MAGSA

McMullin Area Groundwater Sustainability Agency



Aquaterra Water Bank Project
Draft Project Description

PREPARED BY:

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1 INTRODUCTION

The McMullin Area Groundwater Sustainability Agency (MAGSA) is proposing to develop and operate the Aquaterra Groundwater Bank Project (Project) within its jurisdictional boundaries. The MAGSA jurisdictional boundaries, found in Fresno County northeast of Helm, south of Kerman, and approximately 20 miles southwest of Fresno, comprise the project area (Figure 1-1). MAGSA was formed on January 31, 2017, when Fresno County, Raisin City Water District, and Mid-Valley Water District executed the McMullin Area Groundwater Sustainability Agency Joint Powers Agreement. This agreement formed a Groundwater Sustainability Agency (GSA) under the Sustainable Groundwater Management Act (SGMA) for the McMullin Area.

Signed into law in September 2014, SGMA provides a framework for local governments and water agencies to manage groundwater resources through the formation of GSAs. MAGSA is authorized under SGMA to develop, adopt, and implement a Groundwater Sustainability Plan (GSP) for the sustainable management of groundwater in a portion of the Kings Subbasin. MAGSA is one of seven GSAs within the Kings Subbasin (Figure 1-2). It is located west of SR-99 and east of the James Bypass within an agricultural region of the mid-northern portion of Fresno County, CA.

1.1 PROJECT OBJECTIVES

The Project is intended to meet two primary objectives:

1. Establish the Aquaterra Water Bank (Bank) for use by local, regional, and statewide entities to improve their use of available surface water supplies; and,
2. Help MAGSA in achieving sustainable groundwater management for local water and agricultural sustainability, in compliance with SGMA.

1.2 PROJECT BACKGROUND

This section provides background information considered relevant to this Project, including:

- The Central Valley Project (CVP) and the State Water Project (SWP); and
- Groundwater conditions and the SGMA.

1.2.1 Overview of California Water Projects and Contractors

The SWP and the CVP form the backbone of California's engineered water system. The CVP, a federal water project owned and operated by the U.S. Bureau of Reclamation (Reclamation) extends from Redding to Bakersfield, covering about 400 linear miles and including 20 dams and reservoirs (CRS 2021). The CVP can deliver more than 9.5 million acre-feet (AF) of water and provides about 75 percent of its total deliveries for agricultural irrigation, including seven of California's top 10 agricultural counties. The SWP extends more than 700 linear miles and includes canals, pipelines, reservoirs, and hydroelectric facilities (CDWR 2022a). Operated and maintained by California's Department of Water Resources (DWR), the SWP has, on average, provided 34 percent of its water to agriculture and 66 percent to residential, municipal, and industrial users. DWR and Reclamation coordinate operations of the projects, and certain facilities of both projects are jointly used.

Several elements of the CVP and SWP are particularly relevant to this Project. These include state and federal water contractors, the San Luis Reservoir and its associated facilities (Figure 1-3), and the Mendota Pool and the Fresno Slough/James Bypass (Figures 1-4 and 1-5).

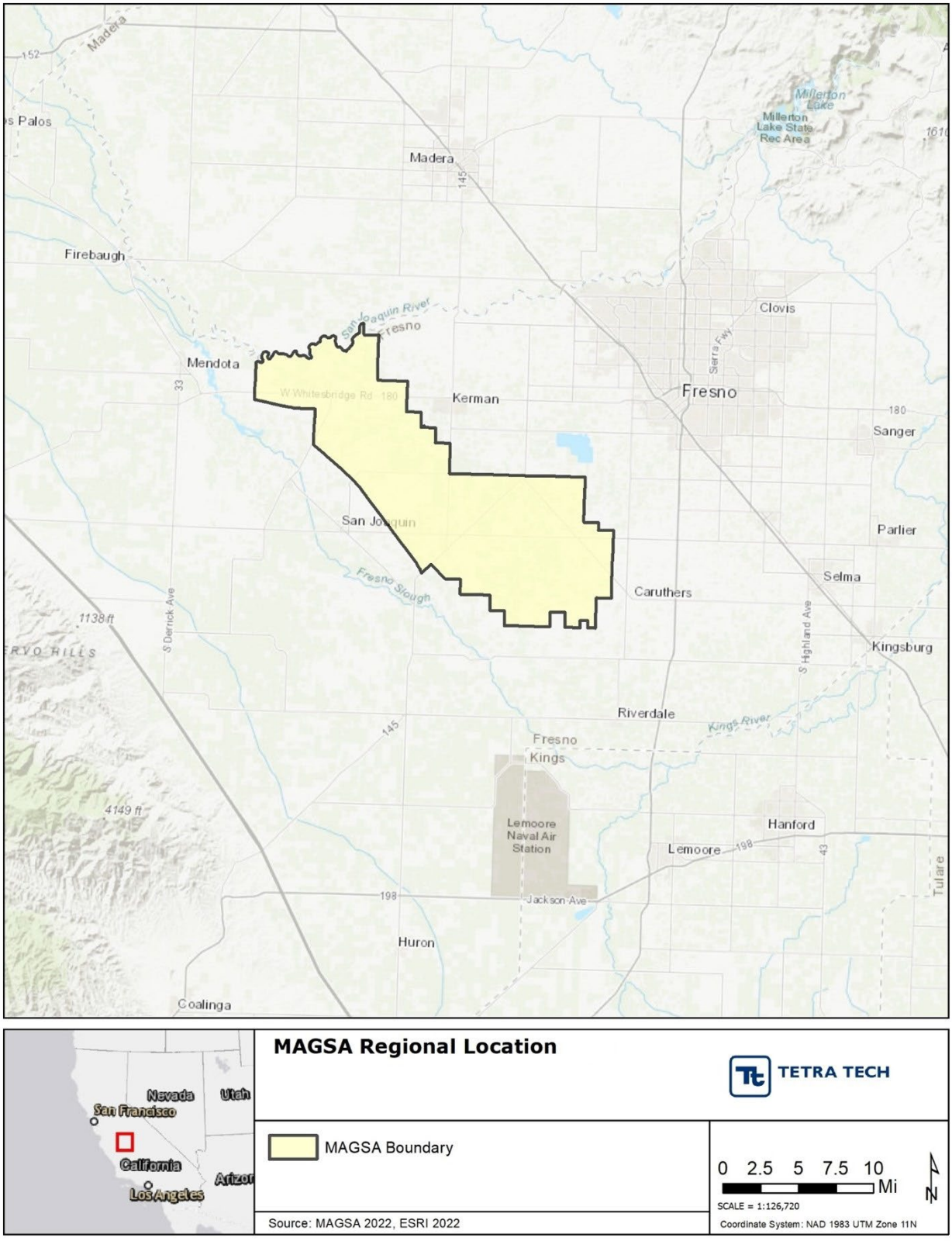


Figure 1-1: MAGSA Regional Location

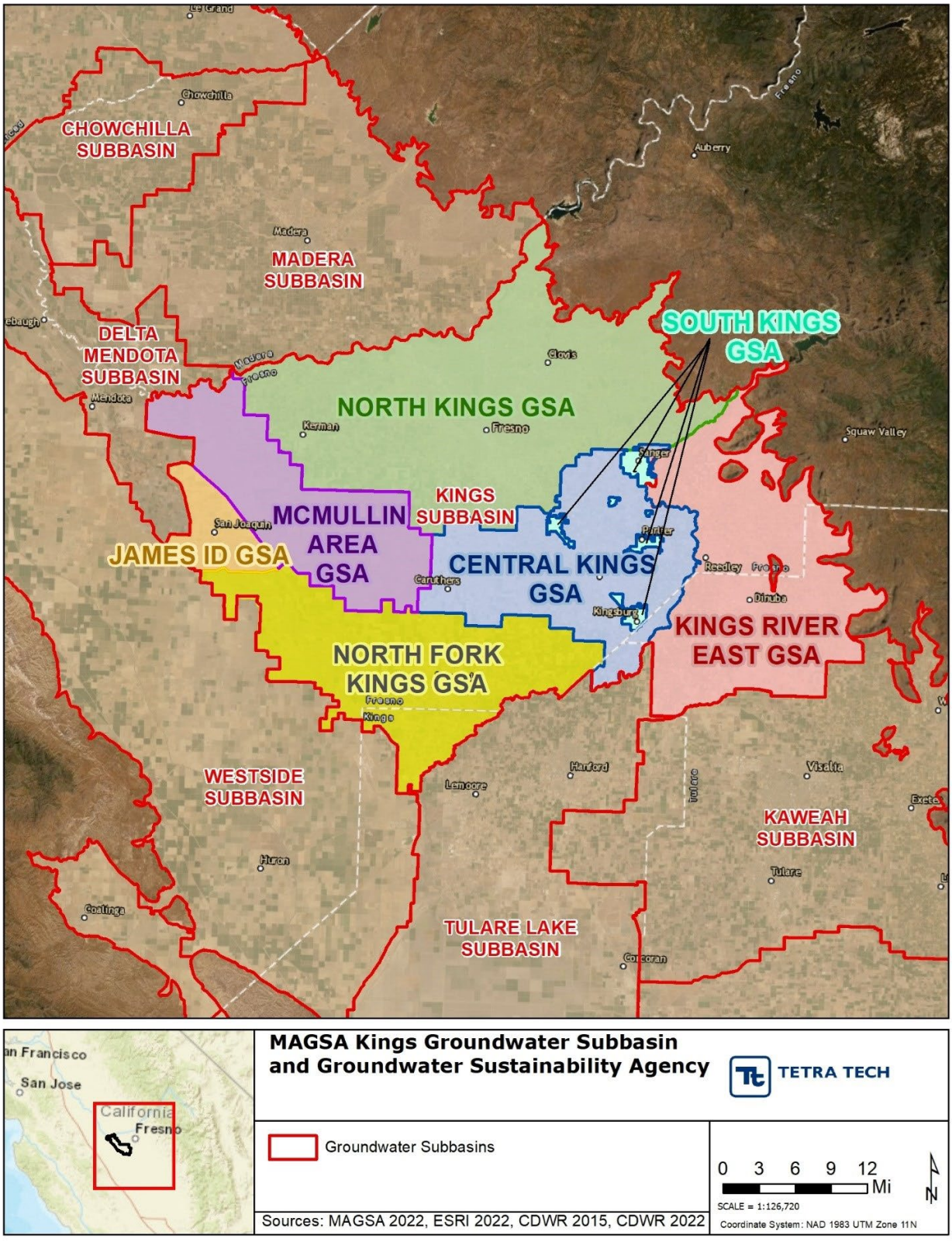


Figure 1-2: Kings Groundwater Subbasins and Groundwater Sustainability Agencies

Water Contractors

Water contractors are public agencies and local water districts who signed long-term water supply contracts that set the maximum amount each can request annually, with actual deliveries based upon regional and statewide hydrologic conditions, current reservoir storage, and the combined requests from all water contractors. These water contractors have financially supported the SWP and CVP by repaying principal and interest on bonds for initial construction and subsequent improvements. The water contractors also pay all associated costs, including labor and power, for facility maintenance and operation (CDWR 2022b).

San Luis Reservoir and Associated Facilities

San Luis Reservoir (SLR) is an offline reservoir serving both the CVP and SWP. It receives state and federal contract water (Figure 1-3). The water stored in the reservoir, which can hold 2,027,840 acre-feet (af), is managed as approximately 48 percent federal water (1,062,180 af) and 52 percent state water (965,660 af) (USBR 2013) and is jointly managed by both the federal and state governments.



Figure 1-3. San Luis Reservoir and Associated SWP and CVP Facilities (Modified from USBR 2013)

Federal contract water is pumped from the southern end of the Sacramento – San Joaquin Delta (Delta) into the Delta Mendota Canal (DMC) using the Tracy Pumping Plant, typically at 2,500 – 3,000 cubic feet per second (CFS) (USBR 2020). Downstream of the pumping plant, federal water gravity flows in

the DMC to the O'Neill Pumping Plant, which lifts the water into the O'Neill Forebay (Figure 1-3). State contract water is similarly pumped at the southern end of the Delta, from the Clifton Court Forebay. State contract water is pumped into the California Aqueduct which gravity flows to the O'Neill Forebay.

The Mendota Pool

The Mendota Pool is a 2,000-acre reservoir created by Mendota Dam with a San Joaquin River (SJR) arm and a Fresno Slough arm (Figure 1-4). DMC contract water delivered to the pool is delivered to the SJR Exchange Contractors Water Authority, other CVP contractors, the Mendota Wildlife Area, and State water contractors through seven withdrawal points in the pool, canals, or pump locations. About 500 CFS remains for discharge past the Mendota Dam into the SJR.

Fresno Slough/James Bypass

The North Fork of the Kings River becomes the Fresno Slough, flowing northward and carrying floodwaters to the Mendota Pool and the SJR (Figure 1-4, Figure 1-5). The James Bypass is a constructed channel bypassing a portion of Fresno Slough, which was originally designed to contain excessive high flows, particularly for flood management. Flows in Fresno Slough and the James Bypass primarily result from Pine Flat Dam flood releases, 55 miles east (Figure 1-4).

