Westlands Water District

Joint Committee Meeting & Board Workshop

February 27, 2024 Meeting

UES

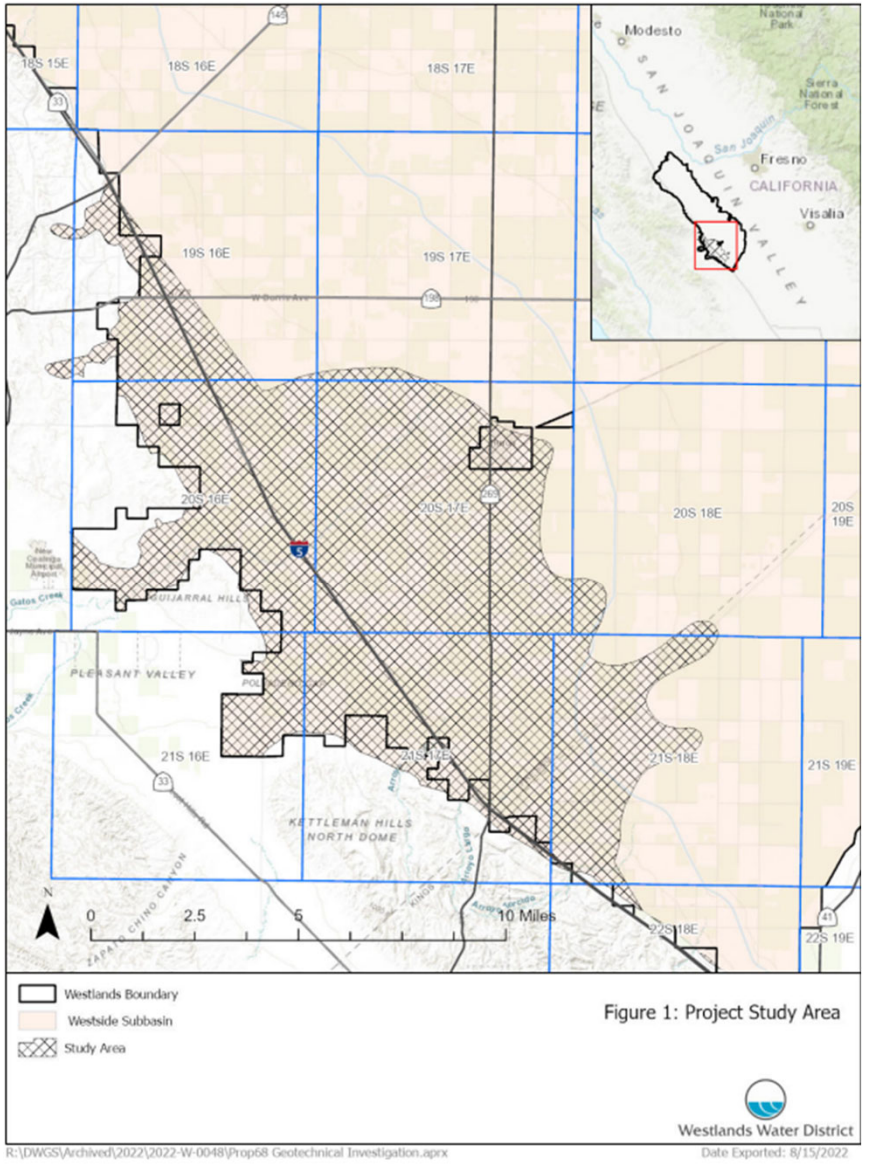
Westlands Water District
World leaders in water conservation

ITEM 4 - Westlands Water District Ground Water Recharge Potential

Introduction

- Study begins February of 2023
- Consists of 2 field phases
  - Phase 1: 128 cone penetration tests (CPTs)
  - Phase 2: 10 soil borings and 10 surficial infiltration tests
- Final report presents a geologic background of the study area, report findings, and implications for groundwater recharge.

Goal: **Identify locations for potential groundwater infiltration to the lower aquifer**



Background

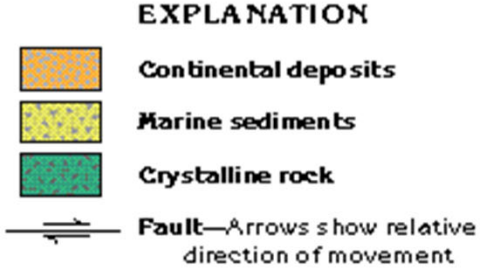
Part of the Great Valley Geomorphic Province

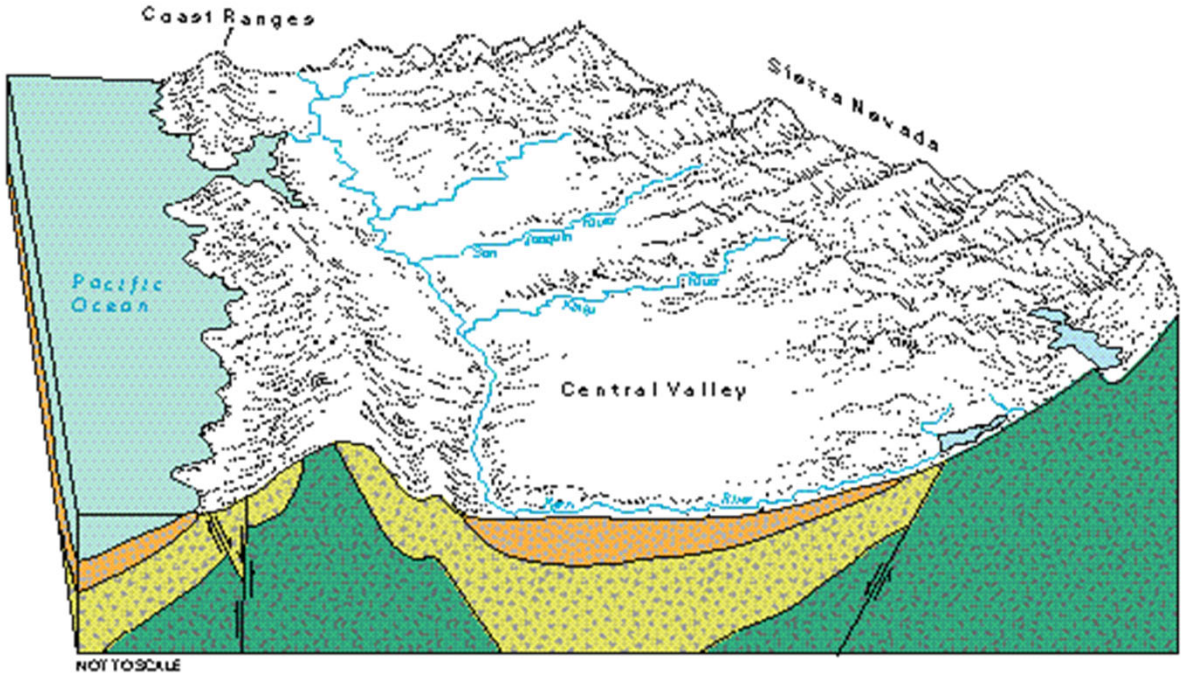
Deep, sediment filled basin.

