Memorandum

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SUBJECT: **Scope of Work for "Aggressive Restoration Alternative" Modeling Scenario**

INTRODUCTION

The Alta Irrigation District (AID) Archetype Analysis (completed May 2016) is one of several technical work efforts that have been completed by CV-SALTS to inform the larger Central Valley Salt and Nitrate Management Plan (SNMP) planning effort and future, local/regional analyses. The AID Archetype Analysis, which is included as a part of the SNMP, serves as an example and "proof of concept" to test, on a spatially refined basis, the application of selected policies, data analysis methods, and salt and nitrate management approaches that are being considered by CV-SALTS. The results will be used to inform the development of implementation elements of the Central Valley SNMP.

Amongst other work efforts, the AID Archetype included an analysis of several management scenarios using the AID Management Zone (MZ) model to evaluate the effects of managing salt and nitrate in the MZ area over both near-term and long-term time frames. A total of five scenarios (a baseline condition along with four management scenarios) were ultimately identified and modeled. The results of this work effort were presented to the CV-SALTS Executive Committee (EC) in March 2016. During that meeting, several EC members suggested that it may be beneficial to run an additional, aggressive management scenario that builds off of the current AID management scenarios and incorporates implementation measures identified by the Nitrate Implementation Measures Study (NIMS) and/or Strategic Salt Accumulation Land and Transportation Study (SSALTS).

In response to the request by CV-SALTS, the Larry Walker Associates (LWA) Team (consisting of LWA and Luhdorff & Scalmanini Consulting Engineers (LSCE)) has prepared this scope of work for an *Aggressive Restoration Alternative modeling scenario.* The information generated by the Aggressive Restoration Alternative modeling scenario is critical in order for CV-SALTS to:

- Identify the types of measures that are necessary in order to address management goal #3 (Implement Managed Aquifer Restoration Program). As part of this scope (with one new

modeling scenario), a subset of the NIMS measures will be evaluated with respect to their performance and effectiveness in achieving goal #3.;

- Identify the types of measures that may also address management goal #1 (Ensure a Safe Drinking Water Supply) As part of this scope (with one new modeling scenario), a subset of the NIMS measures will be evaluated with respect to their performance and effectiveness in achieving goal #1;
- Identify costs associated with the above scenario for the AID study area. Once the project is defined (Task 1), the costs for the implementation measures will be identified using existing information and included within the Economic Analysis that is currently underway and due to be completed by October 3[1];
- Identify potential environmental impacts associated with the above scenario for the AID study area. Once the groundwater model is run and results obtained (Tasks 2-4), the information will be included in the Substitute Environmental Documentation (SED) that is currently underway and due to be completed by October 3[2]; and
- Provide information that will be useful to valley-wide projections of costs and environmental impacts[1,2].

SCOPE OF WORK

The Aggressive Restoration Alternative scenario merges an AID Archetype management modeling scenario (#3 Irrigation Efficiency, N Loading, and Artificial Recharge Changes) with select NIMS controls (focusing on nitrate-related issues within the AID area). It is envisioned that the new scenario will involve the inclusion of the following to the mass loading, flow, and transport models:

- Agricultural wells will be pumped and used for irrigation without treatment prior to land application;
- Municipal wells will be pumped and treated before being distributed and served, and will include new wells that will be pumped, treated, and served to disadvantaged communities[3]; and
- A certain number of extraction and/or injection wells that would pump and treat groundwater before returning it to the subsurface at identified locations for a pump/treat and inject system.

The proposed scope of work to complete this analysis includes:

- Defining the parameters for the Aggressive Restoration Alternative scenario in coordination with the CV-SALTS Project Committee (PC);
- Refining the AID MZ flow and transport model to accommodate the extraction/injection wells;
- Presenting the modeling results to the CV-SALTS PC via conference call; and
- Developing a Draft and a Final Technical Memorandum.

[1] This work effort is included in the CV-SALTS Salt and Nitrate Management Plan and Basin Plan Amendment – Final Economic Analysis Work Plan, approved July 19, 2016.

[2] This work effort is included in the CV-SALTS Salt and Nitrate Management Plan and Basin Plan Amendment – CEQA Assessment Work Plan, approved July 19, 2016.

[3] The pump, treat, and serve aspect of this scenario will be designed to follow what has already been developed in the NIMS project Pipeline Scenario 2d (Figure 5-17 in the NIMS document), and involves two well fields in the south of AID that send groundwater to two centrally-located treatment plants for distribution to disadvantaged communities within AID. The pump, treat, and serve aspect does not address individual private wells. Figure 5-17 is included at the end of this document for reference.