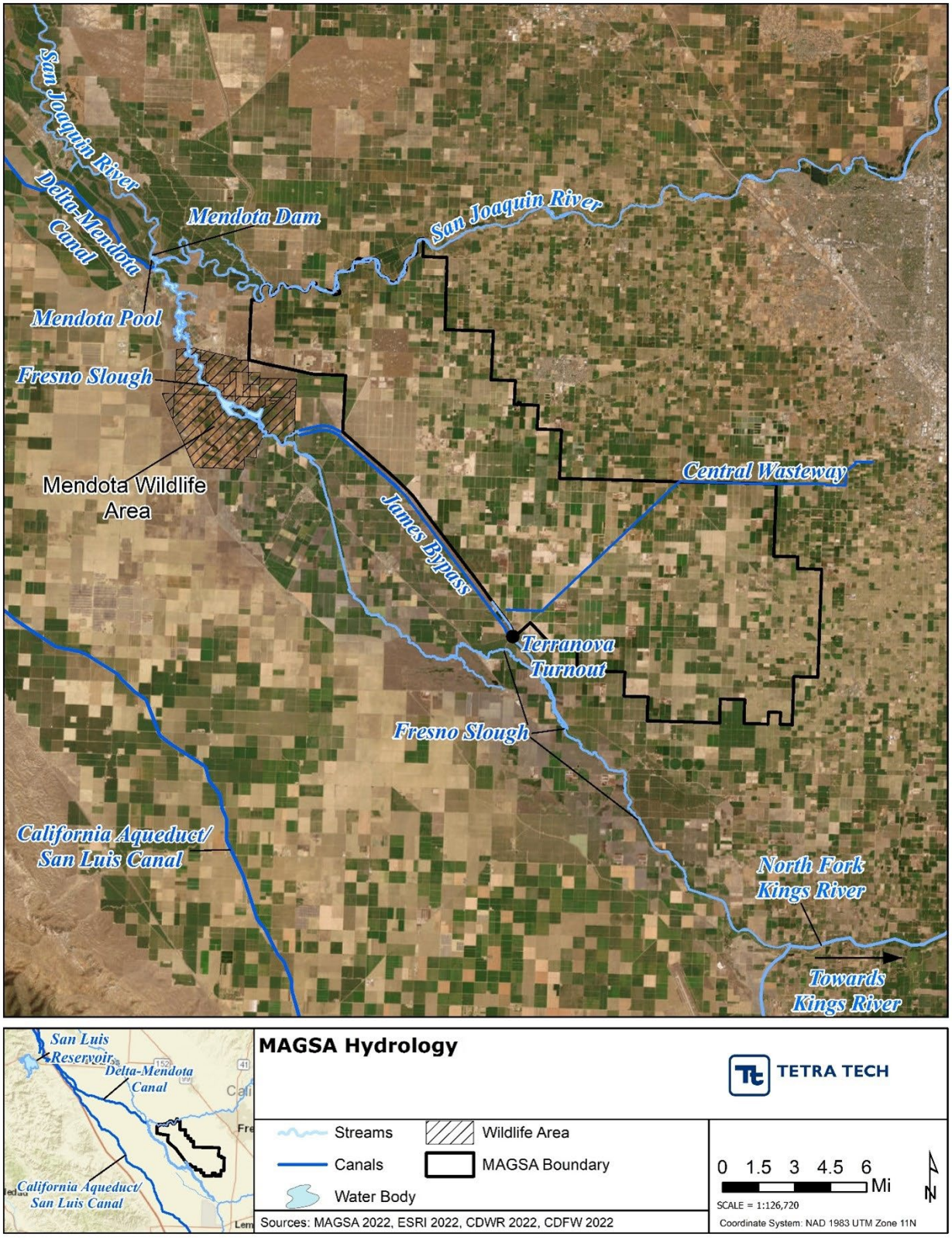


Figure 1-4. MAGSA Hydrologic Features

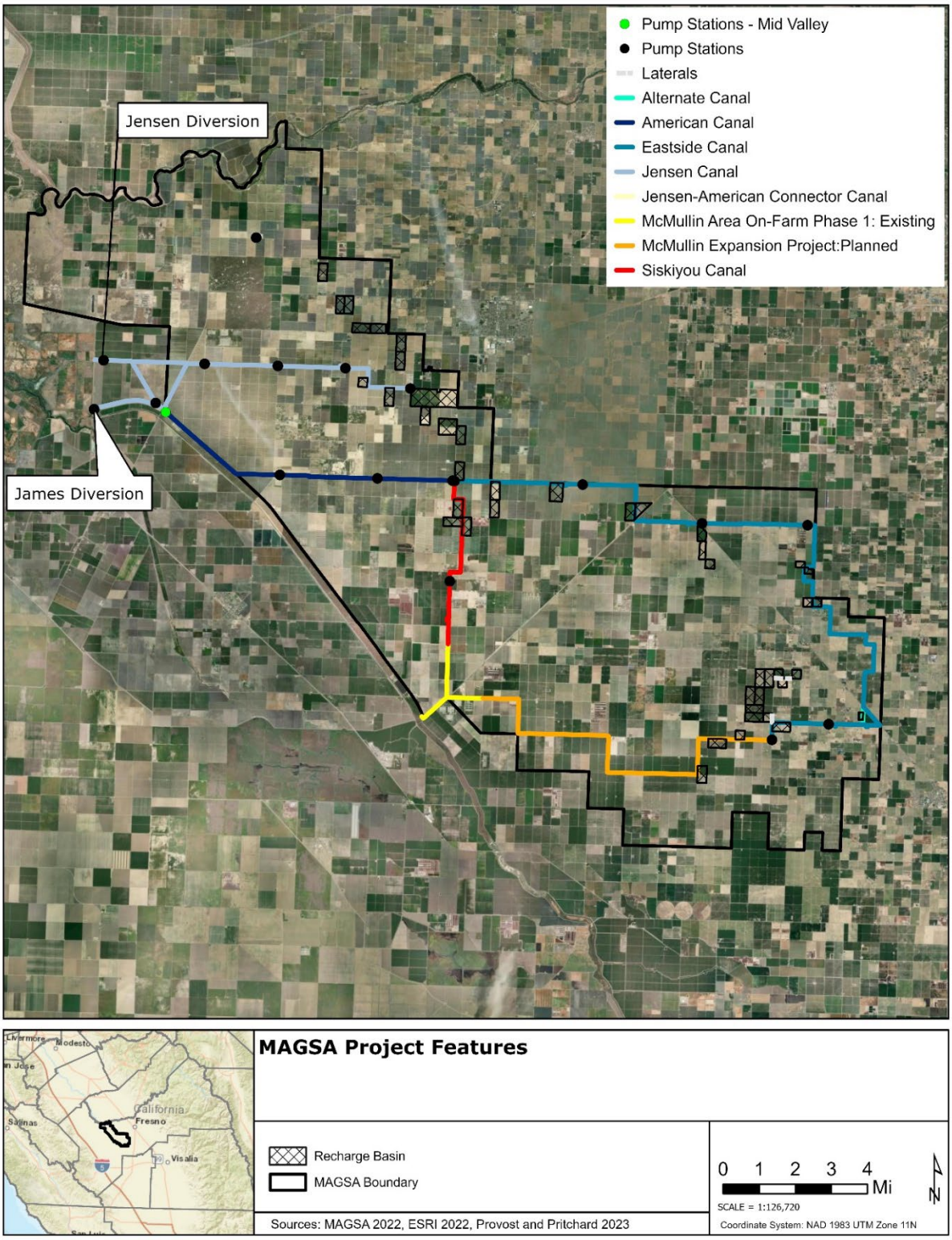


Figure 1-5: Project Features

1.3 PURPOSE AND NEED

The sustainability goal of the MAGSA GSP is to ensure that by 2040 the basin is being managed to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results. The purpose of the Project is to contribute to this sustainability goal by constructing and operating a groundwater bank that provides flexibility to water contractors and contributes to aquifer recharge. The Project will provide additional storage to maximize the capture and use of allocated waters, by allowing contractors to store excess contract water and flood water in wetter years and recover this water in normal or dry years.

The Project is needed is to improve groundwater sustainability in the region by improving water supply reliability and providing flexibility to local agencies complying with the SGMA. Agricultural land uses in the MAGSA area are exclusively dependent on groundwater for irrigation. Groundwater extraction has created a pumping cone of depression, resulting in large amounts of available aquifer storage space. The Project will provide a dry-year water supply to prevent agricultural field fallowing or loss of crops.

The Project will establish the 800k AF-capacity Bank underlying the MAGSA area, which is adjacent to, and will accept water from, the Fresno Slough and the Mendota Pool (Figure 1-4, Figure 1-5). The Bank will be implemented to capture carryover contract water for storage and subsequently return the water to contractors as "wet" water or through state and federal contractor-controlled water trades and transfers. Contract water will be returned to the Pool in compliance with a contractor's request, using existing CVP and SWP facilities, and in full compliance with existing CVP and SWP rules and regulations for transfer through the facilities.

The Project will be designed to divert and recharge up to 208,000 acre-feet per year (AFY) of contract water into the Bank over a 5-month period, and subsequently recover up to 148,000 AFY of contract water from the Bank over a 5-month period for use by SWP and CVP contractors (MAGSA 2022) (Table 1-1). The Bank's proximity to existing water system infrastructure makes it well-suited to accept water deposits from SWP and CVP contractors, local MAGSA partners and consortiums, and others. It is anticipated that the Bank will be recognized as a water bank by the Bureau of Reclamation.

Table 1-1. Aquaterra Water Bank Specifications

Specification	Value	Unit
Recharge		
Maximum Recharge	208,000	AF/Y
Period	Nov - Mar	
Days	151	
Recharge Rate per Day	1,377	AF/D
Recharge Basin Acres	3,480	Acres
% of land available for recharge basins (1)	80	
Available Recharge Acres	2,784	Acres
Design Recharge Basin Infiltration Rate	6	in/d
Recovery (1)		
Maximum Recovery	148,000	AF/Y
Period	May - Sept	
Days	153	
Recovery Rate per Day	972	AF/D
Number of Pumps (2)	88	
Design Recovery Pump Capacity	2,500	GPM

Notes

1 Land is required for associated infrastructure

2 Number of extraction/recovery pumps operational simultaneously

1.4 PROJECT DESCRIPTION

MAGSA proposes to construct and operate a groundwater banking program, described in the following paragraphs. This project description includes the following sections:

- Sources of water;
- Banking program description and operations;
- Infrastructure and easements;
- Construction actions;
- Operations and maintenance;
- Monitoring;
- Governance, ownership, and partner relationships.

This document addresses the construction of the Bank and the first offering of 800,000 AF of bank storage operations. Previous studies estimate the MAGSA aquifer has approximately 1.8 million AF of storage capacity due to aquifer overdraft, therefore up to 1 million AF of storage capacity will remain available after the initial 800,000 AF are deposited (MAGSA 2022). While future offerings are anticipated to use this additional storage capacity once the bank is constructed and initial storage capacity has been met, such offerings are conceptual and not planned to a degree to be assessed in this document. Future offerings would result only in operational changes and would be addressed in future environmental documentation.

1.4.1 Contract Water Sources and Return

State and federal contract water described in Section 1.2.1 will be the source water for the Bank. Diversions to the Bank will be allocated contractor water from San Luis Reservoir that is routed to the Fresno Slough and the Mendota Pool. The Bank will import allocated contract water from two locations in the Mendota Pool (Figures 1-5 and 1-6). Delivery of the allocated contract water from contractors will reduce the amount of carryover water contractors would otherwise save for their use in the following year through storage in San Luis Reservoir. Any contractor's carryover water is at risk of being lost to enable San Luis Reservoir accommodation of the following year's water. Thus, allocated water for delivery to the bank would be carryover water that could otherwise be at risk of loss by the contractor. The Project will allow additional, temporary storage in years where fall San Luis Reservoir storage is high and carryover water is at risk, allowing contractors to retain the current year's allocation for their use in the following year. Movement of allocated contractor water would require authorization from the Bureau of Reclamation or the California Department of Water Resources. The Project would not divert any flood water and would not affect Kings River flood flows. The Project will capture allocated contract water to avoid spills from the San Luis Reservoir and divert that water into the Bank for storage.

Contract water will be returned as either "wet" water or through state and federal contractor-controlled water trades and transfers. All returns will be made upon a contractor's request using existing CVP and SWP facilities, and in full compliance with existing CVP and SWP rules and regulatory requirements for transfer through the facilities.

1.4.2 Groundwater Banking Program

Establishment of the Bank will require construction of conveyance, recharge, and recovery facilities. Construction costs will be recovered through subscription fees collected from bank users, referred to as banking partners. Initial banking partners will have priority options within the water bank, through the purchase of a subscription share that will provide them with a permanent and perpetual right to a set amount of storage capacity. Banking partners with subscription shares will be able to deposit and withdraw contract water within that account. These subscription shares will be purchased per AF of storage capacity and will be available for the entire planned storage capacity of the bank's first offering of 800,000 AF. Should later offerings become available, they would provide a different type of bank share without priority options. MAGSA will own all associated facilities and space of the Bank.

Ten percent of each deposit will be left behind in the water bank to offset operational and evaporative losses and improve subsurface conditions through in lieu recharge (i.e., improving unsaturated zone water content to benefit crops and plants) or direct recharge (i.e., replenishing the underlying aquifer). Losses will be accounted for within the Project area as the volume of water for deposit will be metered when it enters the Mendota Pool and will move directly into the water bank conveyance system for distribution through MAGSA and recharge within the identified recharge zones.

Banking partners are likely to be charged an annual fee to cover operations and maintenance (O&M), monitoring, and other regular annual costs. Banking partners will not be charged any transaction fees for depositing into or withdrawing from the water bank. Future offerings, not evaluated in this document, may involve the potential for transaction fees. All fees will be charged with zero-base budgeting, with no profits for MAGSA, since it operates as a local agency without profit.

Operational Schedule

Recharge deposits to the Bank are expected to occur primarily from October through February of any given year, a five-month period during which the State and Federal Water Projects have historically had excess capacity. Contract water recovery withdrawals from the Bank are expected to occur from May

through September (Table 1-1, MAGSA 2022). This period coincides with both the regional growing season when irrigation drives higher water demand, and California's dry season when other demands such as streamflows for fisheries, recreational use, urban and suburban irrigation increase.

1.4.3 Infrastructure and Easements

The project infrastructure elements include conveyance, recharge, and recovery facilities. MAGSA will attain long-term easements with landowners for these elements. Since MAGSA is a government agency, public ownership will allow use of these facilities by other public organizations in coordination and cooperation with MAGSA. Each facility type is discussed in the following sections.

Conveyance Infrastructure and Easements

The conveyance system (Figure 1-6) will include the construction of a main canal, lateral canals, pump stations with pumps, and road crossings. Table 1-2 summarizes the general design criteria for canals, pumps, and pump stations. Table 1-3 shows the design criteria for each canal.

Table 1-2. Conveyance Facilities Preliminary Design Criteria

System Component	Design Criteria	Unit
Levee and Channel		
Main Canal Design Capacities	300, 400, 500	CFS
Lateral Canal Design Capacities	120	CFS
Side Slopes, Inside and Outside	1.5:1	ratio
Design Velocity	1	FPS
Consolidation Factor	25 [1]	%
Freeboard at Maximum Capacity	1	ft
Direction of Flow	bi-directional [2]	n/a
Levee Easements		
Conveyance Easements	160	ft
Temporary Construction Easements	40	ft
Pump Stations		
Design Capacities	300, 400, 500	CFS
Construction and Materials	Concrete and Steel	n/a
Water Lift Distance per Pump Station	13, 15, 11.25	ft
Pump Bays and Pump Types at Full Capacity	6	each
Number of Pump Stations	19	each
Pumps, Electric [4]		
Individual Pump Capacity: 20% of Pump Station Capacity [3]		
300 CFS Canal	60	CFS
400 CFS Canal	80	CFS
500 CFS Canal	100	CFS
Design Lift	16	ft
Design HP (Based upon CFS)		
300 CFS Canal	145	HP
400 CFS Canal	195	HP
500 CFS Canal	240	HP
Total Number of Electric Pumps	84	n/a
Pumps, Natural Gas [3, 4, 5]		
Individual Pump Capacity: 400 CFS Canal		

System Component	Design Criteria	Unit
Design Lift	16	ft
Horsepower: 400 CFS Canal	195	HP
Total Number of Natural Gas Pumps	18	n/a
Pumps, Propane [3, 4, 5]		
Individual Pump Capacity: 300 CFS Canal		
Design Lift	16	ft
Horsepower: 300 CFS Canal	145	HP
Total Number of Propane Pumps	12	n/a

Notes

[1] Compaction factor is the amount excavated fill will decrease after compaction.

[2] Main canals have 0% slope to allow flow into and from MAGSA.

[3] Each canal is designed to function on five pumps, with one to serve as a backup.

[4] All pumps will have variable frequency drive controls to minimize energy use during low flow.

[5] Natural gas pumps will only be on 400 CFS canals, and propane pumps will only be on 300 CFS canals.

Channels and Levees. The bi-directional main canal will convey water from the Mendota Pool to recharge basins to deposit water into the water bank and will withdraw water back to the Mendota Pool from recovery wells. Table 1-3 summarizes the current design criteria of the canal network. The water bank will include 63.5 miles of new or upgraded canals. A lateral canal system will be constructed to distribute water from the main canal system to non-adjacent recharge basins where necessary. Table 1-4 summarizes the cut and fill volumes of canals. Cut has been calculated at 3.3M cubic yards and fill calculated at 2.3M cubic yards.

Table 1-3. Canal Dimensions

Canal / Channel	Length [5]	Bottom Width [5] (interior)	Levee Top Width (each side)	Canal Top Width (interior) [3]	Canal Exterior Width [1, 3, 5]	Water Depth	Total Canal Depth [5]	Average Excavation below Grade	Design Capacity	Total Acres [4]
	Miles	ft	ft	ft	ft	ft	ft	ft	CFS	acres
Main										
Eastside	37	16	14	52	116	10	12	7	500	897
Jensen	9.5	16	14	49	110	9	11	7	500	230
American	10.75	16	14	49	110	9	11	7	400	261
Siskiyou	4.5	13	14	44.5	104	8.5	10.5	6	300	109
Connecting Canals	1.75	13	14	44.5	104	8.5	10.5	6	300	42
Subtotal	*63.5*	--	--	--	--	--	--	--	--	*1539*
Laterals [2]										
120 CFS	0.75	8	14	28.25	76.5	4.75	6.75	4.5	120	18

Notes:

[1] Measured as slope toe to slope toe on the exterior of levee, and calculated assuming canal invert at surface grade, thus representing a maximum width; if canal invert is situated below grade, this width will be smaller.