- Over 3,000 feet deep in places
- Originally an ancient sea
- Contains marine and non-marine sediments sourced from the Sierra Nevada and Costal ranges

Highly Variable Ground Water levels

- In excess of 200’ deep in the study area





Background

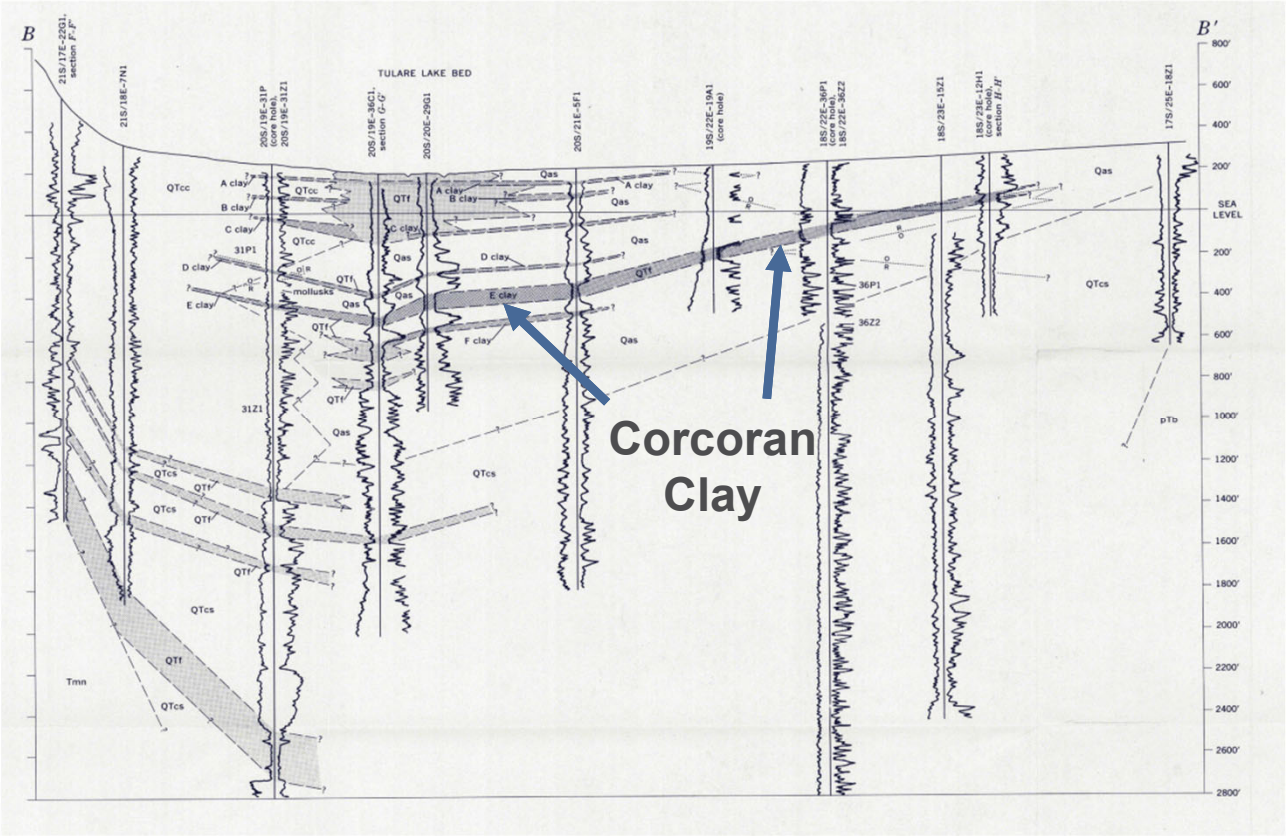
Sediments consist of varying layers of gravel, sand, silt, and clay

Upper unconsolidated sediments known as Tulare formation

- Contains thick layers of clay from lacustrine, flood, and marsh deposits
- The most prominent of these layers is the Corcoran clay

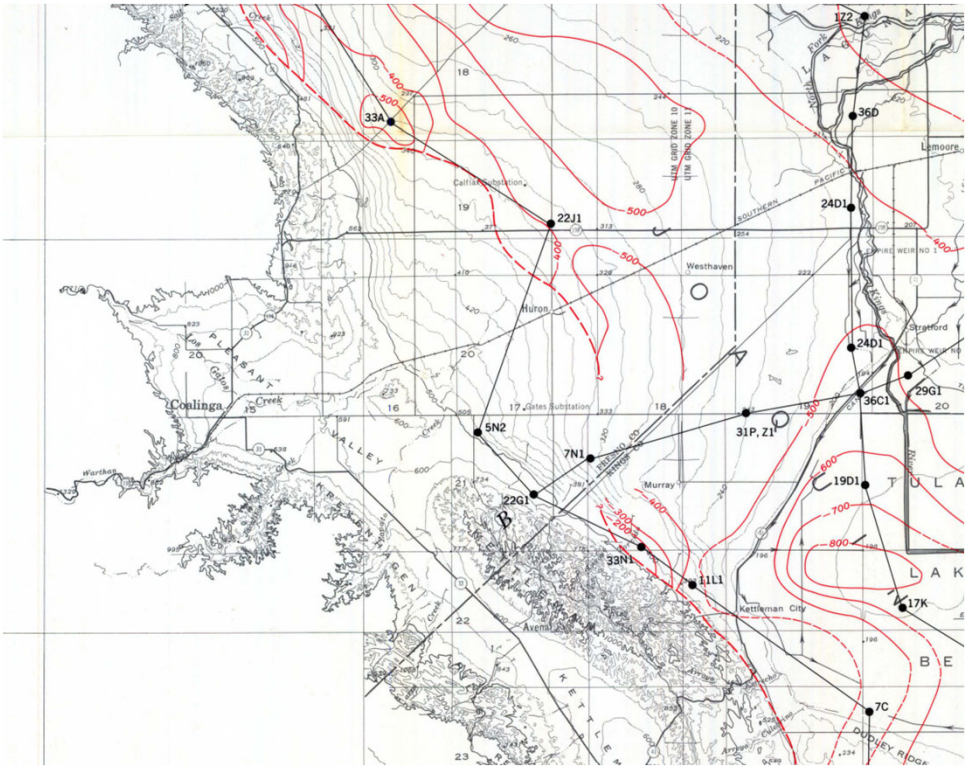
Corcoran Clay serves as the main confining layer between the upper and lower aquifers for the Westlands Water District

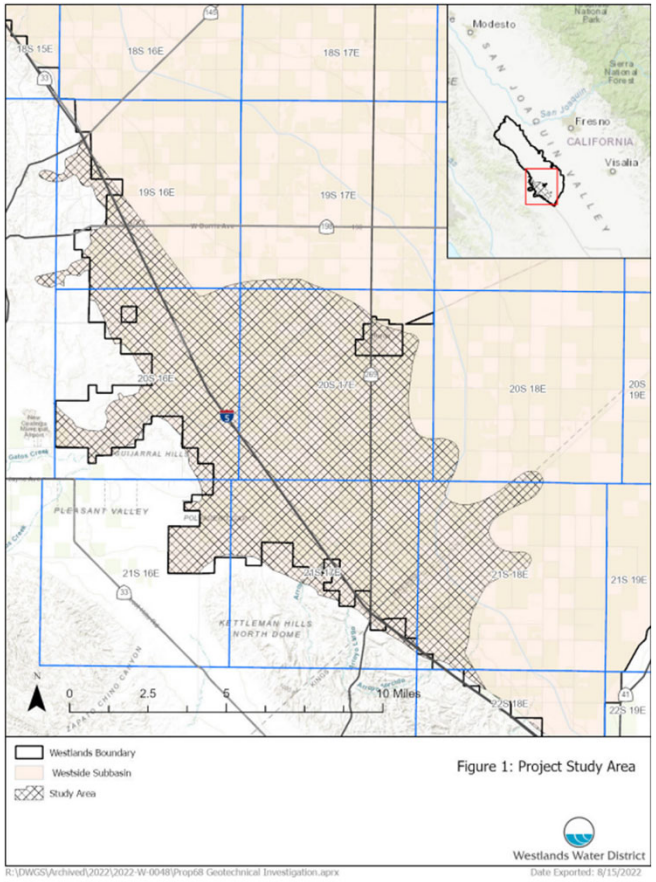
- In order for recharge to occur in the lower aquifer, water must infiltrate around the Corcoran Clay



Background

According to prior USGS studies, well logs, and other data available to Westlands, the Corcoran Clay is not present in most of the study area





