Appendix B: Draft Operations Plan

Operations Plan for the Aquaterra Water Bank

1. Introduction

The proposed Aquaterra Water Bank (hereafter Bank) is a managed groundwater banking facility within the jurisdictional boundaries of the McMullin Area Groundwater Sustainability Agency (MAGSA) in Kings County, California. The Bank will be designed to optimize the storage and recovery of water within the underlying aquifer system, while the aquifer continues to be used as a source of irrigation water for overlying farmed areas. In wet years, the Bank will recharge surplus water into the basin through direct spreading. In dry years, stored groundwater will be recovered and conveyed to meet water demands. This plan outlines the operational, technical, and environmental safeguards that govern the development, updating, and use of a numerical groundwater model to guide bank operations. The overarching objective of this operations plan is to sustainably manage recharge and recovery while protecting existing groundwater users, maintaining or improving groundwater quality, and ensuring long-term aquifer viability.

2. Project Objectives and Operating Principles

The Aquaterra Water Bank is guided by the following operational principles:

- **Maximize beneficial recharge and sustainable recovery:** Recharge during high-flow periods captures excess surface water that would otherwise be lost to downstream users or the environment. By directing this water into the aquifer, the bank increases regional water supply reliability. During dry periods, recovery operations will be managed to withdraw water without exceeding modeled limits, ensuring long-term storage integrity.
- **Maintain or improve groundwater quality:** Water from the Central Valley Project and State Water Project, delivered through the Delta-Mendota Canal, will be used for recharge. Water introduced into the aquifer will be monitored to ensure that it does not degrade native groundwater quality. Monitoring will detect signs of quality changes (e.g., increasing salinity), and operations will be adjusted to avoid regulatory exceedances.
- **Protect existing water users:** MAGSA will ensure that its water banking operations do not cause nearby wells to go dry or reduce their pumping efficiency by more than 50%. Any detected adverse effects to existing groundwater pumping wells will be evaluated by MAGSA using a combination of field data and model outputs. Preventive actions, such as modifying pumping schedules or spacing of recovery wells, will be taken before thresholds are crossed.
- **Prevent interference with surface water rights and operations:** Recharge and extraction activities will be timed to avoid conflict with existing surface water delivery schedules and rights. As part of its annual and monthly planning activities, the Bank will coordinate with upstream and downstream water right holders to ensure that banking activities are transparent and do not interfere with river operations or diversions.

3. Numerical Groundwater Model Framework

3.1 Model Basis and Continuity

The numerical groundwater model used to support Bank operations will be built upon the model developed for the project Environmental Impact Report (EIR). This model incorporates the best available information on regional- to local-scale hydrogeologic parameters, water pumping, exchanges with surface water bodies, water quality and ground cover conditions. The current model is calibrated to observed groundwater elevation data from 2014-2024, and will be updated as new data are obtained from future monitoring. A proposed monitoring well network is presented in the EIR Hydrology Appendix (Figure 26 in Appendix G of the EIR), and this will serve as a starting point for the Aquaterra Bank monitoring network. To the extent possible, the network will take advantage of existing wells that can provide useful data for tracking groundwater.

Once the Bank is operational, it is expected that significant additional hydrogeologic data will be generated. The model will be maintained and refined on an annual basis using additional observed field data and updated boundary conditions. This ensures the model remains a living tool that reflects actual conditions in the basin and can be used reliably for operational decision-making.

3.2 Model Updating Process

MAGSA will form a Groundwater Management Committee which will regularly update its Groundwater Model (Model) to actual conditions and use the Model to project future groundwater conditions. MAGSA will use the best practicable science and latest information available in all modeling and technical matters.

MAGSA will report the modeling results to its Board of Directors and will make the results available to the public on its website. Recovery of banked groundwater in any calendar year beyond March 15 of that year shall not commence or continue until the Model has been run for projected Bank operations and the results have been reported to MAGSA's Board of Directors and made available to the public.