[2] Laterals fall mostly within the recharge basin footprints.

[3] Slope of 1.5.

[4] Total easement widths = 200 ft.

[5] Represents maximum potential value for earthmoving activities (length, bottom width, top width, depth).

Table 1-4. Channel Cut and Fill Volumes

Main Canal / Channel	Cut (cubic yards)	Fill (cubic yards)
Eastside	1,946,141	1,390,229
Jensen	416,031	326,403
American	556,601	355,015
Connecting Canals	203,923	15,904
Siskiyou	196,927	162,846
Main Canal Subtotal	3,319,623	2,250,397
Laterals	12,734	9,551
Total	3,332,357	2,259,948

Diversion and Lift Pumps and Pump Stations. The conveyance system includes diversion pump stations and lift pumps that will enable operation of the water bank program (Figure 1-6). Pump station capacities will range from 300 to 500 cubic feet per second (CFS), depending upon the canal they are servicing, and the pump capacities and power requirements will be specified accordingly (Table 1-2, Table 1-5).

Diversion pump stations are located to divert water from the Mendota Pool (Jensen Diversion; James Diversion) as part of the water banking program. General design criteria for pump stations are provided in Table 1-2. Lift pump stations will be installed along the canal system. Lift pump stations will lift water up to 16 feet (ft), with differences depending upon grade and location. For the bi-directional canal system, lift pumps will be designed for bi-directional flow, able to pump up-gradient and gravity flow down. Up-gradient flow will be used to move diverted waters to recharge basins. Down-gradient flow will be used to gravity flow recovery water back to the Mendota Pool. Descriptive information for the specific diversion stations and summaries of the number of 300, 400 and 500 CFS pumps are presented in Table 1-5.

All pump stations will include discharge manifolds, canal gates, bypass functionality to allow bi-directional flow in the canals, electrical and transmission equipment, and accessories. All pump stations will be designed for six bays. Electric, propane and natural gas-powered pumps will be used at the pump stations:

- 500 CFS pump stations will be comprised of 6 electric-powered pumps;
- 400 CFS pump stations will be comprised of 3 electric pumps and 3 natural gas-powered pumps; and
- 300 CFS pump stations will be comprised of 3 electric pumps and 3 propane powered pumps.

The system will include a total of 84 electric pumps, 18 natural gas and 12 propane powered pumps across 19 pump stations (Table 1-5).

The primary reliance upon electric pumps is intended to reduce greenhouse gas emissions from pumping in compliance with California SB 32. These pumping plants will require new associated natural gas, electrical, and control facilities to enable their operation.

Easements. MAGSA will obtain easements for the construction and operation of the conveyance system. Permanent conveyance easements will be obtained from individual landowners to build canals across their properties. Permanent conveyance easements will be up to 160 ft wide (80 ft to either side of the canal center line). All canals and channels, associated levees, pump stations and road crossings will be located within the permanent conveyance easement. Temporary construction easements, up to 40 feet wide, will be obtained for the Project along the canal system.

Based upon the specifications for the temporary and construction easements, the total maximum easement width will be 200 ft (Table 1-2) along the 63.5-mile main conveyance system (Table 1-3), corresponding to about 1,540 acres.

Table 1-5. Pump Stations

Station Name	No. of Stations	Type	Capacity (CFS)	Location	
				From	To
Diversion					
Jensen Diversion	1	New	300	Mendota Pool	Fresno Slough Access
James Diversion	1	Replacement [(1)]	300	Mendota Pool	Fresno Slough Access
American Diversion	1	New	400	James Bypass	American
Subtotal	***3***				
Lift					
Jensen Canal Lift Stations	4	New	500	Jensen Canal	
American Canal Lift Stations	4	New	400	American Canal	
Siskiyou Canal Lift Station	3	New	300	Siskiyou Canal	
Eastside Canal Lift Stations	5	New	500	Eastside Canal	
Subtotal	***16***				
Pump Distribution	***Pump Types per Station***				
500 CFS	*9*	*6 Electric Pumps per 500 CFS Station*			
400 CFS	*6*	*4 Electric and 2 Natural Gas Pumps per 400 CFS Station*			
300 CFS	*4*	*4 Electric and 2 Propane Pumps per 300 CFS Station*			
Total Stations	***19***				

Notes:

1. Replacement of Mid-Valley Water District Pump Station

McMullin Projects (Phase 1 and Expansion) Integration. The McMullin Projects include a 5,000-acre pilot recharge project in the southwest corner of MAGSA that was constructed in 2021, and the McMullin Expansion Project, found in the south of the MAGSA area and which is in the final stages of planning and design. Conveyance infrastructure constructed for these projects will be integrated with this project to increase capacity and functionality. In particular, the McMullin Project conveyance infrastructure will enable transport of surface waters across the MAGSA area for water banking recharge through recharge basins.

Road Crossings. Box culverts will be installed for County roads when appropriate. Crossings at State highways and busy roads will be jack and bore pipelines. Box culverts will have a design capacity consistent with the adjacent canals and will be designed to meet County and Caltrans requirements as appropriate. For paved road crossings, pavement will be replaced in the impacted area. During construction, traffic at County and State road crossings will be managed through either closing half the road for traffic or having detours. Design details for road crossings are shown in Table 1-6.

Box culverts or standard pipe crossings will be installed at farm road crossings. Selections will depend upon design flows, costs and other site considerations. Culverts will be designed for road crossing lengths ranging from 30 to 120 ft, depending on whether the crossing is perpendicular or diagonal to the road. Culvert piping will either be steel or concrete.

The details and locations of the crossings will be finalized during design with the goal of maintaining the functionality and capacity of the road system during construction and operations. Traffic management requirements will be determined by the County based upon traffic load of the crossing (e.g., vehicles/day) and other factors that affect the road system functionality, such as the detour length.

Table 1-6. Road Crossings

State Highway and County Road Crossings		**Units**
Design	Jack and Bore pipeline [1]	
Construction and Materials	Concrete	
Length	Based on Road Width [1]	ft
Design Head Loss through Culvert	<0.1	ft
Traffic Management	Not required	
County Roads as possible		
Design	Box [1]	
Construction and Materials	Pre-Cast Box Culverts	
Length	Based on Road Width [2]	ft
Design Head Loss through Culvert	<0.1	ft
Traffic Management	Detour or traffic control [3]	
Farm Road Crossings, Option 1		
Design	Box	
Construction and Materials	Pre-Cast Box Culverts	
Length	Based on Road Width [2]	ft
Design Head Loss through Culvert	<0.1	ft
Traffic Management	Detours or traffic control as needed [3]	
Farm Road Crossings, Option 2		
Design	Pipe [7], with end section	
Construction and Materials	Corrugated Steel or Concrete (H25 Live Load)	
Length	Based on Road Width [2]	ft
Design Head Loss through Culvert	<0.1	ft
Traffic Management	Detours or traffic control as needed [3]	

Notes

[1] Designed in accordance with County and State standards, as appropriate.

[2] Will depend upon layout. Will extend beyond the road in accordance with local and county standards as appropriate.

[3] Determined by the County based upon local traffic conditions and need to maintain road system functionality during construction

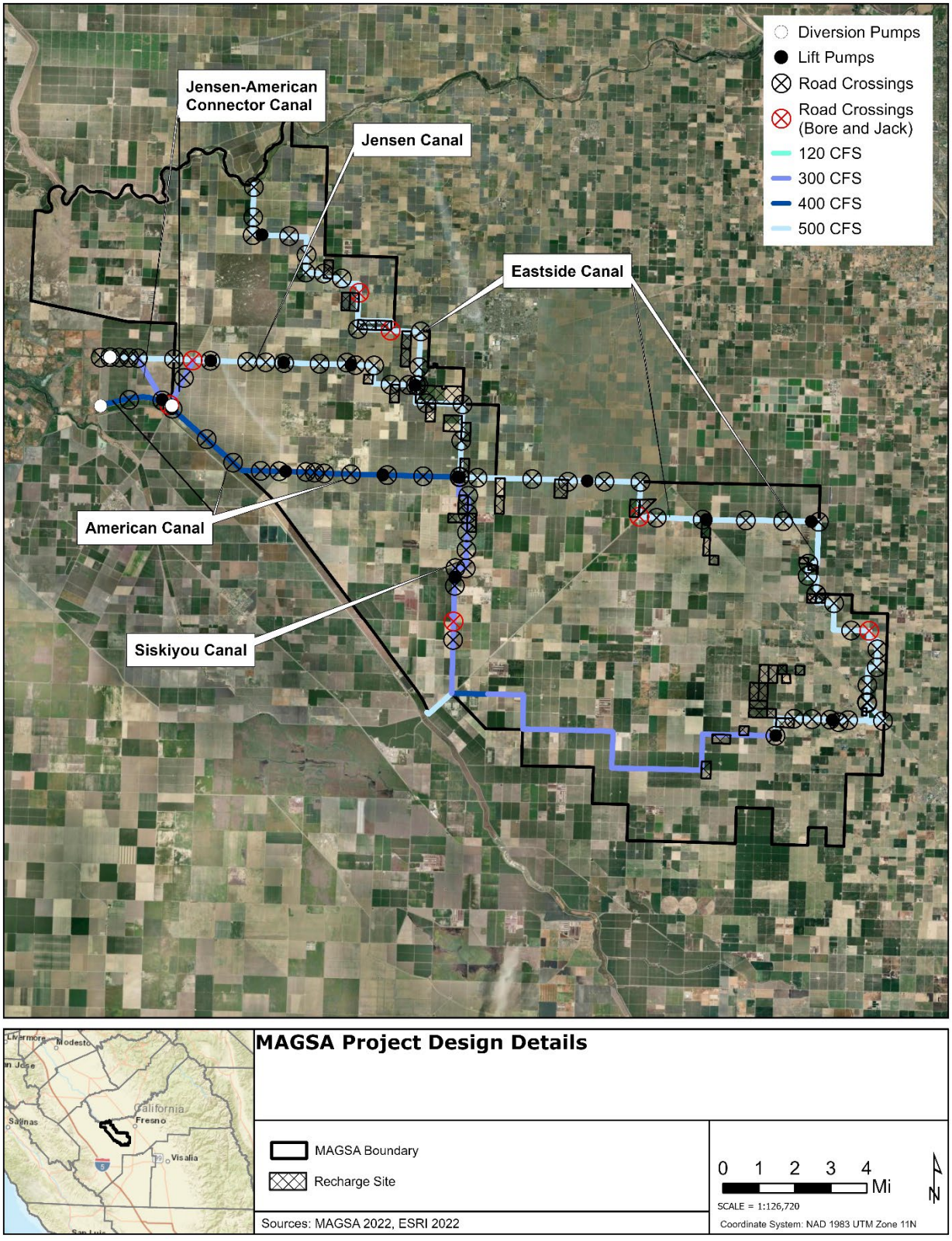


Figure 1-6. Project Design Details

Recharge Basins and Infrastructure

The water banking program will rely on recharge basins for depositing banked water into the underlying aquifer through surface to groundwater infiltration. Approximately 3,480 acres of farmland will be used as recharge basins on a seasonal basis, providing a recharge capacity of approximately 1,377 AF per day (AFD) (Table 1-1). This estimate is based on the following assumptions:

- 80 percent of the land is in operation as recharge area, while the remaining 20 percent is required for associated infrastructure (e.g., levees and drive roads), and
- An estimated recharge rate of 6 inches per day.

Design. The exterior berms are designed to be drivable by truck or tractor at 14-ft top widths. The perimeter levee around the recharge basins will have a design exterior slope of 2:1 and interior slope of 5:1 and will have a bottom width of up to 54 ft, depending on the topography of each site and the height of each berm (between 3.5 ft to 4 ft). The perimeter levees will be constructed by pushing up soils within the recharge basin adjacent to the levee, creating a shallow, 1-foot deep borrow area whose length will depend upon the perimeter berm design. The borrow areas will be up to 140 ft wide. Gathering soils from the recharge basins for levee construction simplifies heavy equipment selection and duration of earthwork construction and minimizes the travel distance of fill material used for berm construction. Scrapers are expected to be used to create the berms. Interior levees will serve as checks to accommodate changes in grade and will have a top width of 8 ft, and a bottom width of up to 30 ft depending on the topography of each site and the height of each berm. Figure 1-7 provides the design for a typical recharge basin and Figure 1-8 provides a cross-section of the external berms. To minimize earthwork in constructing the recharge basins, two primary design configurations have been identified:

1. 3.5-ft tall perimeter and interior berms with 20-acre checks
2. 4-ft tall perimeter and interior berms with 40-acre checks

These designs enable a minimum water depth during operation of about 1 ft, equivalent to two days of supplied water for the design infiltration rate of 6 inches per day. A summary of design and fill specifications for the recharge basins is shown in Table 1-7.