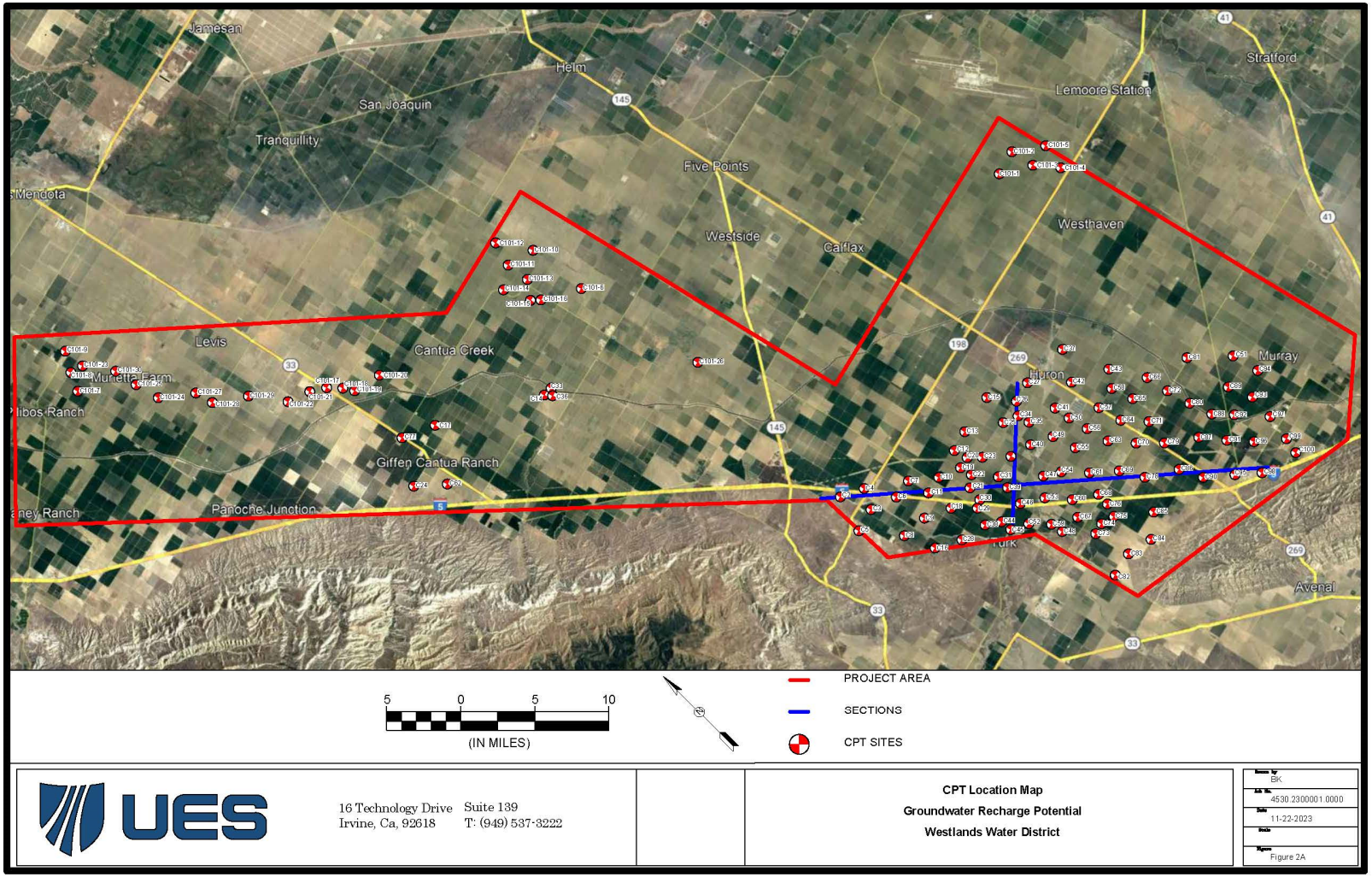
Implications

Water infiltrated from the study area can potentially be used to recharge the lower aquifer

Investigation

128 CPTs to a target depth of 100’ below ground
10 Soil borings to a target depth 100’ below ground
10 Surficial infiltration tests with a double ring infiltrometer

CPT Results

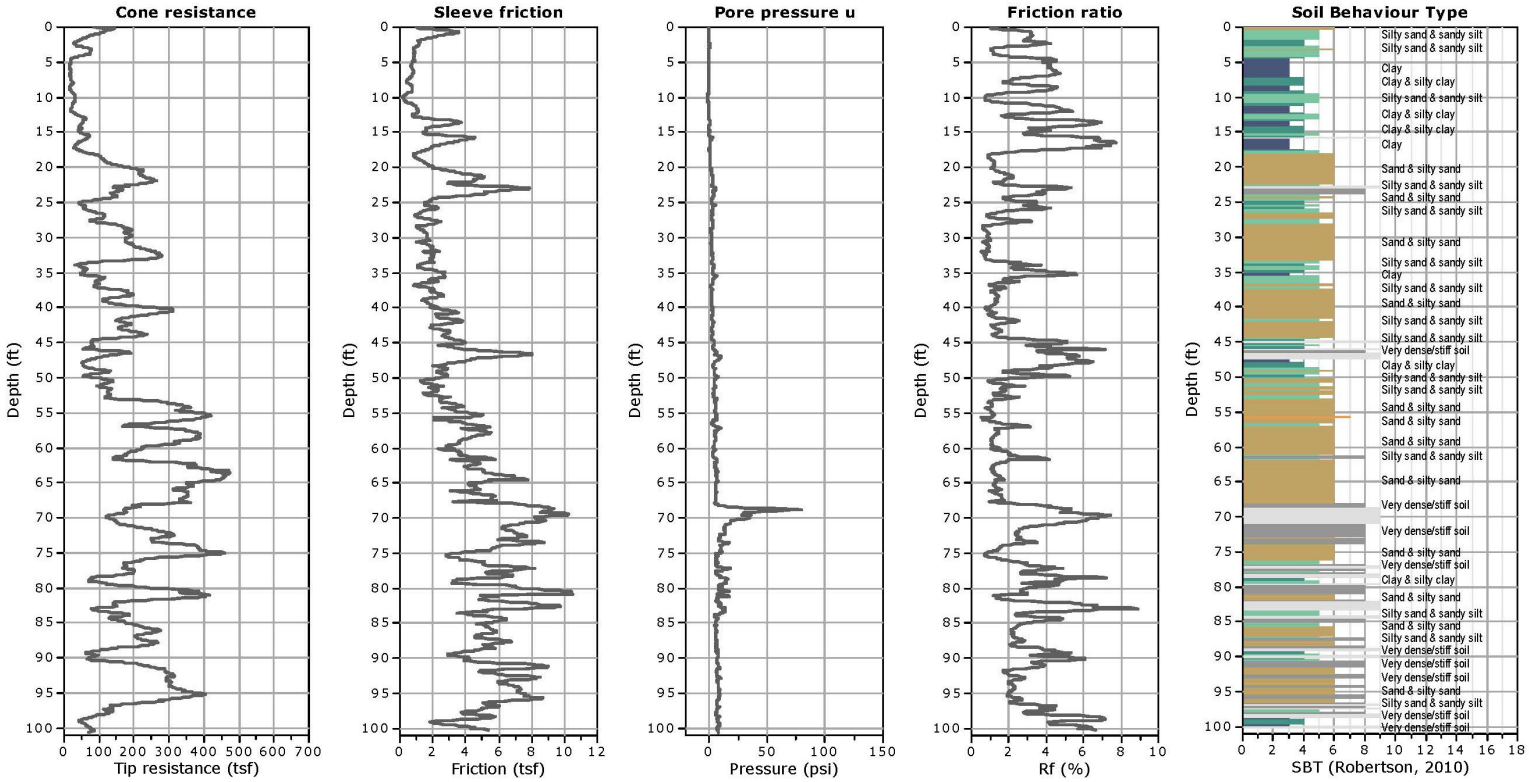

Jamesan
Helm
San Joaquin
Tranquillity
Five Points
Lemoore Station
Stratford
Westside
Calflax
Westhaven
Levis
Cantua Creek
Murrieta Farm
Huron
Murray
Giffen Cantua Ranch
Panoche Junction
Avenal
PROJECT AREA
SECTIONS
CPT SITES
5 0 5 10
(IN MILES)
UES
16 Technology Drive Suite 139
Irvine, Ca, 92618 T: (949) 537-3222
CPT Location Map
Groundwater Recharge Potential
Westlands Water District
BK
4530.2300001.0000
11-22-2023
Figure 2A