The key tasks for the scope of work are provided below.

Task 1 Define Project

The LWA Team will prepare a strawman scenario and participate in a Conference Call with the CV-SALTS PC to discuss the goals and specifics of this work. The discussion will include input from the PC to describe what is to be accomplished with the Aggressive Restoration Alternative scenario and how the scenario will be constructed. The details of the model inputs and additions to the AID model scenario will be agreed upon including the locations and numbers of extraction/injection wells (such as might be used for "pump, treat and serve" and/or "pump, treat and inject" projects). Following the call, a brief summary will be prepared to record the agreed upon scenario parameters. Once the project is defined the LWA Team and CDM Smith-RBI Team will start to work on the corresponding environmental and economic analyses. The results of the modeling will be presented as a part of Task 4.

It should be noted that this is not an optimization scenario, meaning that there will only be one model run with the parameters decided upon by the PC. Given the time constraints, there will not be an opportunity to redo the modeling, so it is imperative that the input parameters (types, locations, and numbers of NIMS projects) are agreed upon by the PC during this conference call. A reasonable number of wells and/or well spacing for pump, treat and reinjection/serve sites will be discussed and decided during the conference call with the PC. This will take into consideration areas where the existing nitrate concentration are the highest and potentially focus more treatment options in those areas.

Once the project is defined (Task 1), the costs for the implementation measures will be identified using existing information and included within the Economic Analysis that is currently underway and due to be completed by October 3[4]. This separate work effort will utilize existing cost estimates from the NIMS work to determine the cost of the new "pump, treat, and serve" system and the cost of the new "pump, treat, and reinject" system.

Task 2 Refine Groundwater Flow Model for Aggressive Restoration Scenario

This task involves adjusting the existing AID MZ flow model by assigning model cells at locations of "pump, treat, serve and/or inject" extraction/injection wells. This task will focus on flow volumes of expected water projects for restoration as identified in Task 1. This task will incorporate SWAT's deep percolation volumes for groundwater flow model recharge input that was used originally in the AID Model Scenario 3. Scenario 3 was the most aggressive modeling scenario in terms of best management practices involving agriculture, including reductions in applied nitrogen and increased artificial recharge projects.

Task 3 Refine Groundwater Transport Model for Aggressive Restoration Scenario

This task involves tracking the concentration of nitrate as N at each cell in the model over time with the new flow regime and Scenario 3's mass loading inputs. The concentrations in all of the "pump, treat, serve and/or inject" wells are also tracked. The time for transport simulations is to be determined, but may exceed the previous modeling efforts of 100 years[5]. This will be discussed as a part of Task 1.

[4] This work effort is included in the CV-SALTS Salt and Nitrate Management Plan and Basin Plan Amendment – Final Economic Analysis Work Plan, approved July 19, 2016.

[5] Results from CDM's "pilot mass balance model" indicated that more than 260 years were needed to accomplish a goal of better than 8 mg/L nitrate as nitrogen in the upper 300 feet of groundwater in AID's subsurface, which does not account for any surface loading. Therefore, with the addition of surface loading, and no longer assuming instantaneous mixing, the timeline for transport modeling may need to be extended by centuries.

Task 4 Draft and Final Technical Memorandum

This task involves one conference call with shared Power Point slides to present CV-SALTS PC with the model inputs and results for the Aggressive Restoration Alternative scenario. The call will highlight important components and results of the work and will allow for discussion of any comments and questions prior to submittal of the final technical memorandum.

This task also involves a draft technical memorandum that will be provided that documents the model inputs and results for comment and review by the PC. A one week review period will be incorporated for the LWA Team to receive comments from CV-SALTS. Following receipt of comments, the LWA Team will submit the final technical memorandum. Information generated in this work effort will be incorporated in the SED report, namely:

- The number and locations of pump, treat, and reinject sites;
- The number and locations of pump, treat, and serve sites (including conveyances)
- The concentration over time of nitrate in the treatment facilities.

BUDGET

The estimated cost to conduct Tasks 1 through 4 is summarized in **Table 1**. **Table 2** (attached) contains a detailed breakdown of the estimated hours and costs for each task. The costs are based on 2014 hourly rates.

Table 1
Cost Estimate for Restoration Scenario Modeling Work

Task	Task Description	Cost Estimate
00	Project Management (coordination, etc.)	$4,380
1	Define Project	$5,950
2	Refine Groundwater Flow Model for Restoration Scenario	$13,180
3	Refine Groundwater Transport Model for Restoration Scenario	$13,180
4	Draft and Final Technical Memorandum	$23,330
	Total Estimated Cost	**$60,020**

SCHEDULE

The work on the Restoration Alternative scenario would begin immediately upon approval of the proposed scope and budget. **Table 3** shows the estimated timeline following approval.