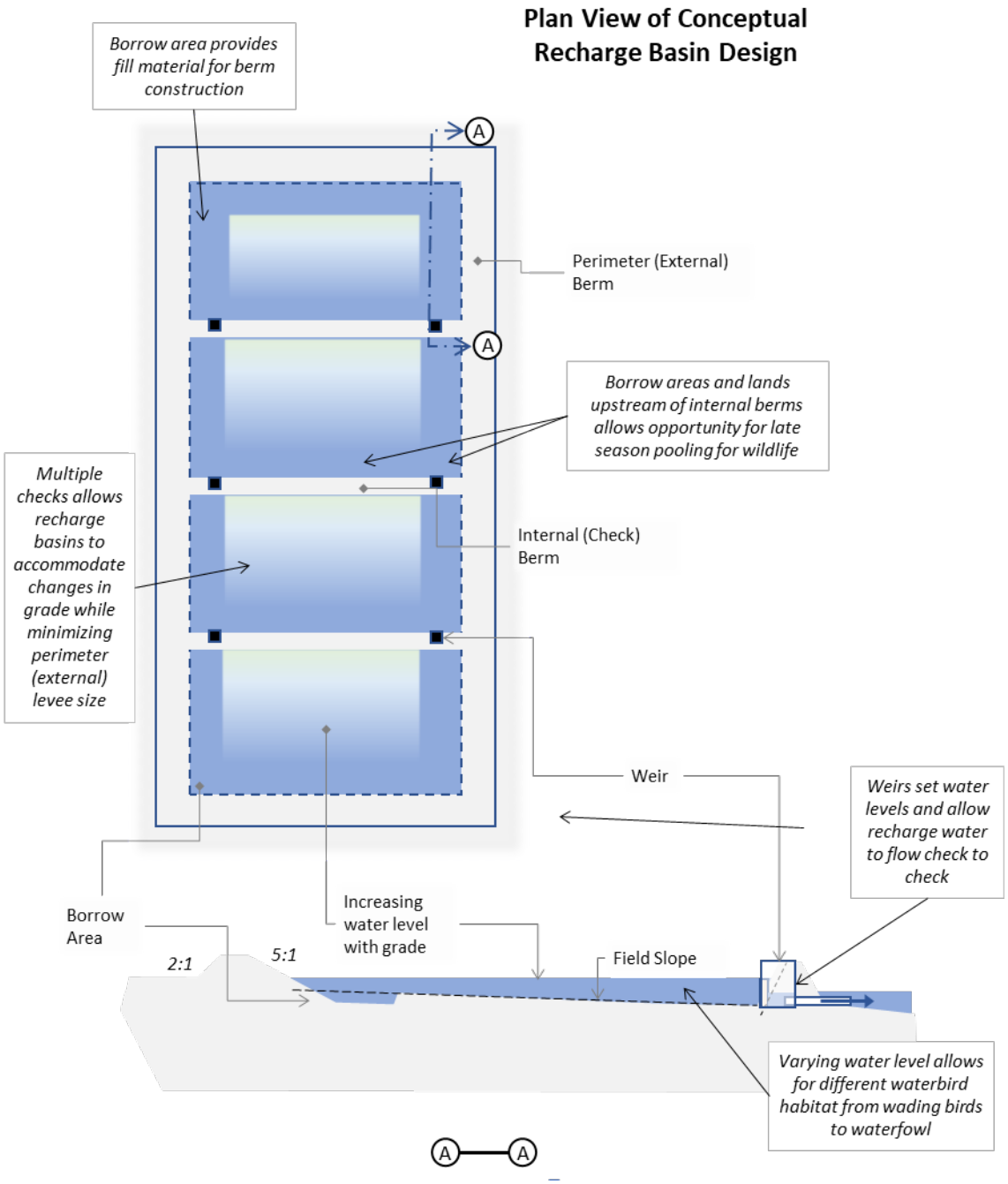
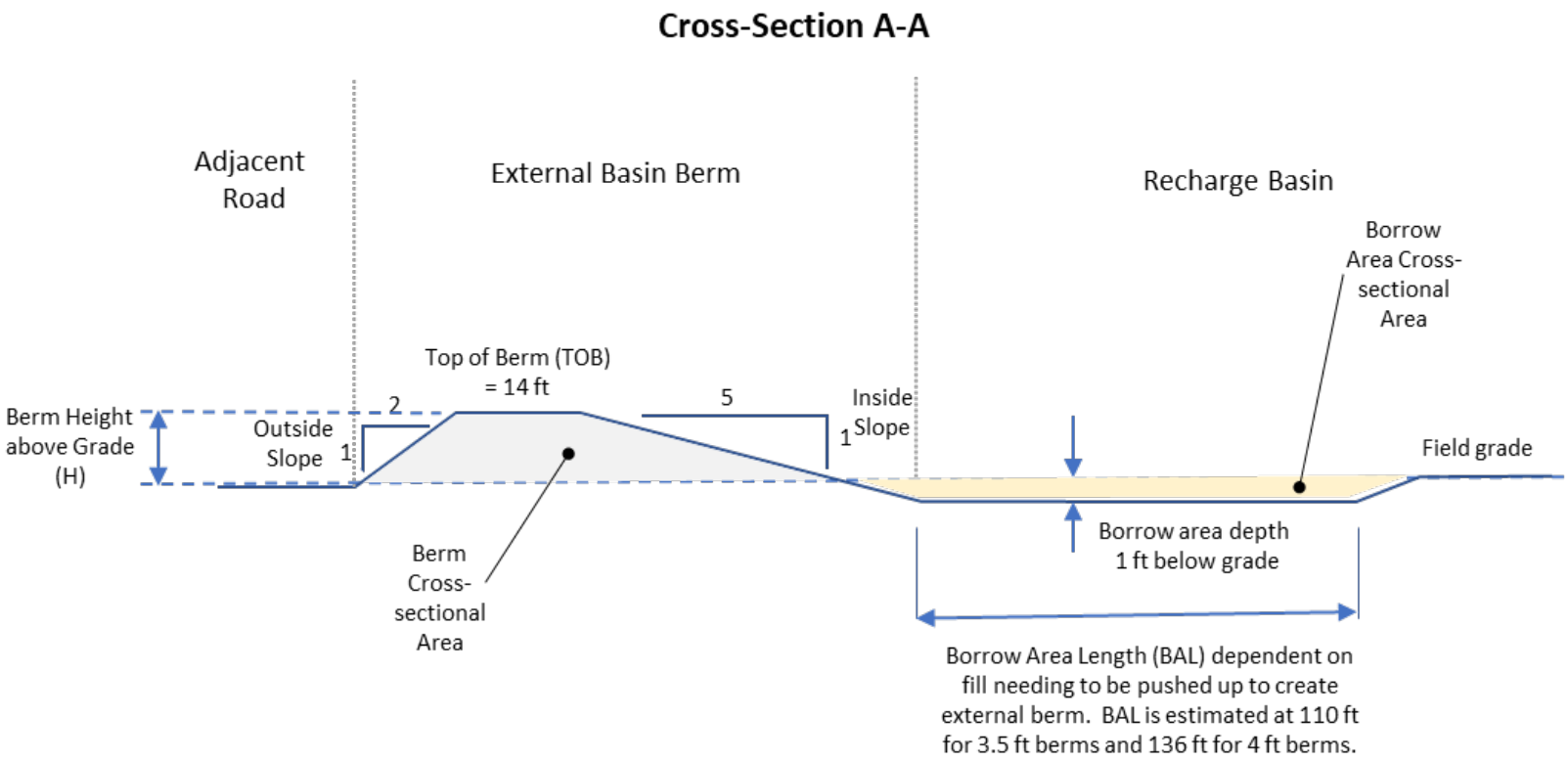


Figure 1-7. Conceptual Recharge Basin Design on 80-acre field with 20-acre checks.

Design shows an overall conceptual approach with berm height, field size and number of checks varying by location.



Notes

1. Not to scale
2. Berm X-sectional Area =Borrow Area X-sectional Area. Does not consider limits on compaction of scraped soils during berm construction. BDL will depend upon compaction efficiencies.
3. Height of berm above grade specified in design and is important for determining fill volumes
4. Fill calculated as Cross-section berm volume for an average berm height above grade times the length of the external levee around the field perimeter. A rectangular 80-acre field has a 1.5-mile perimeter. A square 40-acre field has a 1-mile perimeter. Berms are assumed to surround the perimeter of the field with at the specified average height.

Figure 1-8. Cross-section and assumptions for external berms

Table 1-7. Design and Fill Summary for Recharge Basins, Estimated at 30 Percent Design

Characteristic	Option			Total Fields	Unit
	1	2			
		a	b		
Description	3.5 ft berms. 20 ac checks[5]. 80 ac field	4 ft berms. 40 ac checks. 80 ac fields.	4 ft berms. 40 ac checks. 40 ac fields.		
Acres and Distribution					
Total Planned Acres	***2,160.0***	***720***	***600***	***3,480***	***acres***
% of Total Area	62	21	17		percent
Field Size [4]	80	80	40		acres
Recharge Field Configurations and Requirements					
Berm Height Above Grade	3.5	4.0	4.0		ft
Check Size [5]	20	40	40		acres
Perimeter Levee Length	1.50	1.50	1.00		miles
Interior Levee Length	0.75	0.25	0.00		miles
Total Levee Length	2.25	1.75	1.00		miles
Perimeter Berm Fill [3]	32,340	39,893	26,596		CY
Interior Berm Fill [3]	6,673	2,738	0		CY
Field Construction					
Total Fill for Given Field [3]	39,013	42,631	26,596		CY
Borrow Area Length (BAL)[1]	*110*	*136*	*136*		*ft*
Days to Create Perimeter Berms [2]	56	61	38		days
Construction of All Recharge Fields					
Number of Fields	***27***	***9***	***15***	***51***	***ea***
Total Fill for Planned Area	1,053,360	383,680	398,933	1,835,973	CY
Total Scraper Days for Construction[10]	1,512	549	570	2,631	Scraper-days
Operational Hydrology					
Freeboard[6]	1	1	1		ft
Typical Diagonal Design Slope [9]	0.1	0.1	0.1		percent
Estimated Fall Across Check Diagonal	1.5	1.9	1.9		ft
Maximum Operational Water Level [8]	3	3	3		ft
Minimum Operation Water Level [7]	1.0	1.1	1.1		ft

Notes
[1] Adjacent to perimeter berm. Assumes 1-ft depth
[2] Based upon assumed rate for each scraper day of 700 CY/d
[3] Soil is compacted to about 80 percent of the original volume
[4] For planning and calculation purposes
[5] Check sizes selected to reduce effect of fall on the required perimeter berm size
[6] Based on slope applied to diagonal across check
[7] Minimum water depth measured across check at locations with maximum standing water levels
[8] Water level in check where deepest (lowest bed elevation in check)
[9] Diagonal slope maximum of 0.1 percent considered design constraint to minimize fill volumes
[10] Represents maximum potential value for earthmoving activities.

Recharge Field Selection Process and Operations. The recharge basins are concentrated in five general zones suitable for recharge totaling approximately 37,500 acres (Figure 1-9) (MAGSA 2022). Considerations regarding their placement include land use, location relative to conveyance, soils, underlying lithology, landowner interest in participation, and avoidance of areas that might affect water quality.

Agriculture is the primary land use throughout the recharge zones. Approximately 10 percent of active agricultural land within the recharge zones will be converted to recharge basins, although the basins may still be used for seasonal agricultural practices. The recharge basins are generally located along conveyance alignments. Lateral canals needed for the Project generally lay within the areas designated as recharge basins, and less than one mile of additional laterals to move water from the main conveyance canals to recharge basin complexes has been identified (Figure **1**-9).

The selected zones have large areas of soil types suitable for infiltration and aquifer recharge. Within the entire MAGSA boundary, approximately 20,000 acres of Hydrologic Soils Group (HSG) A soils and approximately 24,000 acres of HSG B soils are found (Figure 1-10). These soil types are predominantly sand, and HSG A soils have no underlying restrictive layers. Soil cores have been collected within the recharge zones and the lithology was determined as suitable for recharge (MAGSA 2022).

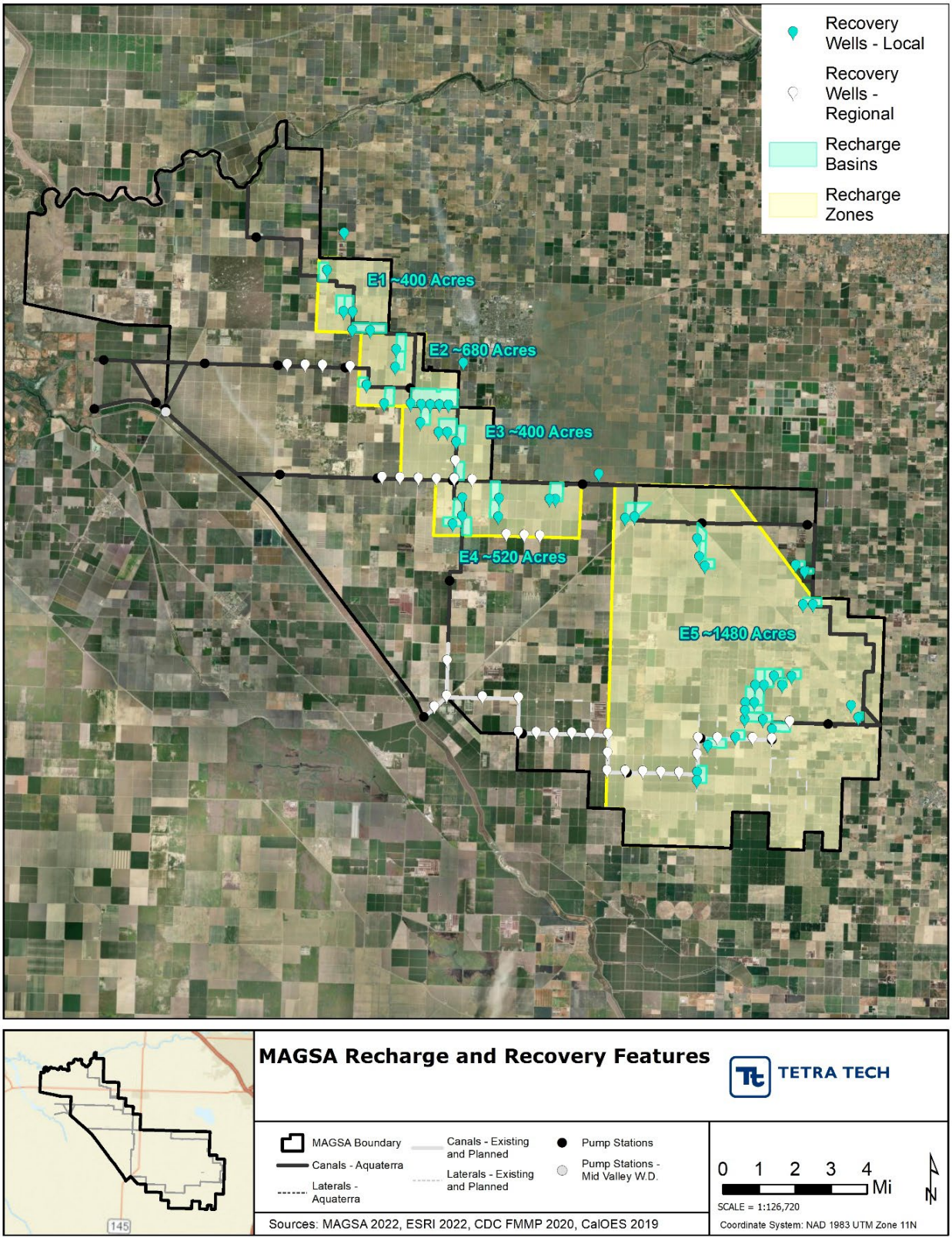


Figure 1-9. Recharge Basins and Local and Regional Recovery Wells

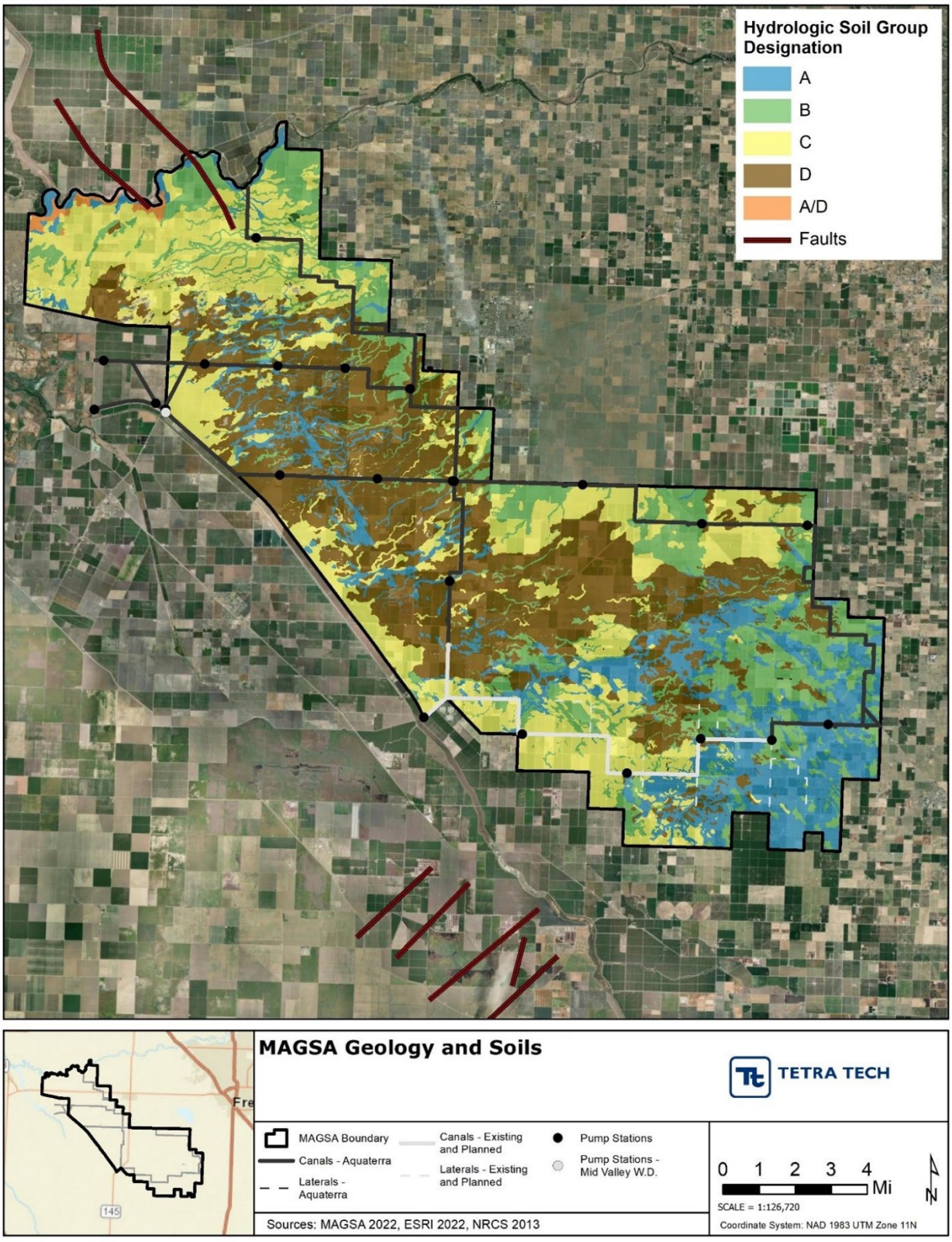


Figure 1-10. Hydrologic Soils Groups A (20,000 acres) and B (24,000 acres)

To protect groundwater quality and to minimize other disturbances to the region, recharge land locations were reviewed for areas with a potential to affect water quality. These areas include ecological preserves, future planned housing developments, townships (e.g., Raisin City), areas with potential soil or groundwater contamination (e.g., the regional landfill, Raisin City oil field, and current or past concentrated animal feed operations). Current or former industrial or maintenance sites are more likely to have broader and more concentrated soil contaminants such as pesticides, fertilizers, heavy metals, hydrocarbons, and animal wastes. Recharge basins will be situated to minimize the potential to transport these constituents to groundwater or mobilize these constituents in existing groundwater.