CPTs

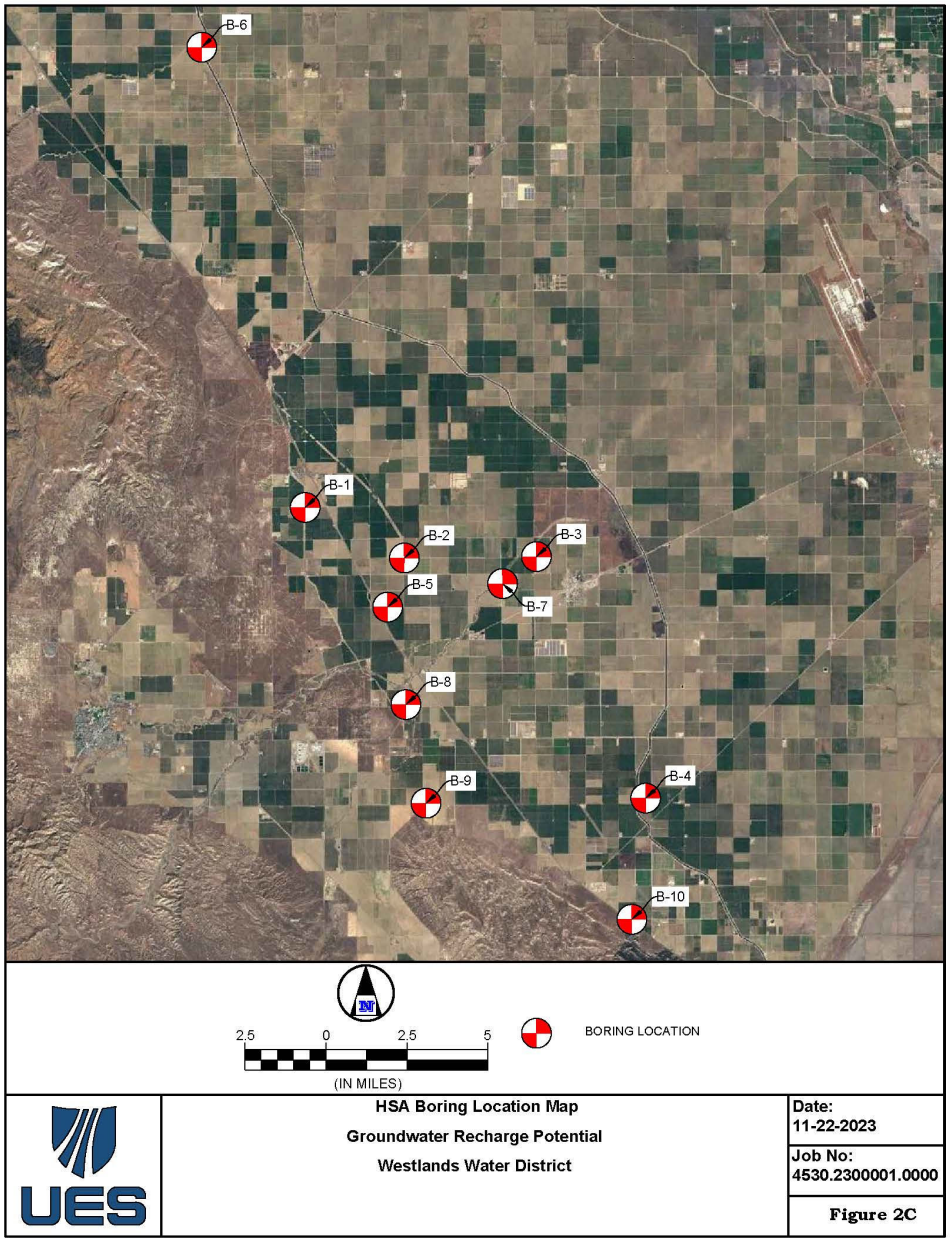
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Universal Engineering Services / Westlands Geotechnical Investigation**
Location: **Turk, CA**

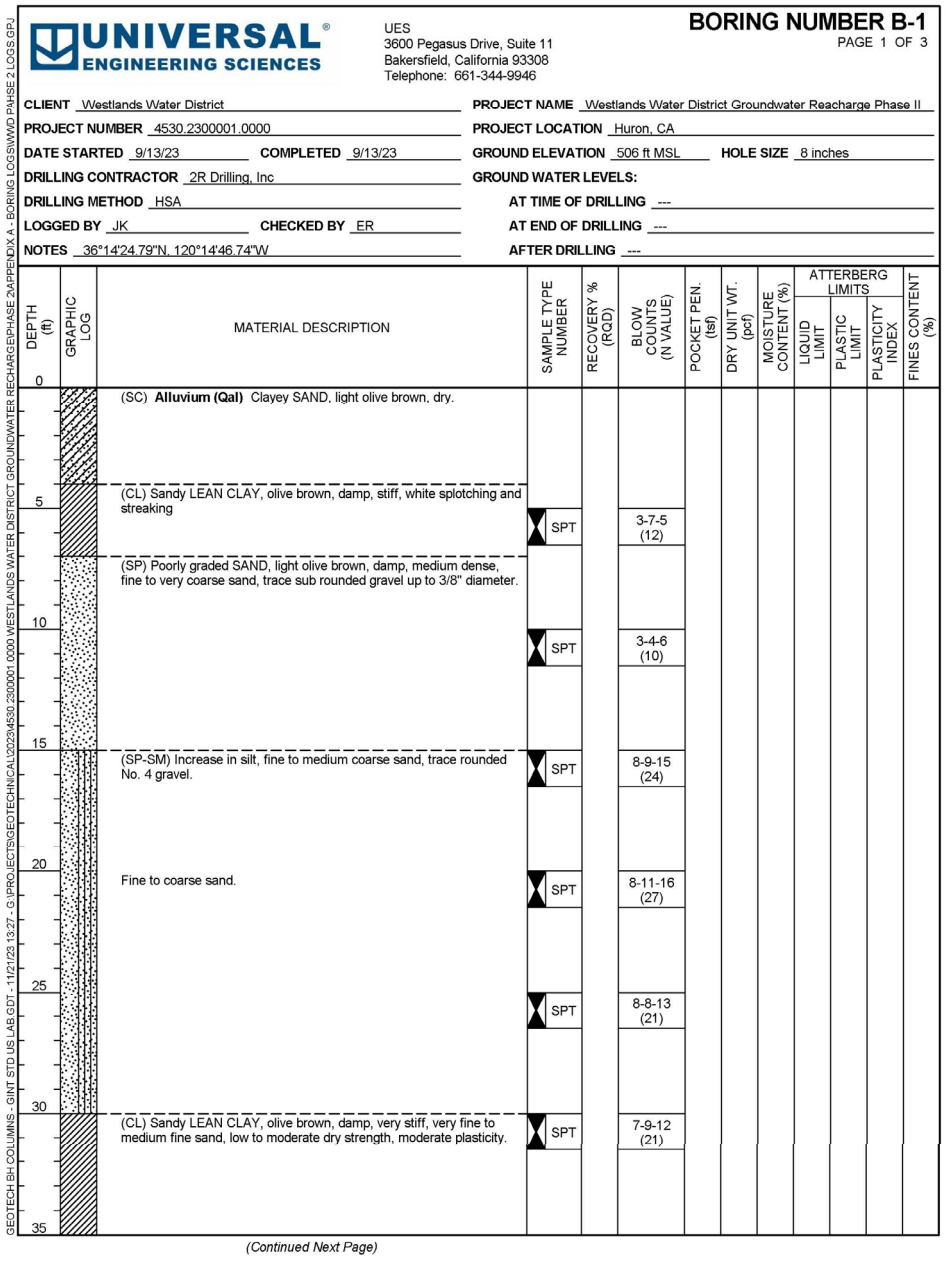
CPT-7
Total depth: 100.53 ft, Date: 5/1/2023



Borings


B-6
B-1
B-2
B-3
B-5
B-7
B-8
B-9
B-4
B-10
2.5
0
2.5
5
(IN MILES)
BORING LOCATION
UES
HSA Boring Location Map
Groundwater Recharge Potential
Westlands Water District
Date:
11-22-2023
Job No:
4530.2300001.0000
Figure 2C

Borings



UNIVERSAL ENGINEERING SCIENCES

UES
3600 Pegasus Drive, Suite 11
Bakersfield, California 93308
Telephone: 661-344-9946

