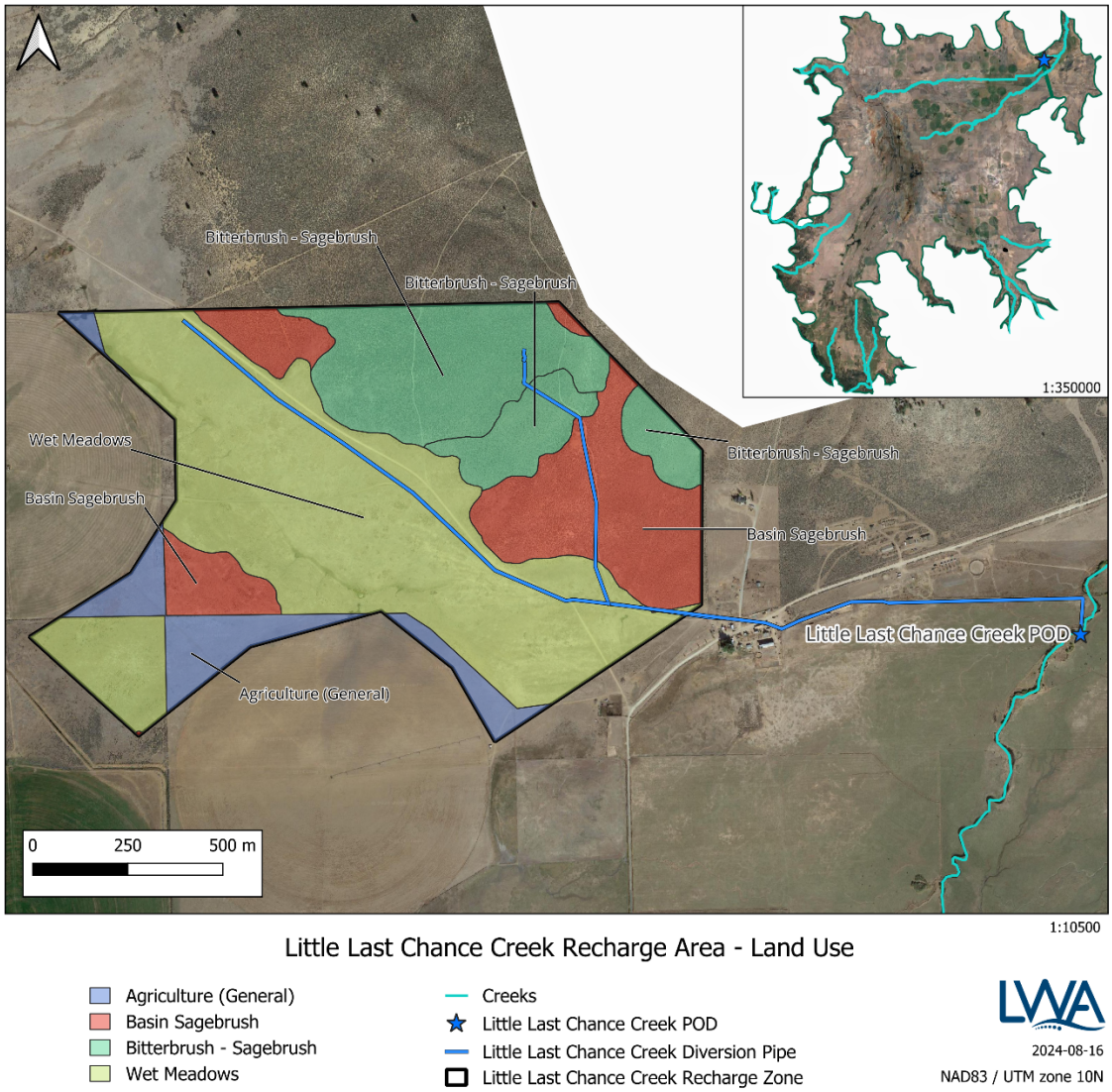

Figure 4. Little Last Chance Creek Recharge Area Land Use

SVGMD is currently working on the following tasks prior to initiating the recharge project:

- Agreement with the Last Chance Water District on the accepted conditions to allow diversion
- Further evaluation of infiltration capacity of proposed recharge site to ensure recharge to the deep aquifer is possible (see land use map above)
- Determination of whether migratory fish are able to swim upstream and over the diversion structure and proceed to spawn upstream. Check boards in the diversion structure can be temporarily removed to allow for fish movement in the West Branch of Little Last Chance Creek.
- Evaluation of availability of water for this project through a transfer of water allocations from Lake Davis to Frenchman Lake

SVGMD Recharge Project Descriptions

2. Staverville Creek

The Staverville Creek recharge project seeks to use an existing ditch and POD along Staverville Creek (Figure 7) to divert streamflow to infiltrate water along the ditch and (if flows are high enough) to a recharge area downstream of the ditch (Figures 5 and 6). The landowners, Dan and Sally Easley, have an existing year-round water right that enables them to divert up to 0.5 cfs of water onto their property. The landowners have not recently used this water right and the POD is in need of repair. Initially, the POD will be retrofitted with a temporary structure to facilitate diversion by December 1. Repairs would include adding a rock structure or sandbags to create a check structure on Staverville Creek to divert the water into the existing irrigation channel. In the irrigation channel, repair would include placing rock or sand-bag structures that are roughly 15' wide. On the steeper part of the diversion channel the structures would be 200' apart, then once the channel flattens out these structures would be placed every 400'. The last 450' of the diversion channel would need the banks to be rebuilt resulting in roughly 223 cubic yards of embankment being installed. At the end of the diversion channel the water will spread out into the recharge basin on the Easley property. If needed, any impeding vegetation may need to be removed.

The 0.5 cfs of recharge is not subject to the 90/20 restrictions due to the presence of an existing year-round water right. This allows recharge to occur at any time, which is a very low-cost method for recharge that could benefit the Basin in the long term.

In addition, a stream gage will be installed along Staverville Creek, a flume downstream of the POD, and two monitoring wells within the recharge area (see map below). In the event that streamflow along Staverville Creek exceeds the 90/20 criteria and all downstream water rights conditions are met, the SVGMD is proposing to divert an additional 0.5 cfs to recharge (for a total of 1 cfs of recharge).

The Watermaster specified that a minimum of 1.65 cfs of Staverville creek flow must be maintained at all times to meet the needs of the downstream water rights holders during the winter recharge period.