The Aquaterra Groundwater Bank Feasibility Study (MAGSA 2022) and the McMullin Phase 1 Flood Flow Capture Plan (FFCP, Bachand et al. 2022b, Appendix 1) provide information and guidance regarding locating, managing, and operating recharge basins, including on active farmlands.

Ownership and Agreements. Recharge will primarily be implemented on private farmlands, ensuring groundwater allocations associated with those lands remain with the landowner. Recharge basins will be under easements and agreements that will require the acceptance of banking water when that water is available.

Multi-Benefit and Associated Design and Operations Requirements. Recharge will be the primary use for the recharge basins and that primary use will be reflected in the design and operations of the recharge basins. Recharge basin operations are expected to allow farming opportunities outside the anticipated recharge schedule, primarily during the normal irrigation season. Compatible farming could include annual crops, such as tomatoes, carrots, alfalfa, and grasses. Farming operations will depend upon farmer needs and decisions. Management practices will be developed to ensure farming operations, if conducted, do not compromise recharge operations and performance.

Decisions regarding using the recharge basins for other uses to provide multiple benefits will be made in discussions with landowners and incorporated into design and operations as appropriate. Outcomes will be consistent with the goals and efforts of MAGSA and its partners.

Mosquito Control. The recharge basins may require measures for mosquito control. These measures could include varying water levels and having periods of draw down to interfere with mosquito breeding patterns, and seasonal introduction of fish to prey on mosquitos. Several Fresno County Mosquito Abatement Districts cover area within MAGSA (Consolidated Mosquito Abatement District, Fresno Mosquito and Vector Control District, Fresno Westside Mosquito Abatement District). Recharge basins will be operated in accordance with their recommendations to manage mosquitos.

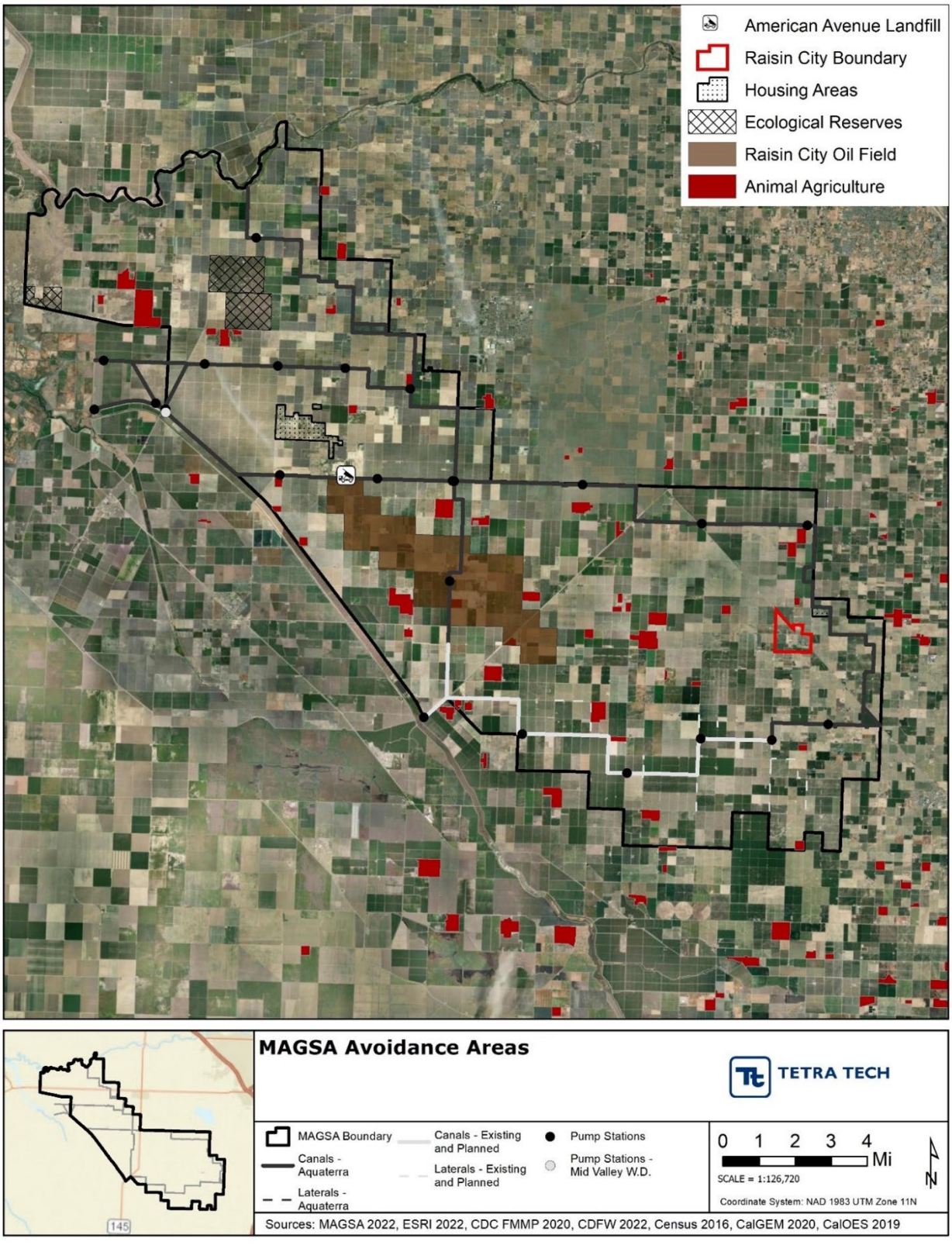


Figure 1-11. Avoidance Areas

Recovery Wells, Infrastructure and Easements

Nearly 90 electric recovery wells with a design capacity of 2,500 GPM will be installed to enable an extraction rate of 148,000 AFY (Table 1-1). These wells will return contract water back into the CVP/SWP system for banking partners (MAGSA 2022). Recovery wells have been distributed within MAGSA into two groups, which include local recovery wells and regional recovery wells. Figure **1-9** shows the well distribution.

Local recovery well placement. Local recovery wells will be installed to capture water at or near recharge basins to extract locally recharged water. These wells will be installed at the downstream groundwater gradient within the recharge basin footprint and included in any easements and agreements on that property.

Regional recovery well placement. Regional recovery wells will be installed to capture recharged contract water that has extended beyond the footprint of the recharge basin and beyond the zone of influence for the local recovery wells. The goals of the regional recovery well systems will be to capture groundwater that has moved beyond the local footprints of recharge basins and to control groundwater flows to manage potential effects, such as water quality impacts associated with past and current land uses and regional hydrology impacts. The groundwater hydrology report (Appendix 2) describes expected mounding during recharge periods that will raise local groundwater elevations up to 100 feet under recharge basins. During the spreading process and in consideration of the groundwater gradient, some portion of the recharged water may extend outside the influence of local recovery wells and travel along groundwater gradients. The regional recovery wells will generally be located about ½ mile apart along the main conveyance corridors to capture groundwater flowing along the groundwater gradient.

Well depths. The typical depths of recovery wells will range from approximately 300 to 600 feet below ground surface (bgs), with an expected average depth of 450 ft. All wells will be screened in the unconfined layer above the Corcoran Clay. The Corcoran Clay layer ranges from 300 to 700 ft deep throughout MAGSA, with shallower depths on the eastern side than the western side.

Monitoring Wells

A groundwater monitoring well network consisting of 80-90 percent 100 to 200 ft deep shallow monitoring wells and 10-20 percent as 400 to 600 ft deep monitoring wells will be installed. All wells will draw from the unconfined layer above the Corcoran Clay. Groundwater monitoring wells will be placed to fulfill the following Project requirements and needs:

- Deep and shallow nested wells will enable MAGSA to monitor water quality groundwater gradients, transport, and mixing across groundwater depths;
- Placement along the main conveyance corridors will enable tracking of groundwater transport, elevation changes, and water quality effects in response to basin recharge and well recovery actions, and inform measures needed to mitigate potential impacts and maximize operations;
- Provide operations decisions related to managing groundwater levels and energy needs associated with groundwater pumping;
- Allow monitoring of groundwater elevations, groundwater gradients and groundwater flow response towards or away from areas of interests (e.g., MAGSA jurisdictional boundaries, recharge zones boundaries, San Joaquin River, Raisin City oil field, Raisin City Water District); and,
- Provide information and data to calibrate the Operational Model and help in its development as a planning and validation tool.

Approximately 60 private monitoring wells are estimated for the Project with the final number to be determined based upon operational needs.

1.4.4 Construction

Construction will require obtaining permits and approvals, establishing a schedule, and managing construction logistics including heavy equipment usage, staging areas, soil management, and building materials.

Construction Permitting and Approvals

Project construction and operation will require coordination, consultation and permits from multiple agencies with jurisdiction for various aspects of the Project. An important element of this process is federal recognition and acknowledgment of the Bank by Reclamation as a groundwater bank, which will allow CVP contractors to take delivery of their water at the bank. Water banking and returning practices will be consistent with California and Federal law, including State of California authorized places-of-use as permitted or licensed. Reclamation is performing a separate NEPA analysis for this project.

Project and Construction Schedule

Construction is planned to begin in 2025 and be completed in 2028. Recharge facilities for banking partners are planned to become available in 2025 and recovery planned to become available in 2026.

Construction Logistics

Preliminary planning identifies typical heavy equipment required for installation of the various facilities to include various heavy equipment (e.g., cranes, drill rigs, excavators, backhoes, graders, concrete trucks, dump trucks, loaders and bulldozers). Table 1-8 shows an estimate of heavy equipment required for conveyance, recharge and recovery construction duration. The calculations estimate approximately 4,700 heavy equipment weeks over a 3-year construction period, equivalent to 1,560 heavy equipment weeks each year and 30 pieces of heavy equipment typically being used simultaneously. Most construction machinery would be used on site.

Five-acre construction staging areas will be identified along the canal system with collaboration and written permission from landowners. One-acre staging areas are anticipated to be required near each pump station. Staging areas would be situated a sufficient distance from Raisin City and other populated areas to avoid nuisances to residents.

All soil excavation will be balanced such that excavated soils equal needed fill. A balanced design will ensure no soil will be imported or exported. Any excess soil will be moved from the excavation areas to on-site disposal areas, such as adjacent farmlands, with scrapers or 16-yard dump trucks.

Building and construction materials are assumed to be locally available from Fresno or neighboring areas with assumed one-way mileage of 20 miles. Building and construction materials will include concrete, steel, and wood, as well as PVC and electrical items. Riprap may be needed for canal slope protection.

Table 1-8. Estimated Heavy Equipment Requirements

Project Element	**Duration**				**Expected Equipment Utilized [2]**											Pieces of heavy equipment in operation in parallel	Heavy Equipment Weeks
	Estimated weeks per project element [(1)]	per unit of	# of units within element [(2)]	Total calculated duration (weeks)	Crane	Drill Rig	Backhoe	Excavator	Grader	Concrete Truck	Scraper	Compactor	Dump truck	Loader	Bulldozer		
Pump Stations																	
Pump Stations	14	location	18	252	x		x	x		x		x				3	756
Road Crossings																	
Paved Road Crossings (Box Culverts)	14	location	17	238	x			x				x	x	x	x	2	476
Railroad Crossings	14	location	2	28	x			x				x	x	x	x	2	56
Paved Road Crossings (Jack and Bore)	14	location	8	112	x			x				x	x	x	x	2	224
Farm Road Pipe Culverts	4	location	56	224	x			x				x	x	x	x	2	448
Subtotal				602													1,204
Main Conveyance Canal																	
Main Conveyance Canals	3	mile	63.5	191				x	x		x	x				4	762
Subtotal																	762
Recharge Elements																	
Recharge Basins	14	basin	51	714			x		x		x	x	x	x	x	2	1,428
Subtotal																	1,428

Recovery Well Elements															
Recovery Wells	3	well	88	264	x	x		x	x		x	x	x	2	528
Summary															
Total Heavy Equipment Weeks															4,678
Years of Construction															3
Estimated Heavy Equipment Weeks per Year															1,559
Estimated Heavy Equipment in Operation in parallel															30

Notes:

[1] Based upon best engineering estimate.

[2] Numbers based upon current design. Some changes may occur during final design and construction

1.4.5 Operations and Maintenance

This section describes how the Bank will be operated and maintained. The Bank will be managed by monitoring hydrologic and water quality data and by planning, tracking, and projecting through an Operational Model. The proposed Operational Model is described in detail in Appendix 10.

The Bank will receive surface water from, and deliver water to, the Fresno Slough and the hydraulically connected Mendota Pool. Diversions from the Mendota Pool are planned for October through February. The maximum diversion rate is 770 CFS (MAGSA 2022). The James Bypass has a design capacity of 4,750 CFS. Historical data from the James Bypass upstream of the Mendota Pool and during periods of flood releases show 75 percent of the bypass flows in March are below 4,000 CFS with over 80 percent of flows below 4,000 CFS between October and February. The Bank operators will limit diversions from, and discharge to, the Mendota Pool in consideration of upstream flood flow releases and Mendota Pool operational requirements. For instance, limiting Bank operations to occur when flood releases are at or below 4,000 CFS will enable the Bank to operate within the design capacity of the James Bypass.

During recharge opportunity years, the diverted water will be infiltrated to the underlying aquifer through 2,784 acres of farmland used as recharge basins. The historical data suggests recharge opportunities will occur in about 46 percent of years and recovery opportunities in 42 percent of years, typically below the maximum design capacities. Surface water hydrology under recharge conditions is shown in Figure 1-12.

During recovery opportunity years, approximately ninety recovery wells within MAGSA will be available to withdraw water from the Bank for return to partners. Annual recovery will occur from May through September up to a maximum annual recovery of 148,000 AF. Contractors will receive water either directly from the Mendota Pool through the DMC or through direct connections to their distribution facilities (MAGSA 2022). Surface water hydrology under recovery conditions is shown in Figure 1-13.

Table 1-1 summarizes the maximum recharge and recovery water volumes that can be served by the Bank and the CVP/SWP infrastructure capacity (MAGSA 2022) and the periods those actions can occur. As part of Bank operations, 10 percent of contract water deposited for storage in the Bank will be left behind. Locally, this water will help to replenish the overdrafted aquifer and raise the water table.