BORING NUMBER B-1
PAGE 1 OF 3

CLIENT Westlands Water District
PROJECT NAME Westlands Water District Groundwater Reacharge Phase II
PROJECT NUMBER 4530.2300001.0000
PROJECT LOCATION Huron, CA
DATE STARTED 9/13/23 **COMPLETED** 9/13/23
GROUND ELEVATION 506 ft MSL **HOLE SIZE** 8 inches
DRILLING CONTRACTOR 2R Drilling, Inc
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY JK **CHECKED BY** ER
AT END OF DRILLING ---
NOTES 36°14'24.79"N, 120°14'46.74"W
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(SC) **Alluvium (Qal)** Clayey SAND, light olive brown, dry.										
5		(CL) Sandy LEAN CLAY, olive brown, damp, stiff, white splotching and streaking	SPT		3-7-5 (12)							
10		(SP) Poorly graded SAND, light olive brown, damp, medium dense, fine to very coarse sand, trace sub rounded gravel up to 3/8" diameter.	SPT		3-4-6 (10)							
15		(SP-SM) Increase in silt, fine to medium coarse sand, trace rounded No. 4 gravel.	SPT		8-9-15 (24)							
20		Fine to coarse sand.	SPT		8-11-16 (27)							
25			SPT		8-8-13 (21)							
30												
35		(CL) Sandy LEAN CLAY, olive brown, damp, very stiff, very fine to medium fine sand, low to moderate dry strength, moderate plasticity.	SPT		7-9-12 (21)							

(Continued Next Page)

Surficial Infiltration Test Results

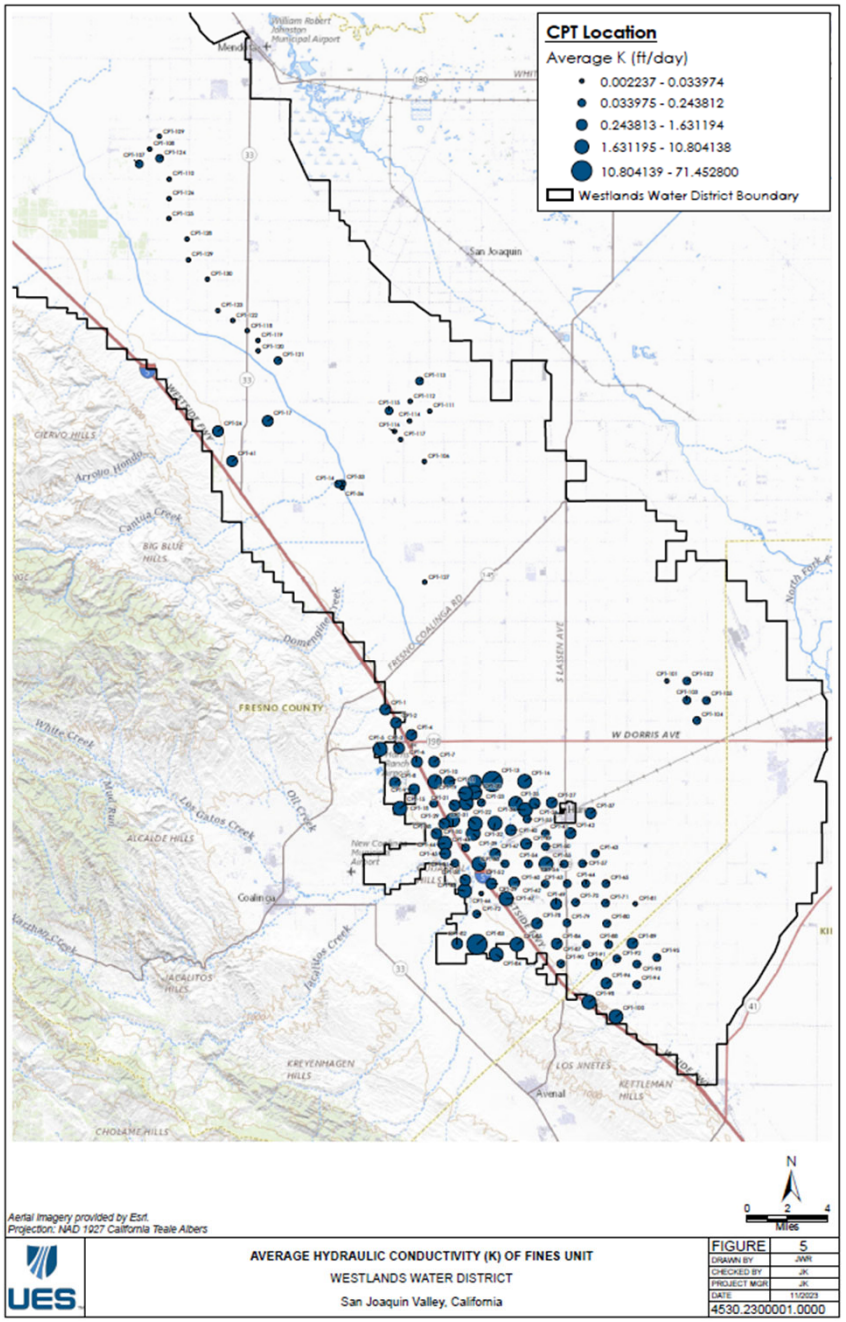
Factors affecting surficial infiltration:

- Sediment type
- Sediment density
- Disturbed vs undisturbed ground

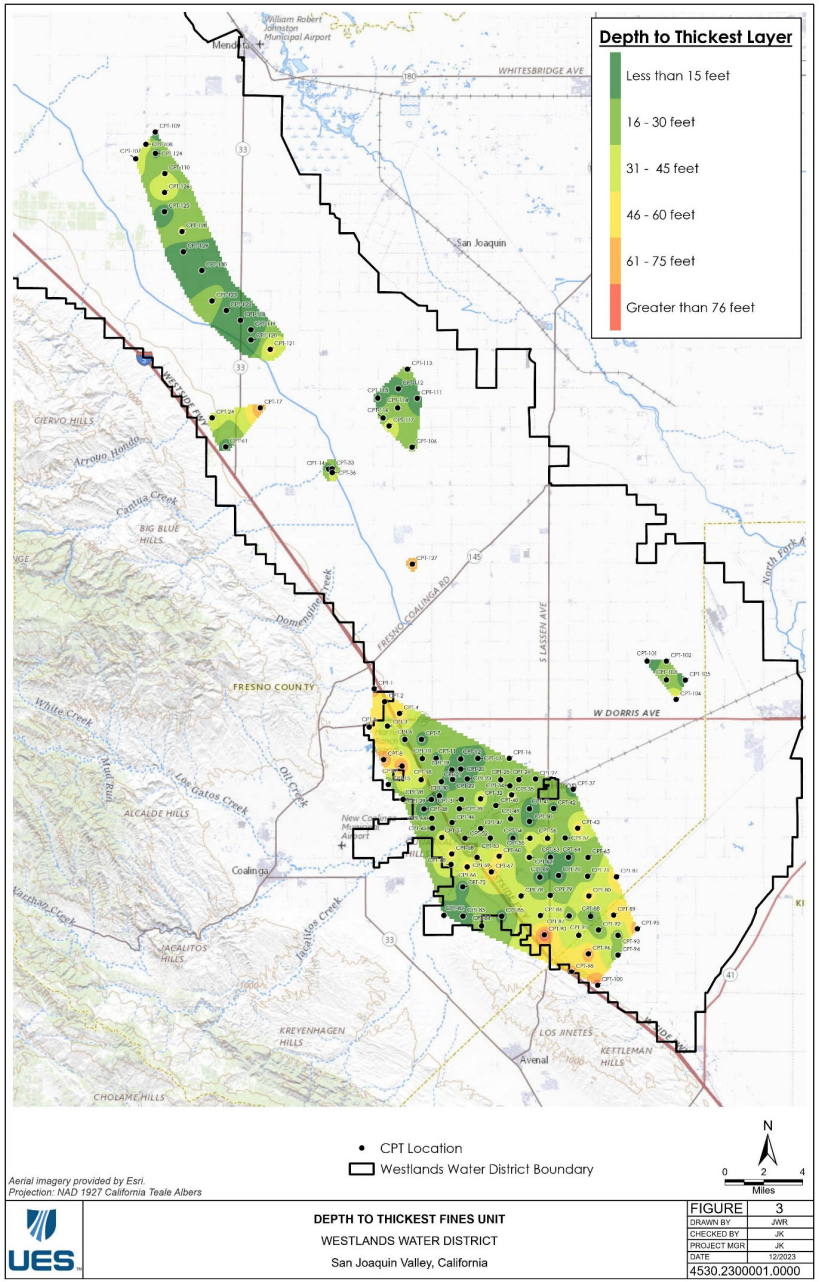
Table 1: Summary of Surficial Permeability values

