FRESNO STATE

California Water Institute

Groundwater Recharge to Benefit Disadvantage Communities in Fresno County Feasibility Study

January 2024

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Groundwater Recharge that could benefit Disadvantaged Communities (DAC's) in Fresno County

Feasibility Study

Prepared by

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And

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With technical assistance from MKN & Associates, Inc.

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Executive Summary

Since the introduction of groundwater pumping in the San Joaquin Valley Region of California, groundwater has been historically overdrafted. To date, many communities within the region are experiencing the negative ramifications of the historic overdraft of groundwater. The communities that are most widely impacted by these negative effects, such as depleting quality and quantity of groundwater, are disadvantaged communities (DACs) reliant on domestic wells for potable water use. The purpose of this Feasibility Study is to evaluate the feasibility of groundwater recharge, in an effort to improve water quantity, at pre-identified locations in Fresno County within DACs in need of improved groundwater conditions. Feasibility will be predominately based on technical and financial analysis.

In early 2023, the California Water Institute (CWI) conducted a geospatial analysis to identify potential sites for groundwater recharge within DACs in the Fresno County Region currently experiencing groundwater quantity issues. CWI Staff started with developing the site selection consideration factors to evaluate specific criteria identified and weighted by the advisory committee. Publicly available data and information collected was placed in a geospatial software to perform the analysis utilizing the following criteria: disadvantaged communities, number of individuals served in these DACs, number of wells, risk of dewatering, soil texture and infiltration rate, depth of groundwater, land cover/land use, and groundwater quality.

The analysis identified four potential locations that met the project's consideration factors for the design and construction of recharge basins near or in the cities of Kerman, Raisin City, Caruthers, and Laton.

For each site, existing conditions were evaluated to aid in preliminary engineering design and determination of feasibility. The notable existing conditions evaluated for each site included the existing groundwater quality of the nearby community, soil conditions, land use, availability of surface water supply, and demographics. The most important existing conditions of constraint evaluated for each site include the soil type and availability of surface water for recharge.

With the existing conditions determined for each site a conceptual design was completed to define any required project improvements needed. The basis of design used for each of the recharge basins was the Caltrans Infiltration Basin Design Guidance Handbook. Following the production of the preliminary design and cost estimates, a feasibility selection matrix was developed to numerically score each of the project sites. The selection matrix considers potential water availability, proximity to surface water, current land use, recharge potential, construction costs, ease of maintenance and operation, and community benefit. Scores of one (1) through ten (10) were assigned for each criterion, resulting in a maximum score of 70, Table ES-1 displays the scoring for each site.

Criteria	Representative Project Location			
	Scoring (Numerical): 1-10			
	Kerman	Raisin City	Caruthers	Laton
Potential Water Availability	5	1	5	6
Proximity to Surface Water	7	1	4	8
Current Land Use	10	2	2	2
Recharge Potential	7	8	8	5
Construction Costs	7	2	5	5
Ease of Maintenance and Operation	8	3	5	4
Community Benefit	9	6	7	5
Totals	**54**	**23**	**36**	**34**

Table ES-1: Feasibility Selection Matrix

The major factors contributing to the Kerman Site's outscoring is the Site's current proximity to surface water, current land use, construction costs, and ease of maintenance and operation when compared to the other sites. For these reasons, the Kerman Site was determined to be the most feasible location should any of the sites included in the study be considered for further investigation or design. The study produced a cost estimate for improvement of probable capital cost of $6,015,000 for a 44-acre size recharge basin.

Raisin City scored the lowest based on the lack of proximity to infrastructure to access surface water. Conversations with the local groundwater sustainability agency identified plans for future infrastructure making this area more feasible in years to come.

This Study was successful in determining the high-level feasibility of project locations identified for groundwater recharge. Should the recommended location from this report be further investigated and eventually successfully constructed, the positive implications of this Study will be immense for DACs facing a reduction in groundwater level. It is important, however, to discuss next steps and recommendations for any site that is considered for further design or construction. Next steps and recommendations include:

- Obtain groundwater quality samples.
- Obtain a Geotechnical Analysis and Report to confirm in-situ infiltration and percolation rates.
- Further collaboration with water supplying authorities to solidify the capacity of existing water conveyance systems and alternative site recommendations based on local expertise.

- Detailed groundwater investigation to determine historical groundwater depth and current groundwater depth and quality.
- Perform hydraulic modeling.
- Perform a topographic site and pipe alignment survey.
- Prepare preliminary construction design documents to confirm cost estimate.

Groundwater recharge basins is just one of multiple groundwater recharge methods that are taking place and will increase in the coming years near groundwater dependent communities. This study specifically focused on the technical and financial feasibility of recharge basins but sites like these would also work great for flooding during the wet season or for subsurface recharge.

Education of what groundwater recharge is, what are its advantages and disadvantages, as well as how it will affect these communities is something that needs to be done in those communities. As a preliminary effort, CWI and Self-Help Enterprise developed an education campaign that included flyers in English and Spanish to the four evaluated communities as part of this project.

This feasibility study has undertaken an examination of the groundwater overdraft issues in DACs within Fresno County and a potential solution. The success of this study in providing a feasibility analysis underscores groundwater recharge as potential positive implications for these communities facing reductions in groundwater quantity. The results of this work mark a pivotal step towards sustainable groundwater management in the San Joaquin Valley.

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