Recovered groundwater will be returned to the Mendota Pool, where it will be returned to banking partners through exchange with other existing water users, either within Mendota Pool or by making an equivalent amount available at San Luis Reservoir. Recovery would be limited by the ability to perform exchanges with Mendota Pool water users, which would be feasible from May through September. Participants will generally have priority access to banking recharge and recovery facilities, with MAGSA having secondary access to those facilities for its own uses on an as-available basis.

All elements of the bank will need routine maintenance. General maintenance practices throughout the project will include weed abatement, trash removal, periodic sediment removal, levee and berm upkeep, pump and equipment maintenance and repairs, and water control structure adjustments. Occasionally, service employees may be on-site for scheduled, preventative maintenance as well as unscheduled service, especially at key monitoring and control locations. Maintenance actions will be logged as part of an Operations and Maintenance Plan.

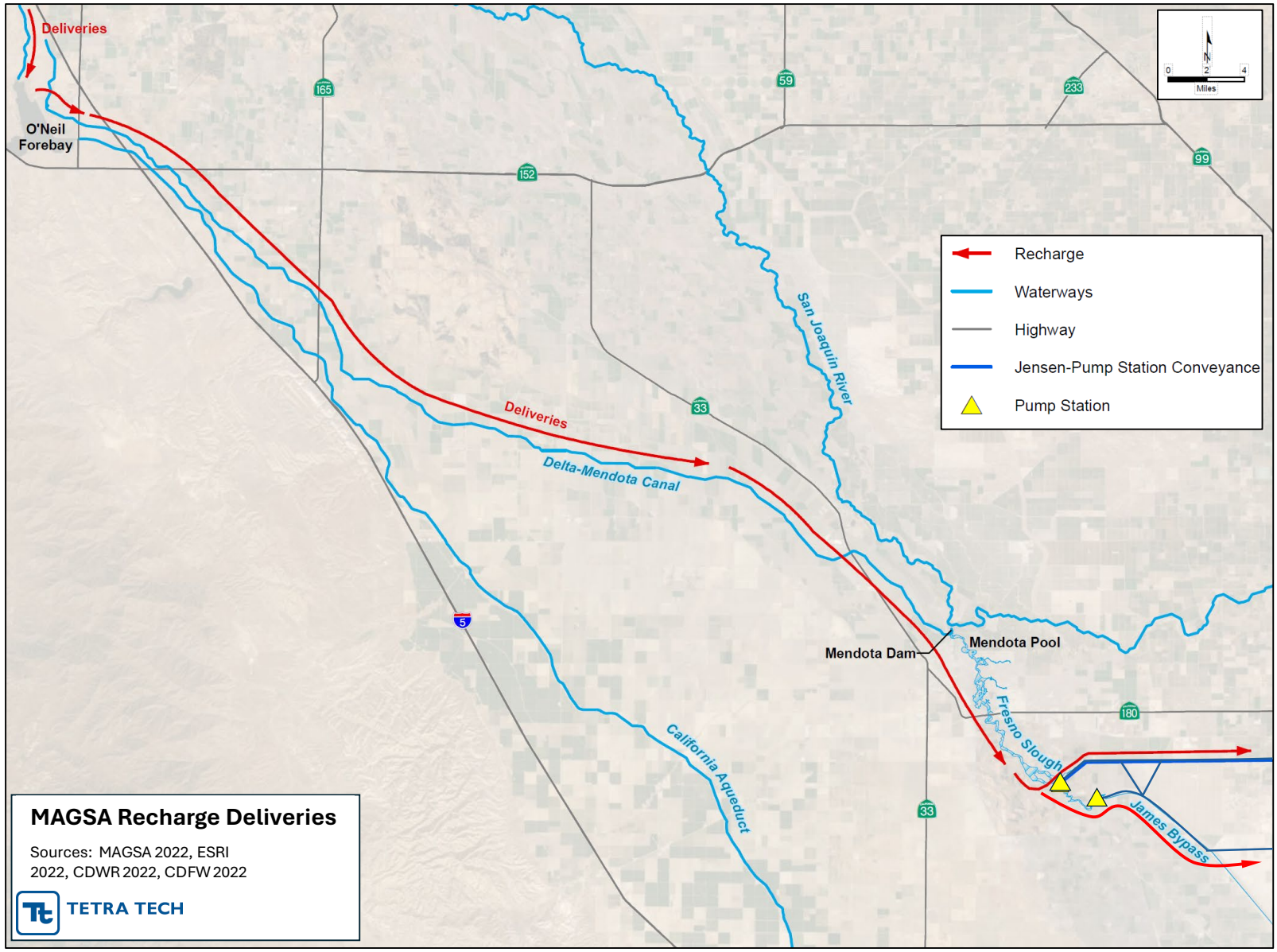


Figure 1-12: MAGSA Hydrology under Recharge Flow Conditions

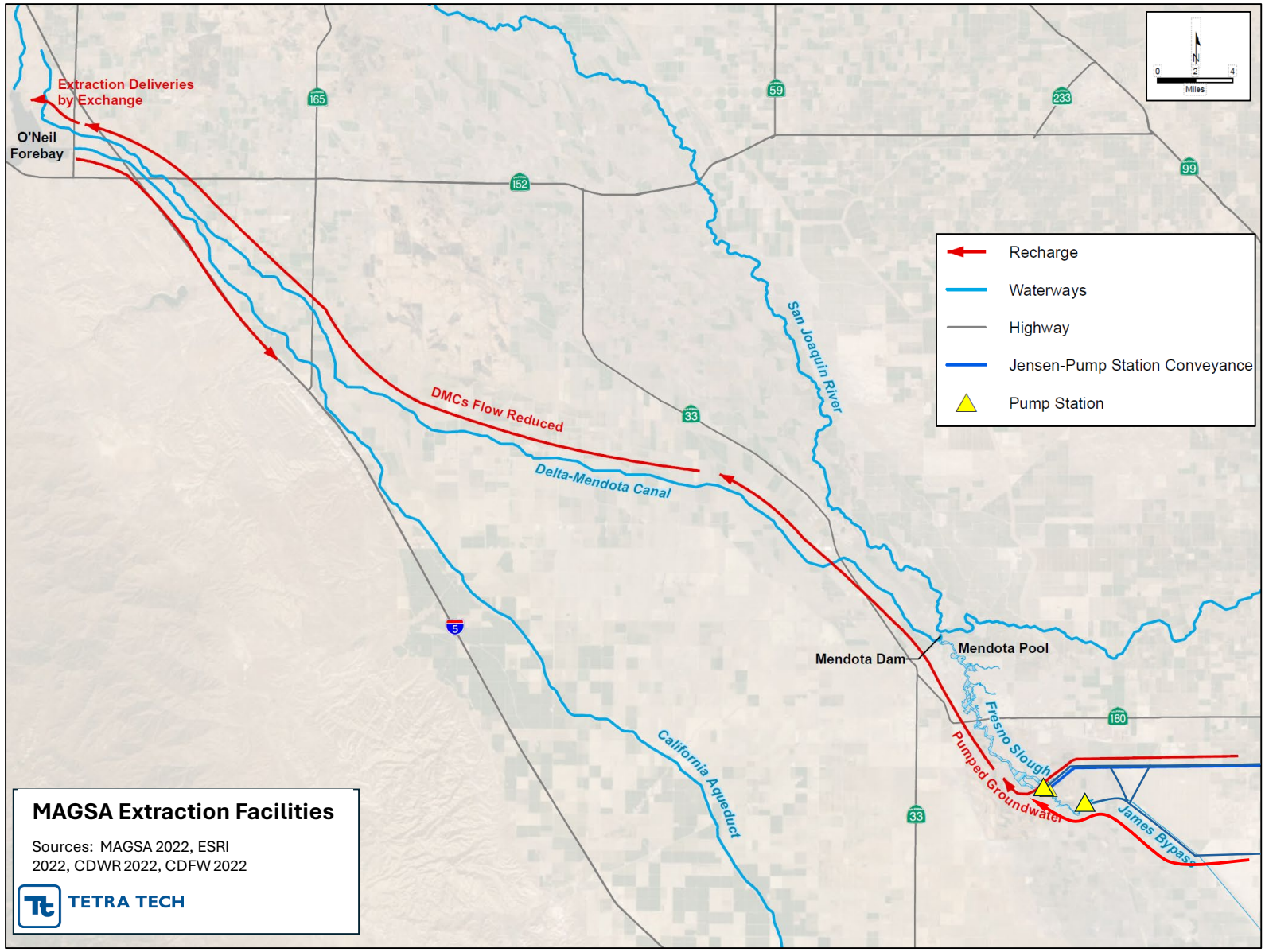


Figure 1-13: MAGSA Hydrology under Extraction Flow Conditions

1.4.6 Monitoring

MAGSA has proposed a robust program to monitor and manage groundwater quality, groundwater and surface water movement, import and export of drinking water constituents to and from the Mendota Pool, and movement of legacy groundwater constituents. Monitoring considerations, processes, and mitigation options are addressed in detail in the project water quality report (Appendix 3).

1.4.7 Governance, Ownership, and Partner Relationships

MAGSA will develop agreements with water banking partners. MAGSA will retain complete ownership of any project facilities and hold the water that is stored in the aquifer in trust for the banking partners. MAGSA will be responsible for the project execution, meaning all permits, environmental documentation, design, construction, land acquisition, and other responsibilities to develop a functioning project. The banking partners will review and agree to contracts and costs as they are developed and prior to MAGSA entering into any agreements.

MAGSA will form a Management Committee to advise on the development, operation, monitoring, and management of the Project. The Management Committee will report to MAGSA and will include membership by water banking partners, local agencies, and area landowners.

The Management Committee will help in planning, development and implementation (e.g. bank Standard Operating Procedures, fee structures, integrating operations with local, regional, and statewide operations; groundwater monitoring and management strategies).The Management Committee will also provide regular reviews and recommendations (e.g., annual operations review, recommendations regarding bank operations, identification and discussion of regional effects or consideration) to ensure the water bank operation is minimizing and mitigating potential hydrologic, water quality or other potential impacts.

2 MITIGATION MEASURES

The following mitigation measures will be incorporated into the program to reduce any potential impacts to a less-than significant level.

2.1 AIR-1) PREPARE AND IMPLEMENT A FUGITIVE DUST CONTROL PLAN

MAGSA will prepare and implement a Fugitive Dust Control Plan (DCP) consistent with SJVAPCD's *Regulation VIII Fugitive Dust Prohibitions*. The DCP shall be submitted to and approved by the SJVAPCD prior to issuance of construction/grading permits. Fugitive dust control measures to be included in the DCP shall include, but are not limited to, the following:

a. All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.
b. All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
c. All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
d. When materials are transported off-site, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.
e. All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions.) (Use of blower devices is expressly forbidden.)
f. Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions
g. Utilizing sufficient water or chemical stabilizer/suppressant.
h. An owner/operator of any site with 150 or more vehicle trips per day, or 20 or more vehicle trips per day by vehicles with three or more axles shall implement measures to prevent carryout and trackout.

2.2 AIR-2) MINIMIZE PERSONNEL AND PUBLIC EXPOSURE

To minimize personnel and public exposure to potential Valley Fever–containing dust both on- and off-site, the following additional control measures shall be included in the DCP to be prepared for this project as required by Mitigation Measure AQ-1:

a. Equipment, vehicles, and other items shall be thoroughly cleaned of dust before they are moved offsite to other work locations.
b. Wherever possible, grading and trenching work shall be phased so that earth-moving equipment is working well ahead or down-wind of workers on the ground.
c. The area immediately behind grading or trenching equipment shall be sprayed with water before ground workers move into the area.
d. In the event that a water truck runs out of water before dust is sufficiently dampened, ground workers being exposed to dust are to leave the area until a full truck resumes water spraying.

e. All heavy-duty earth-moving vehicles shall be closed-cab and equipped with a HEP-filtered air system.
f. Workers shall receive training to recognize the symptoms of Valley Fever, and shall be instructed to promptly report suspected symptoms of work-related Valley Fever to a supervisor.
g. A Valley Fever informational handout shall be provided to all on-site construction personnel. The handout shall, at a minimum, provide information regarding the symptoms, health effects, preventative measures, and treatment.
h. Onsite personnel shall be trained on the proper use of personnel protective equipment, including respiratory equipment. National Institute for Occupational Safety and Health (NIOSH)-approved respirators shall be provided to onsite personal, upon request.

2.3 AIR-3) Implement Vehicle Emissions Controls

1. To the extent locally available, alternative fueled, electric, hybrid, or catalyst construction equipment will be used during construction.
2. On-site mobile equipment will be equipped with PM_{10} pollution control devices and/or newer, less polluting equipment will be required (either lower emissions diesel or alternative fuels engines).
3. Heavy-duty (50 hp, or greater) off-road construction equipment shall, at a minimum, meet U.S. EPA Tier 3 emission standards.
4. On-site equipment will utilize aqueous diesel fuel.
5. The construction contractor will comply with all current and future Regulation VIII rules.
6. Diesel engines will be shut off when not in use for more than 5 minutes to reduce emissions from idling.

2.4 BIO-1) General Measures

GM #1. A Worker Environmental Awareness Program (WEAP) will be incorporated into the Project to ensure that all construction personnel are informed about the special status and sensitive biological resources known to occur in and/or adjacent to the Project area. A qualified biologist shall conduct a WEAP training session for construction workers prior to any Project construction activities. Trainings will be documented and kept on file.

GM #2 Environmentally sensitive areas will be protected from encroachment by construction workers and heavy equipment by orange construction fencing and will be designated as such on the construction plans.

GM #3. Working hours will be confined to daylight hours (sunrise to sunset) unless otherwise necessary to assess or protect biological resources or remain in compliance with local ordinances.

GM #4. Construction workers must limit personal vehicle and construction heavy equipment speeds to 20 miles per hour in the Project area and immediate vicinity.

GM #5. No pets will be allowed in the Project area or immediate vicinity.

2.5 BIO-2) Protect and Preserve Giant Garter Snake

Habitats that are permanently or seasonally flooded and contain herbaceous wetland vegetation such as cattails and bulrushes occur within and adjacent to the Project area. Even unmaintained irrigation canals can substitute as marginally suitable habitat for giant garter snake (GGS) and may occur within the Project area. Areas with excessive shade, lack of basking sites, and absence of GGS prey are not considered suitable habitat.

To protect and preserve the GGS, to avoid any impacts to it or its habitat, and to meet CDFW and USFWS requirements, the following preventative measures shall be incorporated into the Project.

GGS #1. A qualified biologist will flag and designate avoided GGS habitat within or immediately adjacent to the project area as Environmentally Sensitive Areas to be avoided by all construction personnel and equipment.

Escape routes for GGS should be determined in advance of construction and snakes will be allowed to leave on their own.

Construction activities within 200 feet from the banks of GGS aquatic habitat will be avoided to the greatest extent possible.

GGS #2. Clearing will be confined to the minimal area necessary to facilitate construction activities.

Movement of heavy equipment will be confined to existing roadways to minimize habitat disturbance.

Construction-related holes will be covered to prevent entrapment of individuals.

GGS #3. If temporary giant garter snake habitat disturbance is necessary, then 24-hours prior to construction activities, the project area will be surveyed for GGS by a qualified biologist. Survey of the project area will be repeated if a lapse in construction activity of two weeks or greater has occurred.

Construction activity within habitat will be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger.

Any dewatered habitat will be required to remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat. Sightings or incidental take will be reported to the USFWS and CDFW immediately.

GGS #4. During post-construction restoration, the MAGSA contractor will remove any temporary fill and construction debris and restore temporarily disturbed areas to pre-project conditions. If erosion control materials are installed in suitable habitat for GGS, then only non-entangling erosion control materials (no monofilament) will be used to reduce the potential for entrapment. This limitation will be communicated to the contractor through use of special provisions included in the bid solicitation package.