Table 3
Estimated Timeline

Task	Week of								
	Aug 8	Aug 15	Aug 22	Aug 29	Sept 5	Sept 12	Sept 19	Sept 26	Oct 3
Task 1 Define Project	X								
Task 2 GW Flow Model		X	X	X	X				
Task 3 Transport Model		X	X	X	X				
Task 4 Draft and Final TM				X	X	X	*(PC Review)*	X	X

Figure 5-17 from the NIMS report:

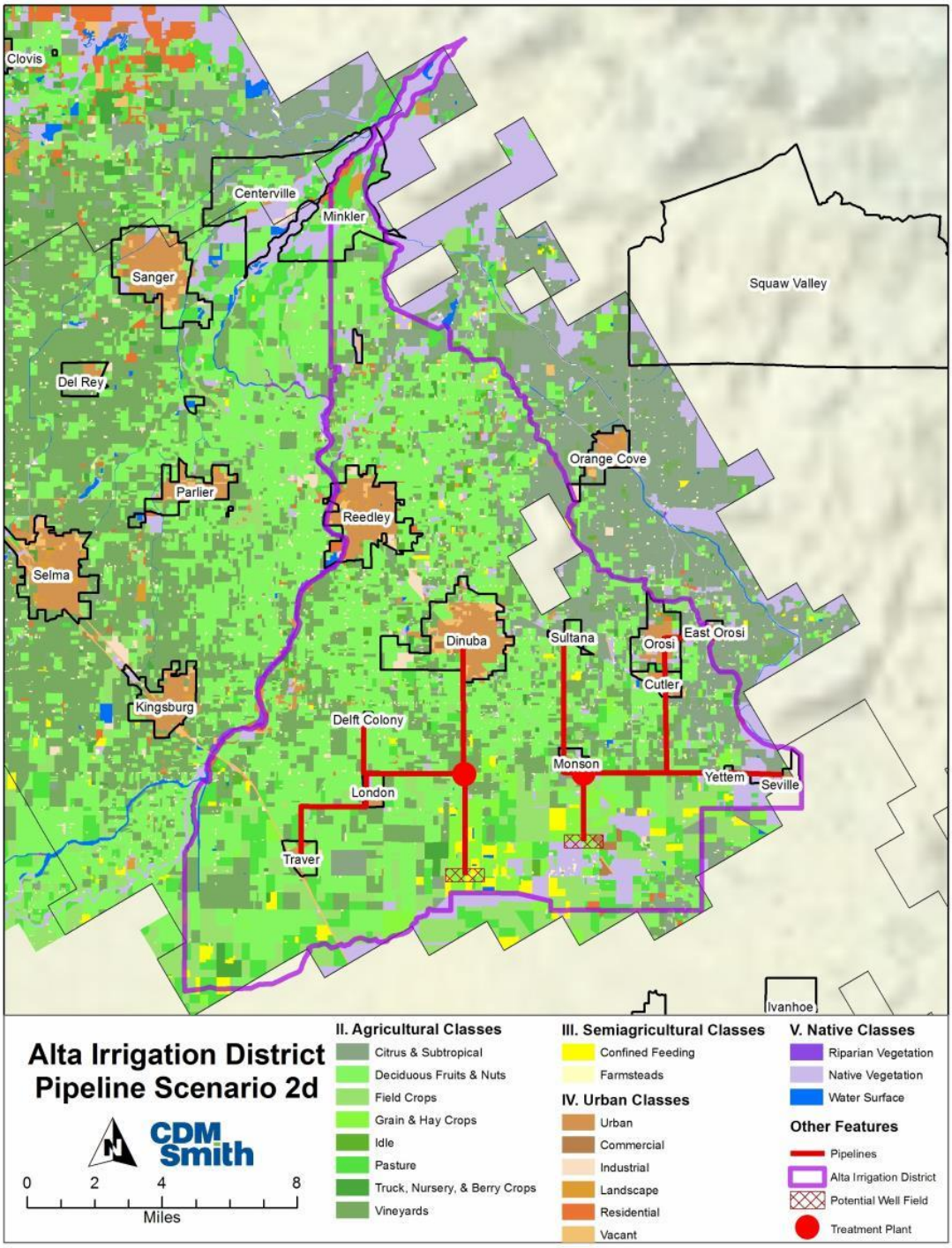

Figure 5-17 Alta Irrigation District Pump, Treat, and Serve Scenario 2d (Land use from DWR http://www.water.ca.gov/landwateruse/lusrvymain.cfm)