SVGMD Recharge Project Descriptions

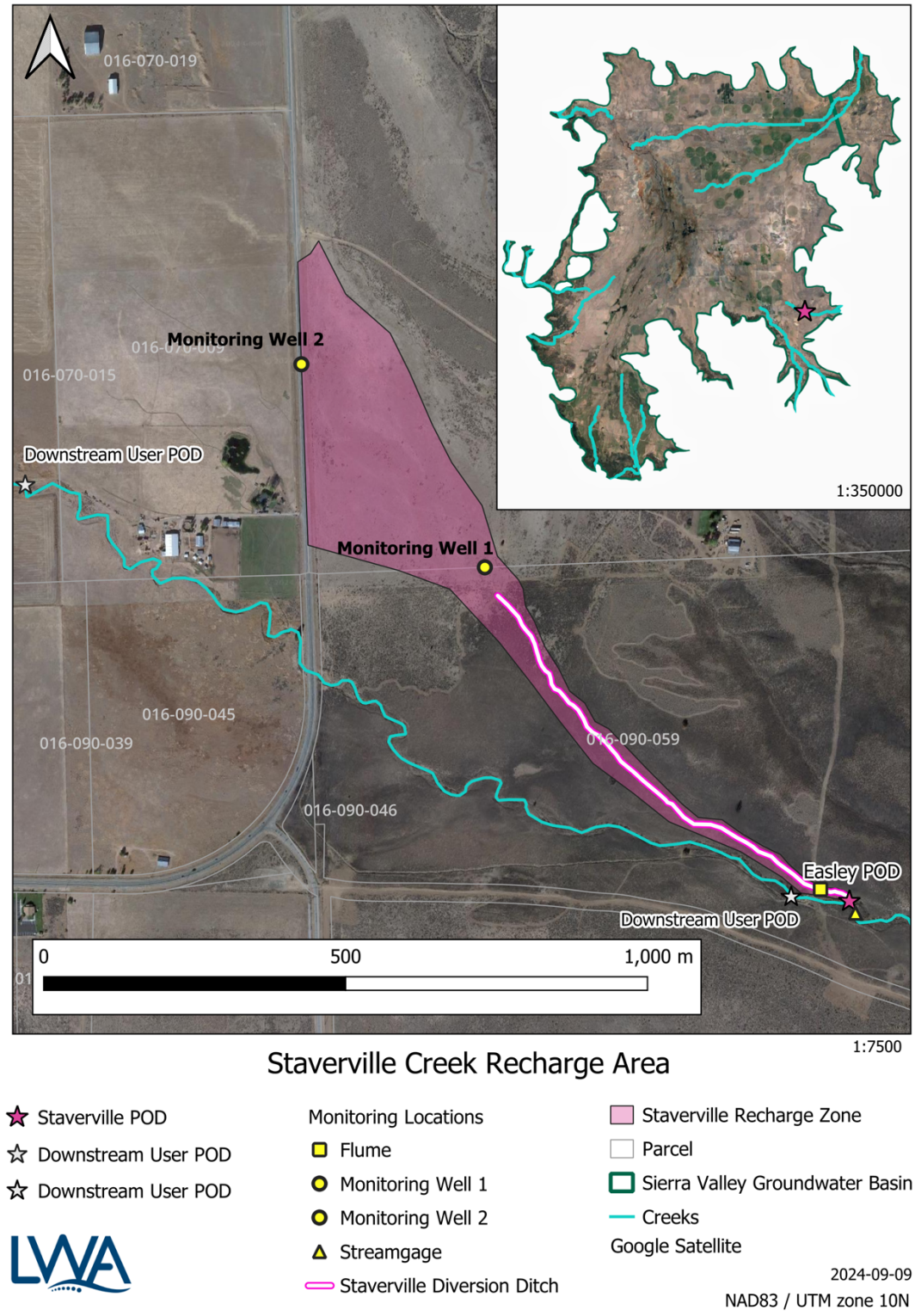

Figure 5. Staverville Creek Recharge Project

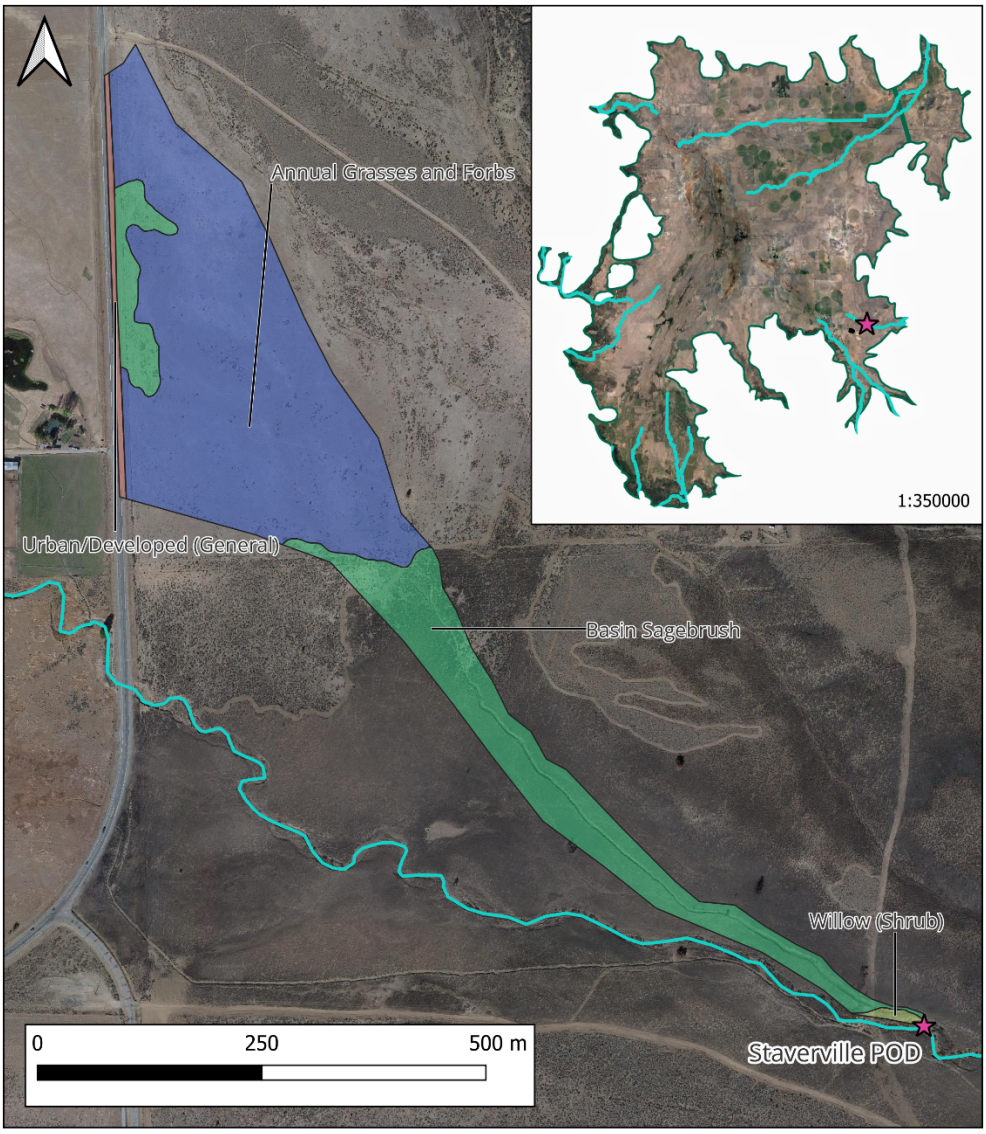

Figure 6. Staverville Creek Recharge Area Land Use

SVGMD Recharge Project Descriptions

Figure 7. Staverville Creek Diversion Ditch

SVGMD is currently working with CDFW regarding the components (e.g., sandbags) that will be used to return the POD to its previous operational structure.

3. Ephemeral Drainage (Smithneck Creek Tributary)

The Ephemeral Drainage project will involve installing temporary (installed on December 1 and removed on March 16) rock structures or sand-bags to create a check structure within the streambed of a tributary to Smithneck Creek (see Figure 1 for location relative to other two projects, see Figure 8 for more specific site information). The check strucutures are planned to be roughly 60' wide in the valley and 30' wide closer to the hillside while being approximately 5' in height. A check structure will be placed every 5' in elevation moving southeast on Sierra County property across the Griffin property and Sierra County Property. As a result, spacing will vary depending on the grade of the drainage channel.

The purpose of this project is to slow the transport of water along the tributary for long-enough to allow some volume of water to pool upstream of the check strucuture and infiltrate into the aquifer as recharge (see Figure 8; check structures would be placed within the red squares). The project check strucutures would likely retain no more than 1 cfs of flow for a short period of time (less than one day). Above 1 cfs, additional water would flow past the check structures and down the ephemeral stream.

Flow monitoring equipment was installed at downstream culverts to assess streamflow during the 2023-2024 water year (flow data shown in graph below). According to the stream gage record, the ephemeral stream flowed from early February until mid-April, offering a potential window of recharge in the latter portion of the winter diversion period. The stream has low water levels not exceeding 0.5 ft during the remaining portion of the year.

SVGMD Recharge Project Descriptions

Another recharge project was conducted in April-June 2024 as a proof of concept project using an existing water right on Smithneck Cree. Approximately 20 acre-feet of water were recharged to the groundwater aquifer. During this effort, stream flow in Smithneck Creek and groundwater levels in a nearby well were tracked near the ephemeral drainage area. One thing that was learned through the well level measurement was the potential for recharge. Specifically, the monitoring well, 30 feet in depth, showed a direct rise in groundwater levels from water applied to the nearby land surface via field application (irrigation) or intermittent drainage (spring runoff and storm flow). The direct response of groundwater from water at the surface shows favorable infiltration conditions exist for shallow aquifer recharge. Deep aquifer recharge has not yet been studied at this location. However, the Technical Support Services (TSS) well being installed by DWR is a deep well that will belocated in this project area and will facilitate evaluation of deep aquifer recharge.