2.6 BIO-3) PROTECT AND PRESERVE TRICOLORED BLACKBIRD

Within the Project area, potential tricolored blackbird (TCB) nest sites are often associated with freshwater marsh or thistle thickets and other thorny vegetation, and TCBs may forage in agricultural fields (such as large tracts of alfalfa or dairies). To protect and preserve the TCB, to avoid any impacts to it or its habitat, and to meet CDFW requirements, the following preventive measures shall be incorporated into the Project during construction activities.

TCB #1. If a Project activity is anticipated to occur in potential TCB habitat or habitat is present within 500 feet of the Project footprint, then an approved biologist will conduct a field investigation to determine if existing or potential nesting or foraging sites are present within the project footprint and adjacent areas within 500 feet. Nesting sites shall be noted on plans.

TCB #2. Pre-construction surveys will be required to determine if active nests are present within a project footprint or within 500 feet of a project footprint if existing or potential nest sites were found during design surveys and construction activities will occur during the breeding season (March 1 through September 15). An approved biologist will conduct pre-construction surveys within 30 days and within 3 days of ground-disturbing activities, and within the proposed Project footprint and 500 feet of the proposed Project footprint to determine the presence of nesting tricolored blackbird. Pre-construction surveys will be conducted during the breeding season (March 1 through August 31).

TCB #3. a. If active nests are found within the Project construction footprint, the MAGSA contractor will establish a 500-foot temporary buffer around the active nest until the young have fledged.

b. An approved biologist experienced with TCB behavior will be retained by the MAGSA contractor to monitor the nest throughout the nesting season and to determine when the young have fledged. The approved biologist will be on site daily while construction-related activities are taking place near the disturbance buffer. Work within the nest disturbance buffer will not be permitted. If the approved biologist determines that tricolored blackbirds are exhibiting agitated behavior, construction will cease until the buffer size is increased to a distance necessary to result in no harm or harassment to the nesting tricolored blackbirds.

2.7 BIO-4) Protect and Preserve Waters of the U.S. and Waters of the State

To protect and preserve waters of the U.S. habitats, to avoid and lessen any potential impacts, and to meet CDFW, USACE, and RWQCB regulatory requirements, the following preventive measures shall be incorporated into the project.

WUS #1. As the design for conveyance system alignments and associated Project infrastructure continues to be developed, the project team including wetland and permitting specialists, will avoid direct impacts to wetlands to the extent possible. Where avoidance is not possible, impacts will be minimal and concentrated to previously impacted areas.

WUS #2. If additional construction is required in areas not within the 2022 ARD review area, then an additional ARD shall be conducted if necessary to evaluate and quantify wetlands and/or other waters of the State of California and/or U.S. which may be impacted by the additional construction. A resulting ARD report will quantify the acreage of wetlands or other waters which will be impacted and thus, the acreage to be permitted by the resource and regulatory agencies. The evaluation will also aid the consultants and USACE in determining the type of permit and the permitting process to follow if needed.

2.8 BIO-5) Protect and Preserve the Burrowing Owl

California ground squirrel burrows are dispersed throughout the Project area and may offer some suitable nesting/denning habitat for burrowing owls. Earthwork performed with heavy equipment during project construction has the potential to destroy this habitat type and/or harm retreating owls.

To protect and preserve the burrowing owl, to avoid any impacts to it or its habitat, and to meet CDFW requirements, the following preventive measures shall be incorporated into the Project.

BO #1. A protocol burrowing owl survey shall be conducted to ensure that no owls nest on or adjacent to the Main Canal alignment or the recharge basins. The surveys shall be conducted

four times in the winter and five times during the February through July period as per the guidelines (CBOC 1997).

BO #2. If an owl is found, the CDFW shall be consulted and MAGSA shall select one or more of the following possible measures for implementation by a qualified biologist.

- Redesign the Project temporarily or permanently to avoid occupied burrows or nest sites until after the nesting/fledgling season (February 1 through August 31).
- Delay the Project until after the nesting/fledgling season (March 1 through August 31).
- Install artificial burrows in open-space areas of or near the Project area and wait for passive relocation of the burrowing owl.
- Active relocation of burrowing owl with conditions. MAGSA shall fund the relocation of burrowing owls to unoccupied, suitable habitat which is permanently preserved (up to 6.5 acres per nesting pair). Details and requirements are specified in CDFW (2012).
- Though not endorsed by the CDFW, if other measures are possible and can be successful, ensure that potential burrows are vacant, and destroy vacant burrows prior to February 1 and/or after August 31.

2.9 BIO-6) PROTECT AND PRESERVE SWAINSON'S HAWK

To protect and preserve the Swainson's hawk, to avoid any impacts to it and its habitats, and to meet CDFW and USFWS requirements, the following measures shall be incorporated into the Project.

SH #1. a. Swainson's hawk nest trees should not be removed.

b. To the extent feasible, construction activities shall be started during the non-nesting season of September 1 through January 31 when Swainson's hawks are gone from California and have migrated to their wintering grounds in Mexico and South America. Thus, Swainson's hawk will not be in the project vicinity and thus will not be disturbed by the project.

SH #2. If construction must occur during the nesting season, a preconstruction survey shall be conducted by a qualified biologist for hawks and their nests within a one-half mile radius of the construction area prior to construction. Surveys should be performed within 10 days prior to the onset of construction.

SH #3. If an active Swainson's hawk nest is found within a one-half mile radius of the Project area, the biologist will establish a half-mile buffer around the nest, or as needed to adequately protect the nest in the context of the actions planned at that location. The buffer will be identified by placing flags and stakes around the perimeter and will remain in place until the biologist has determined that all young have fledged.

2.10 BIO-7) PROTECT AND PRESERVE NESTING BIRDS

Although no trees will be removed by the Project, potential nesting trees associated with the settlement areas occur scattered throughout the project area. Swallow nesting habitats and ground nesting shall also be considered.

To protect and preserve nesting birds and their nests, to avoid any impacts to them and their nests, and to meet CDFW and USFWS requirements, the following preventive measures shall be incorporated into the project.

NB #1. Prior to any construction activities on the project area during the nesting season (February 1 through August 31), a preconstruction (one-day) survey shall be conducted by a qualified biologist for nesting birds within a minimum of a 250-foot radius around project activities. Results of the preconstruction survey shall be prepared in a letter and given to MAGSA prior to any construction activities. If no nests are observed, project construction activities can proceed without additional nesting bird measures.

NB #2. If any active nests are observed, the nests shall be designated as an Environmentally Sensitive Area with buffer zones determined by a qualified biologist to be protected and avoided (while occupied) during the construction activities. CDFW shall be contacted, consulted, and avoidance measures, specific to each incident, shall be developed in cooperation with the project biologist.

2.11 BIO-8) PROTECT AND PRESERVE SAN JOAQUIN KIT FOX

To protect and preserve the SJKF, to avoid any impacts to it or its habitat, and to meet CDFW and USFWS requirements, the following preventive measures shall be incorporated into the Project during construction activities.

KF #1. The USFWS's Standardized Recommendations for the Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance (USFWS 2011) will be incorporated into the Project and shall be implemented to avoid potential impacts to SJKF.

KF #2. A check for and monitoring of potential kit fox dens (squirrel burrows) along the Main Canal alignment shall be conducted for three consecutive nights to evaluate SJKF use as per the USFWS 2011 guidelines (USFWS 2011). A report on the findings will be prepared. Vacant squirrel holes will be filled by hand after the survey by a qualified biologist to prevent future use by and future impacts to the SJKF.

KF #3. A preconstruction (one-day) survey shall be conducted by a qualified biologist to examine potential dens (squirrel burrows) on and immediately adjacent to the Project area for the existence of SJKF. The survey shall be conducted within 30 days prior to any construction activities. Results of the preconstruction survey shall be prepared in a letter and given to MAGSA prior to any construction activities.

KF #4. If a SJKF den is found, the CDFW and USFWS shall be immediately consulted, and appropriate avoidance measures shall be developed in cooperation with the qualified Project biologist and MAGSA.

2.12 BIO-9) PROTECT AND PRESERVE WESTERN POND TURTLE

To protect and preserve the WPT, to avoid any impacts to it or its habitat, and to meet CDFW and USFWS requirements, the following preventive measures shall be incorporated into the Project during construction activities.

WPT #1. Any WPT nests that are discovered remain undisturbed with a no-disturbance buffer maintained around the nest until the eggs have hatched and neonates are no longer in the nest or Project areas. If WPT individuals are discovered at the site during surveys or Project activities, they will be allowed to move out of the area of their own volition without disturbance.

2.13 CUL-1: WORKER ENVIRONMENTAL TRAINING

Prior to the initiation of construction of the project, a Secretary of Interior qualified archaeologist will be retained and will provide a cultural resource briefing to all construction workers. The briefing will include discussion of all applicable laws and penalties pertaining to disturbing cultural resources, a brief discussion of the prehistoric and historic regional context and archaeological sensitivity of the area, types of cultural resources found in the area, and instruction that project workers will halt construction if a cultural resource is inadvertently discovered during construction. The archaeologist will discuss procedures to follow in the event an inadvertent discovery is encountered, including appropriate treatment and respectful behavior of a discovery (e.g., no posting to social media or photographs). The consulting tribes will provide a representative to participate in the environmental training to discuss or provide input from a tribal cultural perspective regarding the potential cultural resources within the region (as applicable). After the training, all personnel will be given a worker education/training brochure regarding identification of cultural resources and protocols for reporting finds. Any employee beginning work following the initial worker education/training secession must also receive commensurate cultural, tribal, and archaeological resources sensitivity training (via a power point presentation or handout) and will be provided the brochure.

2.14 CUL-2: CULTURAL RESOURCE MONITORING AND INADVERTENT DISCOVERY PLAN

A Secretary of Interior qualified archaeologist shall be retained on-call and shall prepare a Monitoring and Inadvertent Discovery Plan for the project which includes appropriate Monitoring and Inadvertent Discovery Procedures. The Plan shall be prepared and approved prior to the initiation of construction. The Plan shall include (but not limited to): monitoring schedule, project ground disturbing activities and areas that require a cultural resource monitor, monitoring procedures, stop work and notification procedures in the event of an inadvertent discovery, treatment for an inadvertent discovery, reporting, and final monitor reporting. During project-level construction, should subsurface archaeological resources be discovered, all activity in the vicinity of the find (and 100-foot buffer) shall stop. The qualified archaeologist shall be contacted to assess the significance of the find according to CEQA Guidelines Section 15064.5 and/or NRHP criteria (as applicable). In addition, the lead representative for the consulting tribes will be notified (as applicable). If any find is determined to be significant, the archaeologist shall determine, in consultation with the implementing agencies and consulting Native American group(s) expressing interest, appropriate avoidance measures or other appropriate mitigation. Under CEQA Guidelines Section 15126.4(b)(3), preservation in place shall be the preferred means to avoid impacts to significant tribal cultural resources (as defined by PRC 21074), and archaeological resources qualifying as historical resources. Methods of avoidance may include, but shall not be limited to, project reroute or re-design, project cancellation, or identification of protection measures such as capping or fencing, PRC 20184.3(b)(2) provides examples of mitigation measures that lead agencies may considered to avoid or minimize impacts to tribal cultural resources. Consistent with CEQA Guidelines Section 15126.4(b)(3)(C), if it is demonstrated that resources cannot be avoided, the qualified archaeologist shall develop additional treatment measures, such as data recovery or other appropriate measures, in consultation with the implementing agency and any local Native American representatives expressing interest in prehistoric or tribal resources. If an archaeological site does not qualify as an historical resource but meets the criteria for a unique archaeological resource as defined in Section 21083.2, then the site shall be treated in accordance with the provisions of Section 21083.2. Federal law and California state law requires that all project excavation activities halt if human remains are encountered and the County Coroner must be notified. Any discovery of human remains during project-related activities would be treated in accordance with federal laws and PRC Section 5097.98 and Section 7050.5 of the State Health and Safety Code.

2.15 GEO-1: CERTIFIED PALEONTOLOGIST

The project shall have a certified paleontologist, who meets the standards of SVP, on call to evaluate excavated material for paleontological significance. If the paleontologist makes a paleontologically significant discovery, all construction will stop within 50 feet of the find. The paleontologist will evaluate the significance and recommend any appropriate treatment of the site. At each location where a fossil was found, the paleontologist will maintain all appropriate data forms; record pertinent geologic and stratigraphic data; take notes and photographs and map the location; collect and submit for analysis any necessary sediment samples; and ensure all records and data of the find are curated at an accredited institution. The paleontologist will prepare a report for any significant finds and submit to the appropriate entities, including Fresno County records.

2.16 HAZ-1: PREPARE AND IMPLEMENT A SPILL PREVENTION AND RESPONSE PLAN (SPRP).

To help avoid and minimize potential accidental spills during construction, a project specific SPRP would be prepared by the construction contractor prior to construction that conforms to applicable local, state, and federal requirements. The SPRP would be on site during construction and distributed to all workers and managers prior to construction. The SPRP shall include measures that ensure the safe transport, storage, use, and disposal of hazardous materials used or encountered during construction. The construction contractors shall be required to comply with the SPRP and applicable federal, state, and local laws. The project sponsor would provide compliance oversight. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate offsite disposal facility.

The federal reportable spill quantity for petroleum products, as defined in EPA's CFR (40 CFR 110), is any oil spill that 1) violates applicable water quality standards, 2) causes a film or sheen upon or discoloration of the water surface or adjoining shoreline, or 3) causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines. If a spill is reportable, the construction contractor shall notify the project proponent who shall inform the applicable county agency and arrange for the appropriate safety and cleanup crews to ensure the spill prevention plan is followed. A written description of reportable releases must be submitted to the RWQCB and the applicable county agencies. This submittal must include a description of the release, including the type of material and an estimate of the amount spilled, the date of the release, an explanation of why the spill occurred, and a description of the steps taken to prevent and control future releases. The releases would be documented on a spill report form. If a spill has occurred, the applicant shall coordinate with responsible regulatory agencies to implement measures to control and abate contamination.

2.17 TRA-1: PREPARE AND IMPLEMENT A TRAFFIC SAFETY PLAN.

The project proponent will require the construction contractor to prepare and implement a traffic safety plan before the onset of the construction phase. The traffic safety plan shall be reviewed and approved by the Fresno County Department of Public Works and Planning, Transportation Planning Division. The plan shall address:

- Appropriate vehicle size and speed,
- Travel routes,
- Detour or lane-closure plans,
- Flag person requirements,
- Locations of turnouts to be constructed,
- Coordination with law enforcement and fire control agencies,
- Coordination with California Department of Transportation personnel (for work affecting state road rights-of-way),
- Emergency access to ensure public safety, and

- Traffic and speed limit signs.

It shall also be specific in this plan that before beginning construction activities, the project proponent or the construction contractor shall contact local emergency-response agencies (Fresno County Sheriff and Fire Departments) to provide information on the timing and location of any traffic control measures required to complete the proposed project. Emergency response agencies will be notified of any change to traffic control measures as the construction phases proceed so that emergency-response providers can modify their response routes to ensure that response time would not be affected.