Each year, the model will be updated using:

- **New groundwater level measurements from monitoring wells:** These data provide the primary basis for tracking changes in aquifer storage and assessing the effects of recharge and recovery activities. As noted above, a network of dedicated monitoring wells has been proposed in the EIR Hydrology Appendix to understand groundwater storage and flow over key gradients across the MAGSA area.
- **Annual recharge and recovery volumes:** Accurate accounting of water added to and extracted from the basin, using meters at inflow locations to the canal network and at

recovery wells will allow the model to track net storage changes and forecast future conditions. Some water budget terms, notably seepage and evaporative loss in canals, and evaporative loss in recharge areas, will not be measured directly, but will be estimated using standard engineering practices.

- **Water quality data from production and monitoring wells:** Parameters like TDS and nitrate will be tracked at inflow locations into the canal network and in recovery wells to identify trends that could indicate migration of lower-quality water or changes due to recharge operations.
- **Land use and evapotranspiration data to refine consumptive use estimates:** Agricultural practices influence water use patterns and recharge potential. Incorporating updated land use data ensures the model's water budget remains accurate.

The updated model will be calibrated and validated against observed trends. When significant new data become available (e.g., new well logs, pumping tests), the hydrogeologic framework will be revised accordingly.

3.3 Forecasting and Simulation

Using current condition data, the updated model will be used to forecast each quarter of the following year (for example, using the water year end-2025 model calibration, forecasts will be made for the four quarters of water year 2026):

- **Groundwater elevations under various recovery scenarios for the upcoming year:** Simulations of different recovery rates and patterns will identify how groundwater levels might respond, helping avoid over-pumping or adverse impact on existing pumping wells.
- **Areas at risk for potential drawdown or mounding:** Model outputs will highlight locations where excessive lowering or rising of the water table could damage infrastructure or impair wells.
- **Changes in groundwater gradients that may affect water quality:** The model can identify shifts in flow direction that could cause brackish or contaminated water to migrate into clean zones.
- **Sensitivity of recovery to different hydrologic year types:** By simulating wet, average, and dry conditions, Bank managers can plan and adjust recovery strategies based on water supply forecasts and reservoir outlooks.

These simulations will inform decisions on whether recovery should be increased, reduced, or redistributed in a particular water year.

4. Use of Model Results for Operational Management

Model results are central to the Bank management decisions:

- **Recovery Planning:** Forecasted drawdown informs the maximum safe recovery volume for each wellfield, and the schedule of pumping operations to minimize localized impacts. These predictions ensure that recovery operations do not induce harmful drawdowns that could affect surrounding groundwater users.
- **Recharge Strategy:** Model predictions help determine the timing, location, and quantity of recharge to maximize infiltration and benefit aquifer storage. Recharge efforts will be targeted to areas where the aquifer has the most storage capacity and where percolation rates are high.
- **Impact Avoidance:** Simulations identify thresholds for significant adverse effects, including drawdowns exceeding 30 ft from baseline elevations or water quality degradation beyond drinking water standards. Operations will be proactively modified to prevent violations of these thresholds. This allows the Bank to act before impacts occur, rather than in reaction to complaints or damage.
- **Contingency Mitigation:** Modeled worst-case scenarios define operational triggers. If model thresholds are crossed, the plan calls for temporary suspension of pumping and immediate mitigation. This approach helps avoid irreversible harm and builds confidence with external stakeholders.

5. Groundwater Monitoring Plan

5.1 Monitoring Network

The Bank monitoring network will consist of multiple gradients of dedicated monitoring wells across the bank footprint and a 1- to 2-mile buffer area. The proposed well network has been outlined in the Hydrology Appendix (Figure 6-1) and serves as a starting point for locating these wells on the ground. The network will take advantage of existing wells to supplement data and minimize the drilling of new wells.

5.2 Monitoring Parameters

Water Levels: Measured monthly at minimum, and weekly during high-intensity pumping or recharge events. This provides a near-real-time understanding of how bank operations are influencing groundwater conditions. MAGSA will report current groundwater levels to its Board of Directors at each monthly regular meeting, and will make the reports available to the public on its website (http://www.mcmullinarea.org/).

Water Quality: Quarterly sampling for total dissolved solids (TDS), nitrate, and other parameters of concern (e.g., arsenic, selenium). Regular testing ensures that any degradation is detected early and addressed promptly.