CPT Name	Average K (ft/day)	Soils Classification
B-1	0.72	Clayey Sand/Sandy Clay
B-2	0.13	Clay with Sand
B-3	1.92	Silty Clayey Sand
B-4	0.48	Clay with Sand
B-5	0.25	Clay with Sand
B-6	2.88	Clay with Sand
B-7	0.48	Clay with Sand
B-8	2.50	Clay with Sand
B-9	1.92	Silty Clayey Sand
B-10	1.92	Silty Sand

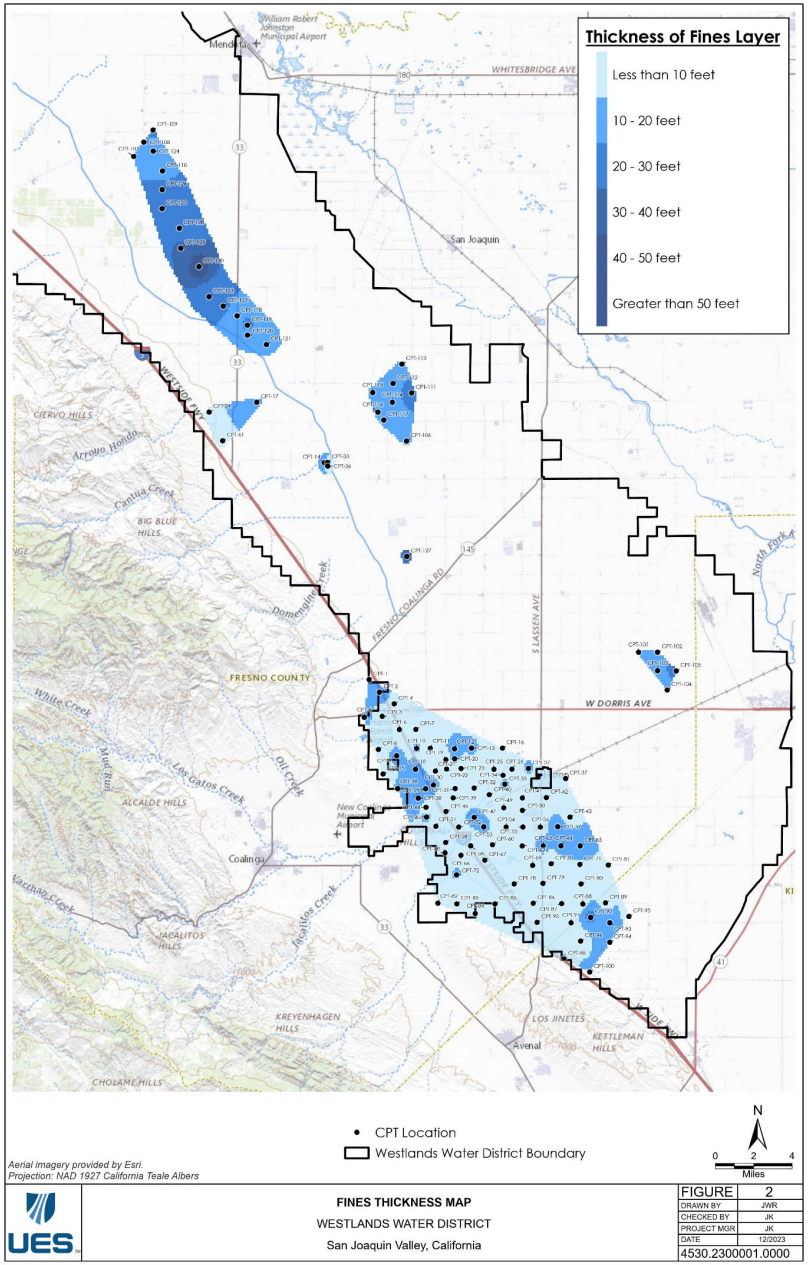
Subsurface Results



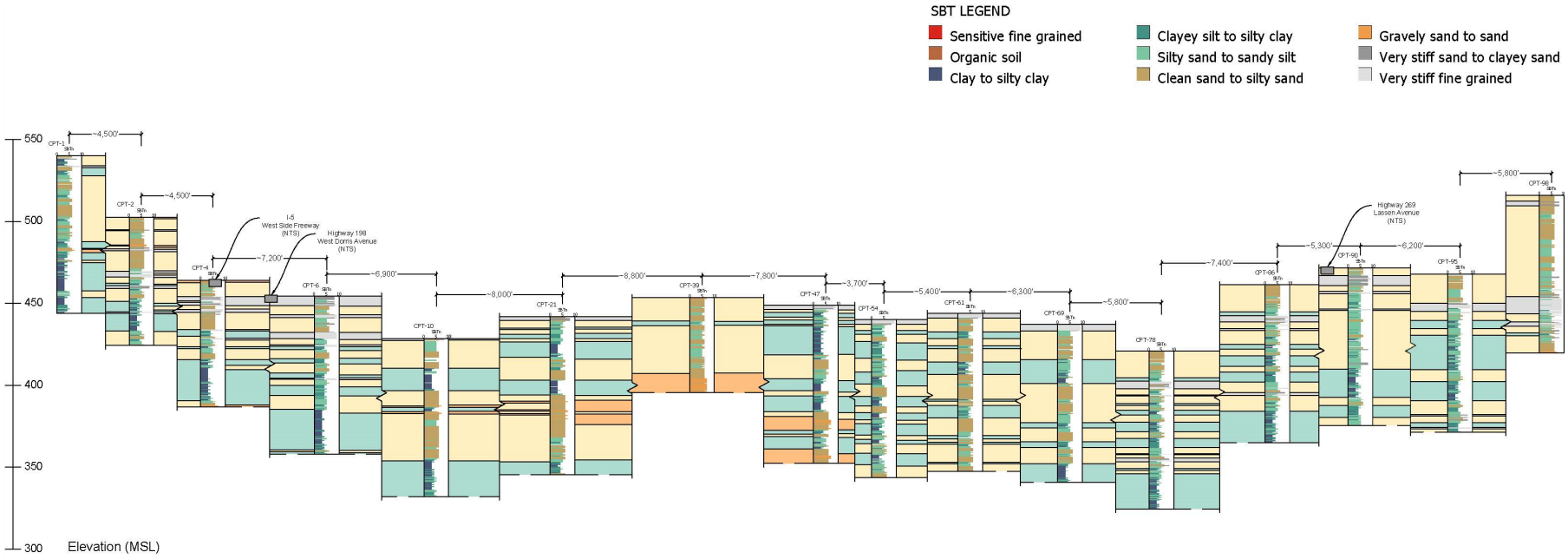
Subsurface Results

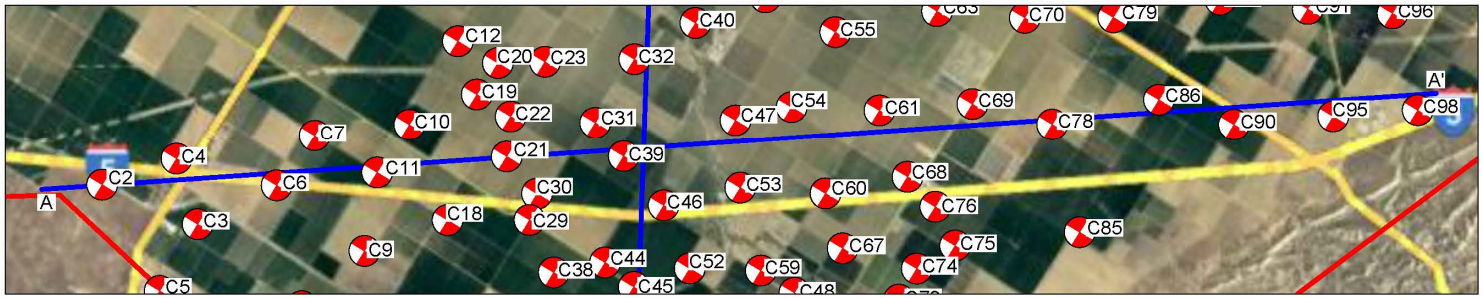


Subsurface Results

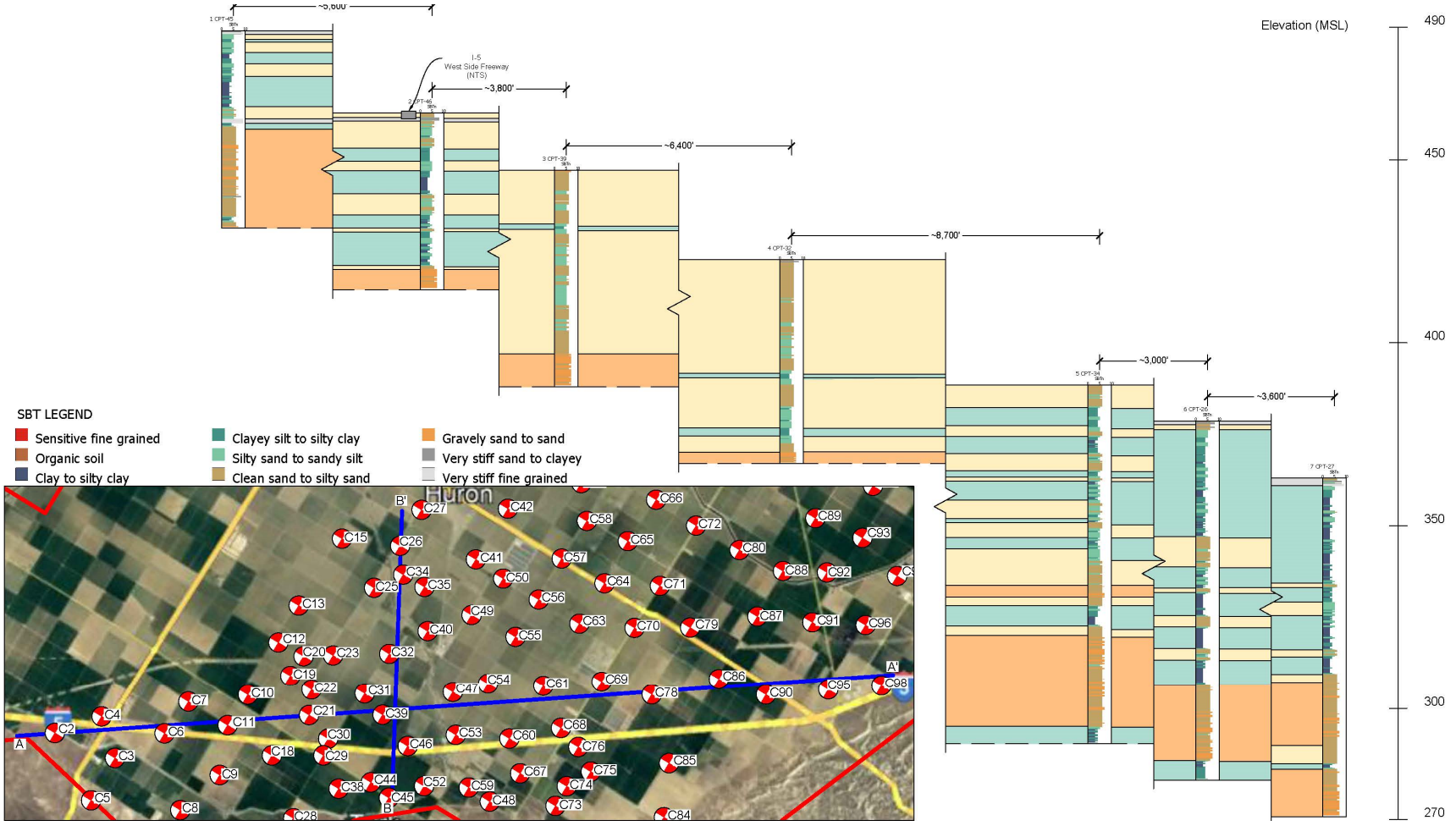


Subsurface Results



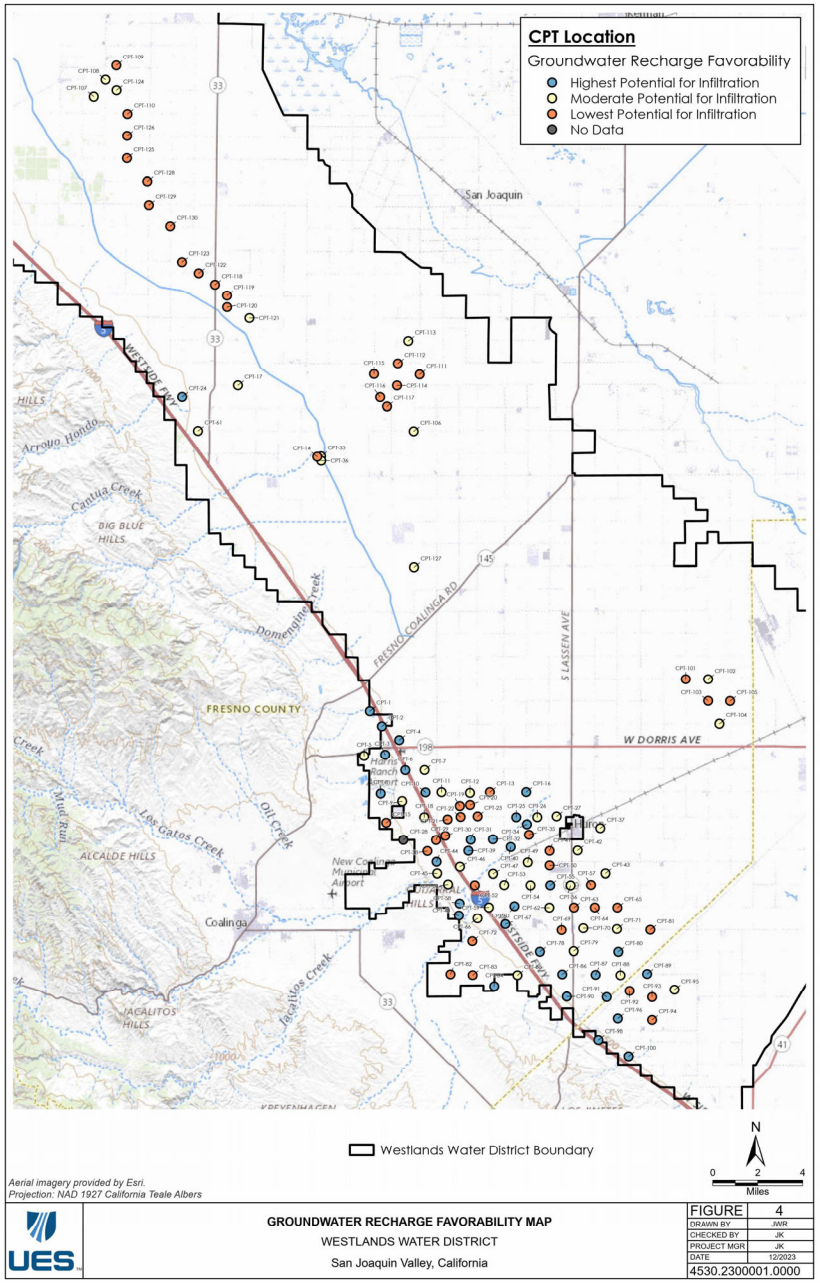


Subsurface Results



Conclusions

- Infiltration into the deeper subsurface should generally be possible in locations with high average permeabilities and thin surficial clay layers.
- Locations with the best conditions are most commonly found on the western limits of the study area and in a band just north of, and roughly parallel to Arroyo Creek.
- Any locations where surficial infiltration is to be used should first be scarified as deep as reasonably possible to break up hard, compacted sediments that would be less permeable.
- Certain locations with unfavorable infiltration potential due to thick surficial clays, may become highly favorable with the development of facilities that would allow water to pass through these clays.