2.18 WAT-1: RECHARGE BASIN SCREENING

The first flush of nitrate, salts and other constituents from the vadose zone could create local water quality challenges for the Bank and limit its flexibility. Selecting basins with lower expected legacy loading will help mitigate those challenges. The following steps will be taken in selecting recharge basins:

A. Recharge basins will be selected to avoid areas where recharge could elevate risks to groundwater quality (Figure 1-11). Such areas include the Raisin City Oil Field, the American Avenue Landfill, the ecological reserves, and animal agriculture facilities.
B. Recharge basins will be selected using the Groundwater Recharge Engineering and Assessment Tool (GREAT). GREAT integrates current nitrogen budget data for crops in the San Joaquin Valley with crop histories to identify fields with lower to higher expected nitrogen loading levels. This tool includes all agricultural lands within MAGSA and will provide an initial screen of fields expected to have lower nitrogen and salt loading. Fields will be screened to identify recharge fields as related to nitrogen and select fields with predicted loading in the lower 50th percentile.
C. Recharge basin loading potential of salts and nitrate will be validated through soil cores and associated pore water sampling along the profile. Soil cores will be taken to depths of 30 ft to enable sampling within and below the root zone. The number of cores will depend upon known data for the site and is estimated at three to six cores per field. Integrating soil cores and water quality data will enable determination of nitrogen and salt loads within the top 30 ft. Fields will be selected that have salt and nitrogen loading below reported median salt and nitrogen loading in the top 30 ft. The water quality report in Appendix 3 (Bachand et al 2023b) references data for the top 30 ft of nitrogen and salts in farms local to MAGSA. The median salt load in the top 30 ft for those data is 27,000 kg per hectare and for nitrate is 640 kg per hectare. Those values shall be the initial values used in screening fields and will be statistically updated as data is developed for this Project.

2.19 WAT-2: IMPORT WATER IN COMPLIANCE WITH BANK IMPORT PUMP-IN STANDARD

A water quality standard will be implemented for contract water received by the Bank to improve resident groundwater conditions within MAGSA (Appendix 3, Bachand et al, 2023b).

A. A Bank Import Pump-In standard will be developed based upon the Mendota Pool Group standard (Reclamation 2019); and upon the Non-Project water quality sampling for the San Luis Canal (Reclamation 2017). The latter requirements are in compliance with EPA Title 22 Water Quality Standards.
B. Import water quality monitoring will be developed and implemented in accordance with the requirements above (Reclamation 2017, 2019). The Import Bank Pump-In standard will be based upon the DWR Non-Project Pump-In standard (DWR 2012), the Mendota Pool Group standard developed for the Mendota Pool Group 20-Year Exchange Program EIR/EIS (Reclamation 2019); and the Non-Project water quality sampling for the San Luis Canal (Reclamation 2017).
C. Water received by the Bank at the intakes will be required to meet the above Bank Import Pump-In standard and imports will be curtailed if they do not meet standards. Curtailment represents a "hard stop" to ensure resident groundwater within MAGSA and the potential for return of

contract water back to subscribers will meet all regulatory and Pump-In standard requirements (Reclamation 2017, 2019; DWR 2021).

2.20 WAT-3: RECHARGE BASIN EMPLOYMENT AND OPERATIONS

A. Incremental introduction of recharge basins will reduce vadose zone first flush impacts by spreading it over time. A stepwise approach will avoid first flush impacts with the incremental introduction of recharge basins, so that as a first flush completes and flush water becomes clean, another basin starts infiltrating. Continued use of recharge basins that have infiltrated more than 15-30 feet of water will be prioritized because it will result in improved groundwater quality. First flush will be tracked by measuring flow into the basins, and the groundwater quality underlying the basin or adjacent areas will be monitored to document completion of the first flush of constituents from the vadose zone.
B. Groundwater levels are not expected to reach ground surface based upon conclusions from the groundwater hydrologic report (Appendix 2, Bachand et al 2023a). If surface flooding or saturation occurs through operations of a recharge basin, from operational failure, berm failure, or upwelling, delivery of contract water to the recharge basin will be curtailed until necessary repairs have been made. In consideration of potential groundwater upwelling, groundwater level monitoring data from Mitigation Measure WAT-9 will be used to identify when upwelling has ended. A groundwater level more than 10 ft below ground levels will be the threshold for that determination.

2.21 WAT-4: RECOVERY WELL DISTRIBUTION, DESIGN AND OPERATIONS

A. The locations of recharge basins and extraction wells are designed to optimize the quality of groundwater reaching potential users. Extraction wells will be located to limit groundwater flow into areas such as the oil fields, where it could hasten movement of existing plumes of degraded groundwater, potentially impacting other users. Extraction wells will be located a minimum of 500 meters downstream of basins to avoid first-flush impacts. The extraction wells will initially be situated in regions with higher quality groundwater, such as the eastern quarter of MAGSA, where groundwater meets Pump-in standards. This will allow high quality groundwater to be returned to contractors, even during the early first flush period.
B. Recovery well operations will be curtailed if such operations are drawing local groundwater elevations below those allowed under SGMA. The groundwater hydrologic report predicts recovery well will not cause significant or extended declines in local groundwater levels.
C. Recovery well operation will be curtailed as deemed necessary to ensure that export water from the Bank meets the Bank Export Pump-In Standard (WAT- 5) in the event that mixing and other actions are not successful in allowing export water to meet that project requirement.

2.22 WAT-5: EXPORT WATER IN COMPLIANCE WITH BANK EXPORT PUMP-IN STANDARD

a. A Bank Export Pump-In standard will be developed to govern the export of returned Bank contract water to the Mendota Pool. The Bank Export Pump-In standard will be based upon the DWR Non-Project Pump-In standard (DWR 2012), the Mendota Pool Group standard developed for the EIR/EIS (Reclamation 2019), and the Non-Project water quality sampling for the San Luis Canal (Reclamation 2017). The latter requirements are in compliance with EPA Title 22 Water Quality Standards.
b. Export water quality monitoring will be developed and implemented in accordance with the requirements above (Reclamation 2017, 2019) The Bank Export Pump-In standard will include the same sampling schedules (e.g., daily, weekly, monthly) as presented in the above documents. Received water quality monitoring will occur at the input structure for the Bank per locations in the Pool as shown in Figure 1 5.

c. Water exported by the Bank into the Mendota Pool will be required to meet the Export Pump-In standard and only accepted accordingly. Export water actions will be curtailed until the exported water can meet the Bank Export Pump-In standard requirements. Curtailment represents a "hard stop" to ensure the Mendota Pool is only receiving water that meets all regulatory and Pump-In standard requirements (Reclamation 2017, 2019; DWR 2021).
d. Actions taken within MAGSA to ensure export water meets the Bank Export Pump-In standard will include temporary recovery well shutdown, permanent recovery well abandonment, blending of recovered waters, and changing the distribution of recovery wells in operation.
e. Export water will include "wet" water exported directly to the Pool and "dry" water exported through water trades and transfers. Contract water will be returned to the Pool or through trades and transfers, in compliance with a contractor's request, using existing CVP and SWP facilities, and in lawful compliance with existing CVP and SWP rules and regulations for transfer through the facilities.
f. The Bank Export Pump-In standard will not allow Bank water to be returned to the Pool during times when the weighted EC average of the Bank discharge locations exceeds the DMC by more than 90 micromhos per centimeter (~58 mg/L TDS), consistent with the MPG Pump-In standard (Reclamation 2020).

2.23 WAT-6. COMPLIANCE WITH CENTRAL VALLEY REGULATORY PROGRAMS

Some recharge basins may be used for multiple uses, specifically farming and recharge. All farms in the Central Valley are regulated through various agricultural programs by the Central Valley Regional Water Quality Control Board. MAGSA will require that farms in which recharge fields include agriculture meet CVRWQB regulatory standards. MAGSA reserves the right to limit recharge fields for land uses, including for agriculture unless provided proof of compliance.

2.24 WAT-7. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

Because soil surface disturbance for the proposed project would be greater than one acre, specific erosion control measures will be identified as part of the Construction General Permit (CGP) and SWPPP required for construction. The construction contractor will prepare a SWPPP that details measures to control erosion, contain sediments, and prevent turbidity and leakage of vehicle and equipment fluids during construction. The SWPPP will be approved by the Bank sponsors and ensure compliance with the plan throughout the construction process. Measures from the SWPPP will be incorporated into the contractor's work plan and will be implemented prior to groundbreaking. The Bank sponsors will comply with requirements, including preparation and implementation of the SWPPP and the NPDES General Permit for Stormwater Discharges from Construction and Land Disturbing Activities issued by the SWRCB.

2.25 WAT-8. INSPECT WATER CONTROL STRUCTURES AND CANALS, AND EMERGENCY ACTIONS.

During initial operations each season, MAGSA will visually inspect all levees that protect infrastructure or surrounding buildings to ensure that there are no structural deficiencies that may lead to levee failure under normal operating conditions. The levees will be reinspected each year before flooding or after events which may damage levees, such as earthquakes. The inspectors will record the dates and locations of all levees inspected, any deficiencies identified, and remedial measures used to correct problems. Emergency measures for canal operations in case of levee failures include stopping pumping to canal sections, diverting from or draining canal sections, emergency repairs such as sandbags and earthwork.

2.26 WAT-9. DEVELOP AND IMPLEMENT MONITORING PLAN

A monitoring plan will be developed for surface and groundwater. All monitoring will be used for real-time system management (WAT-11) and for developing, validating and refining the Operational Model (WAT-12)

A. Surface Water Hydrologic and Water Quality Monitoring

Surface water monitoring goals will include compliance with pump-in and drinking water standards (Water Quality Report, Table 31). These goals relate to both water quality and flow monitoring. Surface water hydrology and water quality monitoring will be critical in real-time operational decisions and for regulatory requirements.

Surface water monitoring includes any above-ground monitoring. This includes water provided to the recharge basins for recharge and water recovered from wells for export. Surface water flow and water quality monitoring will occur at key conveyance locations:

- Flow and water quality monitoring at Bank import and export locations (Figure 1-6).
- Flow and water quality monitoring at operational nodes or intersections within the conveyance system (Figure 1-6)
- Flow monitoring at inflow locations to recharge basins (Figure 1-9)
- Pumping flows, water levels and water quality at recovery wells (Figure 1-9).

Monitoring will include real-time, telemetric monitoring of surface flows and levels to provide actionable data to manage and control surface water distribution through the Bank and to alert water managers of potential system failures. Pump flow monitoring will be determined directly through flow meters or indirectly through pump energy demand and the calibrated energy-flow relationships. Water quality monitoring at import and export locations will be developed as required by the Pump-In standards defined in WAT-2 and WAT-5. Monitoring methods will be consistent with standards identified in EPA Title 22 sampling and pump-in monitoring (Reclamation 2017, 2019). EC monitoring will be used for real-time monitoring of salts.

The water quality report, Section 10, provides an initial plan for monitoring during periods of recharge and recovery (Appendix 3).

B. Groundwater Monitoring

MAGSA will implement a groundwater monitoring program that will include a grid of monitoring wells spaced approximately 1 – 2 miles apart to accurately map groundwater quality and levels and track lateral groundwater movement. A subset of nested wells will be used to track water quality constituent concentrations with depth. These data will be collected to avoid any negative impacts to domestic wells, and to ensure recovery wells can access higher quality groundwater. Well data underlying and downstream of recharge basins will be used to monitor first-flush of constituents, characterize flow paths, and plan for future groundwater recovery.

Level monitoring will also be used to track groundwater responses to recharge and recovery to support local recharge basin and recovery well operations, including determinations regarding curtailment of operations at those locations (WAT-3, WAT-4).

2.27 WAT-10. DEVELOP AND IMPLEMENT FACILITIES OPERATION, MAINTENANCE AND MONITORING MANUAL

MAGSA will develop a comprehensive Facilities Operation, Maintenance and Monitoring Manual for the Bank.

A. System Operations and Maintenance (O&M)

This manual will develop O&M protocols for conveyance canals, recovery wells and recharge basins and their associated turnouts, valves, pumping stations, security fencing and other equipment and instrumentation. Mechanical and electrical equipment such as pump stations, valves instrumentation, and telemetry systems will utilize manufacturer and installer recommendations, manuals, and standard practices for their O&M. Below is a list of items that could be included:

- Regional conveyance infrastructure and associated systems:
    - Pump stations, including pumps, piping, valves, electrical equipment, controllers and instrumentation (e.g., flow meters, electrical meters, telemetry); and including security measures.
    - Canals and associated levees, culverts, water control structures, turnouts, valves, piping, and instrumentation and controls (e.g., flow meters, telemetry, transducers); and security and safety measures.

- Recharge basin and associate infrastructure:
    - Local berms to prevent berm failure and for weed management.
    - Valves, piping and water control structures, associated instrumentation and controls (e.g., flow meters, telemetry, transducers); and security and safety measures.

- Recovery wells and associated infrastructure:
    - Well maintenance protocols
    - Valves, piping and pumps, and associated and associated pumps, pipes and valves, and security and safety measures.

- Access road crossings including repairs, maintenance, and safety measures (e.g. guardrails).

B. Inspections and Repairs

Inspections and associated repairs will occur prior to operations, and under an operational schedule during operations:

- Regular scheduled inspections, vegetation management, channel repair and stabilization of canals and associated water control structures per WAT-8.
- Regular scheduled inspections, vegetation management, and repair of recharge basins,

C. Operations and Operational Curtailments

System operations will be developed to comply with subscriptions regarding contract water delivery and returns. Contract water will be returned to the Pool or through trades and transfers, in compliance with a contractor's request, using existing CVP and SWP facilities, and in lawful compliance with existing rules and regulatory requirements required through the CVP and SWP for transfer through the facilities.

Operations will also be developed to manage local groundwater levels consistent with SGMA requirements, for efficient operations, and for water quality.

Curtailments will occur under certain conditions as described in the earlier Mitigation Measures:

- WAT-2 for curtailment of contractor water not meeting the Bank Import Pump-In Standard as measured at the intake structures;
- WAT-3 curtailing recharge basin operations in case of local flooding;

- WAT-4 curtailing recovery well operations are exceeding levels allowable under SGMA as implemented within MAGSA; or if recovery wells are drawing groundwater at levels exceeding the Bank Export Pump-In standard that cannot be mitigated through other measures (e.g. blending);
- WAT-5 curtailment of export from the Bank if exported waters exceeds the Bank Export Pump-In Standard as measured at the out-take structures;
- WAT-6 curtailing agricultural use of a recharge basin if the landowner cannot show proof of compliance with Central Valley Regional Water Quality Control Board regulatory standards.
- WAT-8 emergency protocols for canal operations in case of levee failures (e.g., stopping pumping to canal sections, diverting from or draining canal sections, emergency repairs such as sandbags and earthwork).
- WAT-11 requiring all subscription actions to be in lawful compliance with existing CVP and SWP rules and requirements.

2.28 WAT-11. MANAGE DIVERSIONS AND RECOVERY TIMING

All subscriber requests returned to the Pool or through trades and transfers, in compliance with a contractor's request, using existing CVP and SWP facilities, will be in lawful compliance with CVP and SWP rules and regulatory requirements for transfer through the facilities. All requests will specify where the water is being sent, identify the infrastructure used under current rules and regulations, and be consistent with operation of the Pool and other Water Project facilities. Requests will be at the control of State and Federal water contractors. "Wet" contract water will be returned to the Pool from May through September, depending upon partner contracts within the constraints described in WAT-5.

2.29 WAT-12. DEVELOP AND IMPLEMENT OPERATION MODEL

MAGSA will develop an Operational Model (OM) to guide planning and design, and for developing initial operations and management plans. The OM will be comprehensive, identifying needed standards, protocols and agents. An outline of the OM is provided in Appendix 10.

The OM will use currently available information and data and will be subsequently refined and evolve as water quality, hydrology and other needed data is collected. As the OM is refined, it will become a more precise predictive model that will further support decision making.

Key goals and objectives of the OM include;

- Developing recharge and recovery strategies to ensure water quality requirements are being met for exported water returned to contractors,
- Supporting design and distribution of recharge basins and recovery wells to protect or enhance groundwater recovery and its quality,
- Recharge and recovery actions are not adversely affecting groundwater levels or quality,
- Recharge and recovery actions are not impeding use of groundwater within MAGSA for irrigation, drinking water or other uses,
- Recharge and recovery actions are enhancing groundwater sustainability throughout MAGSA with regard to groundwater supplies and quality.

These goals and objectives are discussed by Bachand et al. in the water quality and hydrologic analysis (2023a; 2023b). The model development will utilize collected groundwater data (*WAT-5*) and surface water data (*WAT-9*) for initial calibration and for subsequent refinement.