Production Data: Flowmeters on recovery wells and recharge structures will track volumes whenever the wells are operational. Telemetry will provide real-time access to operational data. These data are vital for accurate modeling and regulatory compliance.

5.3 Reporting and Data Management

MAGSA will monitor groundwater levels monthly, except during periods of no recovery when monitoring will occur at least quarterly. MAGSA may rely on monitoring conducted by the Groundwater Management Committee to meet these requirements. MAGSA will report current groundwater levels to its Board of Directors at each monthly regular meeting and will make the reports available to the public on its website (http://www.mcmullinarea.org/). Data collected through the monitoring program will be compiled into an Annual Groundwater Report, detailing:

- **Groundwater elevation trends:** A time series analysis will identify whether the Bank is maintaining sustainable aquifer levels or is contributing to groundwater level declines in the area.
- **Recharge and recovery volumes:** These metrics support water accounting and ensure compliance with operational goals.
- **Determine water level conditions** with "Without Bank Operations" for the purpose of evaluating the potential impact of "With Bank Operations". The "Without Bank Operations" is the water level that would have been found at any particular well location absent "Bank Operations."
- **Water quality changes:** Charts and tables will show how recharge and recovery affect salinity and nutrients over time.
- **Model performance and calibration results:** Comparisons between predicted and observed data will verify model accuracy and suggest improvements.

Data will be posted on a public-facing portal to ensure transparency and allow stakeholders to monitor bank operations.

6. Mitigation and Impact Response Protocol

To protect third-party groundwater users, the Bank will implement a tiered mitigation strategy.

6.1 Triggers for Mitigation

A drawdown of 30 feet or more at a domestic or municipal well above what would have occurred without Bank operations: The Model will be used to forecast any localized areas for special attention and/or additional monitoring where groundwater levels will decline 30 or more feet below the "Without Bank Operations" groundwater level. This threshold is based on levels that could impair well functionality, and modeling will be used to separate natural declines from Bank-induced impacts.

- **Water quality degradation beyond drinking water standards (e.g., nitrate above 10 N-mg/L or TDS above 450 mg/L averaged annually across all extraction wells):** Note

that the mitigation triggers are based on averages and individual wells can exceed the standards as long as the aggregate values are below the threshold.

6.2 Claim Review Process

Upon receipt of a complaint, the Bank will:

- **Inspect the affected well:** A field visit will confirm reported problems and collect data.
- **Review water level and quality data:** Trends from monitoring wells will be analyzed to assess recent changes.
- **Compare model-predicted impacts to observed data:** This helps determine whether Bank operations are likely responsible.
- **Determine the portion of the impact attributable to the Bank:** If the impact is due to multiple causes, only the portion linked to the Bank will be mitigated.

6.3 Mitigation Measures

- **Lower pumps or deepen wells (if feasible and with landowner consent):** This restores water access in a cost-effective manner.
- **Provide replacement water or compensation:** Where engineering solutions are infeasible, financial or water supply offsets may be provided.
- **Adjust or suspend recovery operations until conditions normalize:** Operational flexibility will be used to reduce ongoing impacts.

7. Governance and Coordination

The Bank Governance Committee will consist of Bank staff, hydrogeologists, and representatives from bank depositors and stakeholders. The committee will:

- **Meet monthly during recovery operations:** Frequent meetings will allow for real-time adjustments to ongoing activities.
- **Review modeling results and operational plans:** Technical evaluations ensure decisions are based on sound science.
- **Evaluate mitigation claims and recommend actions:** The committee provides oversight to ensure fair treatment of impacted parties.
- **Communicate with landowners and regulators:** Open channels for information sharing will build trust and foster regional cooperation.

8. Adaptive Management and Plan Revisions

This plan will be reviewed and updated every five years or following:

- **Major hydrologic events (e.g., multi-year drought):** Such events may affect baseline assumptions and require operational changes.
- **Significant model revisions:** Structural changes to the model may affect forecasts and thresholds, necessitating updates to the plan.
- **Regulatory changes:** New laws or policies may alter monitoring, reporting, or mitigation requirements.

Updates will incorporate stakeholder feedback, scientific advances, and lessons learned from operations.