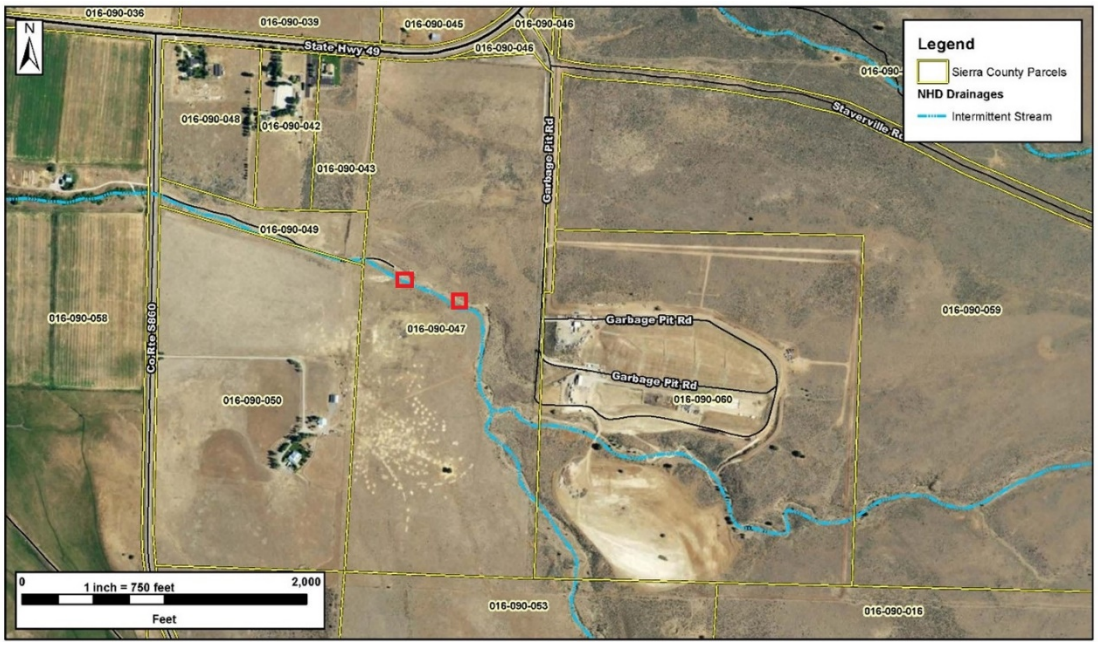

Figure 8. Ephemeral Drainage Project Location

SVGMD Recharge Project Descriptions

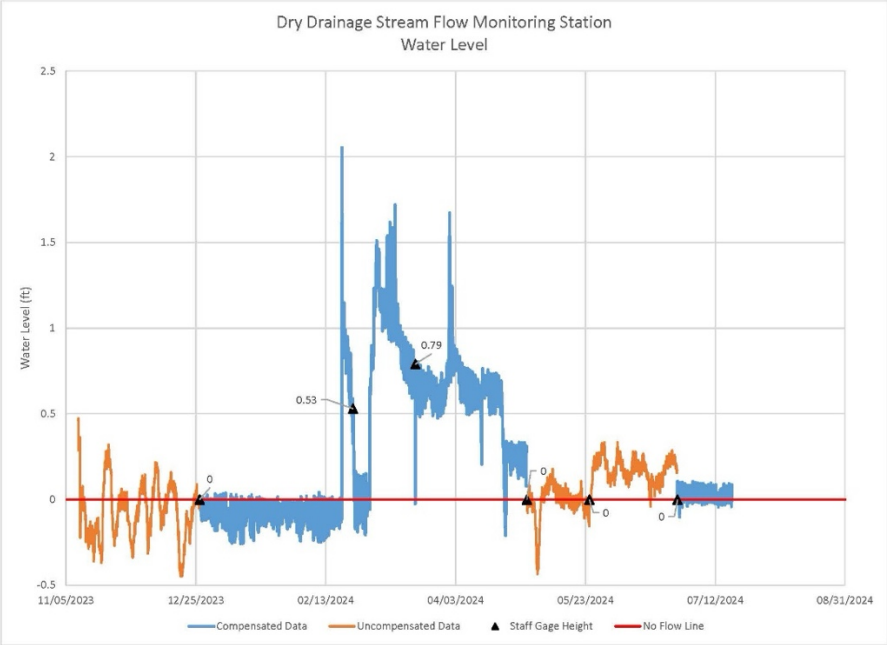

Figure 9. Ephemeral Stream Flow 2023-2024

Figure 10. Ephemeral Stream Tributary to Smithneck Creek