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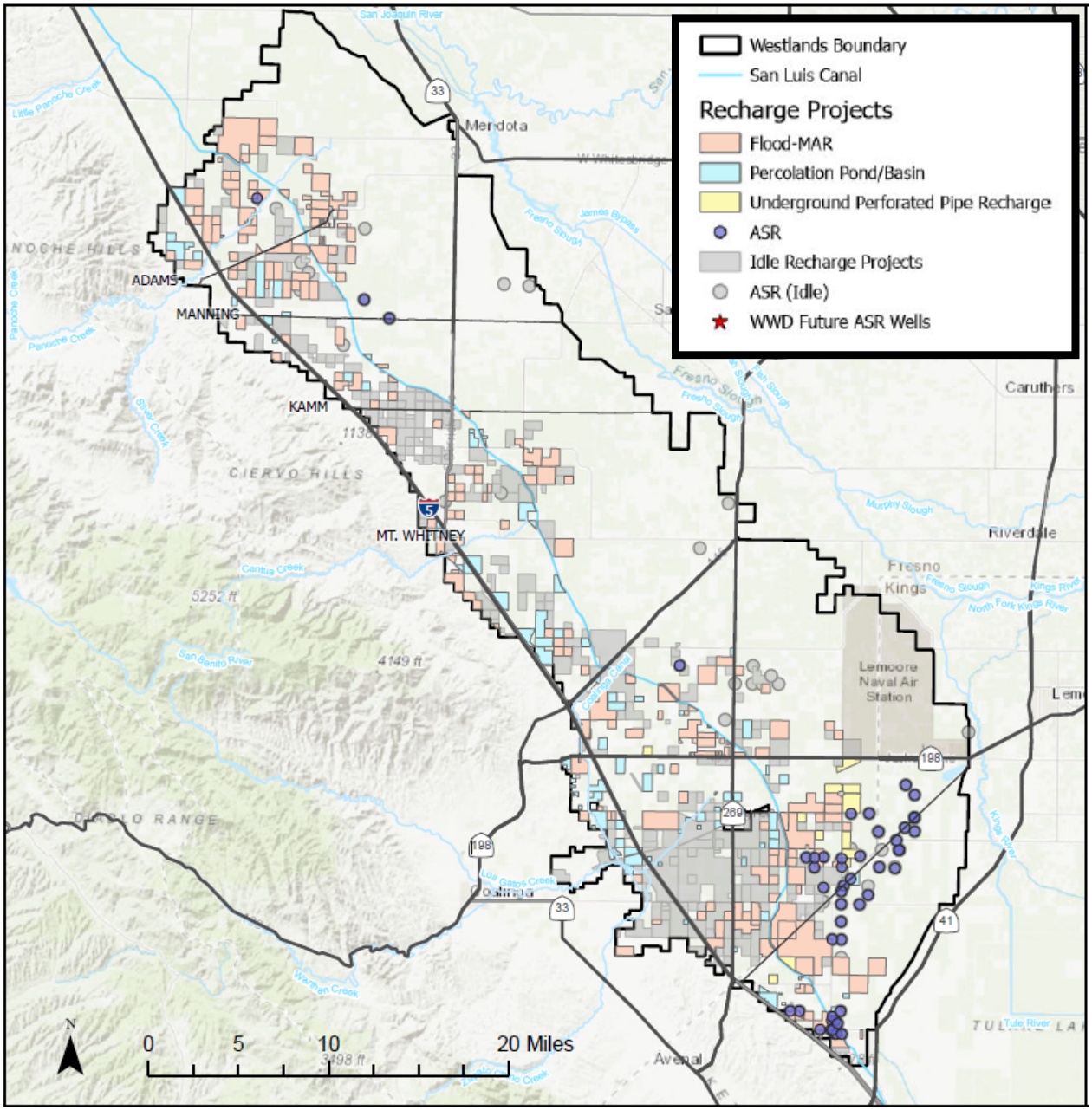
Westlands Water District

World leaders in water conservation

Questions

Item 5- GW Recharge Update

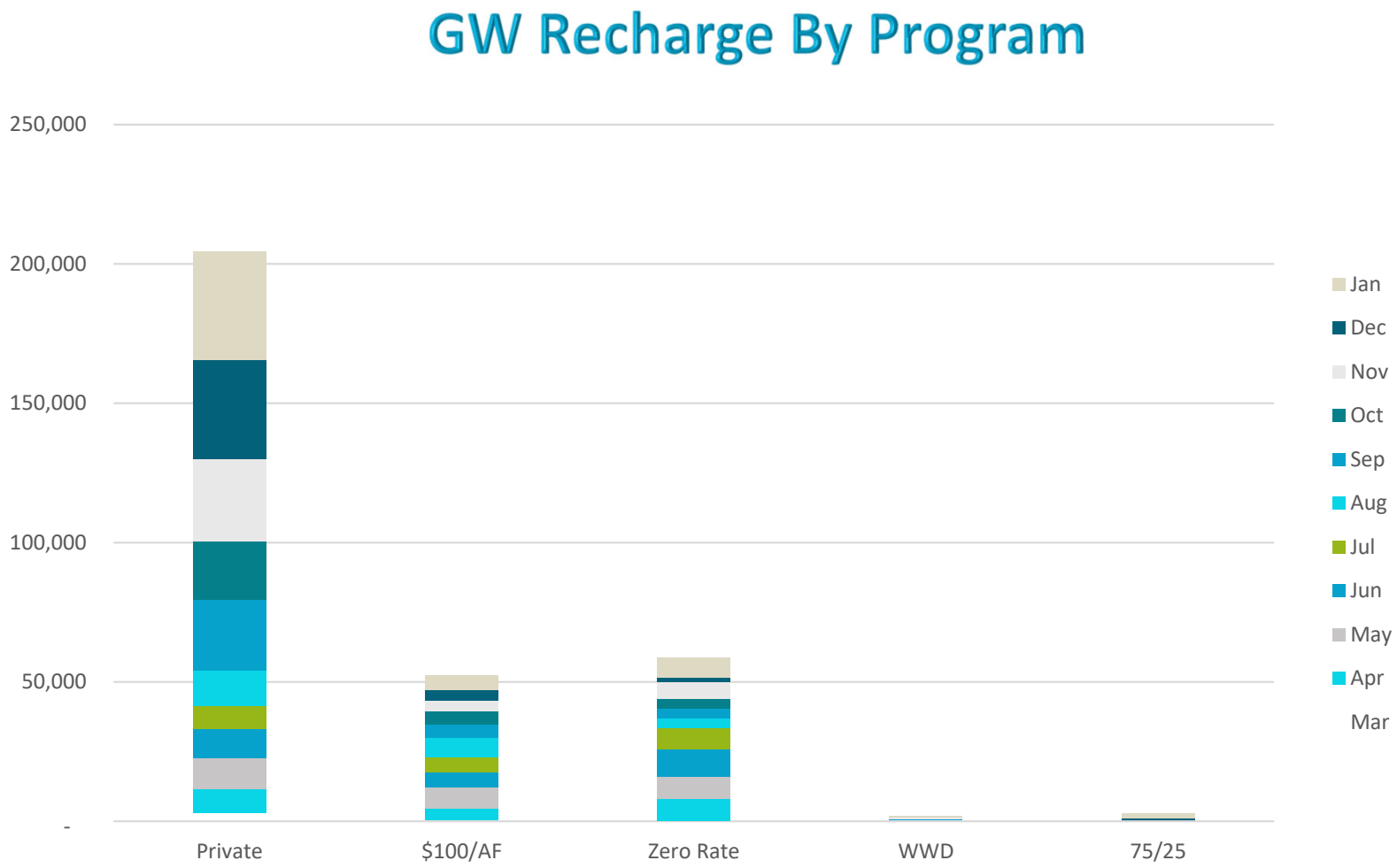


February Stats

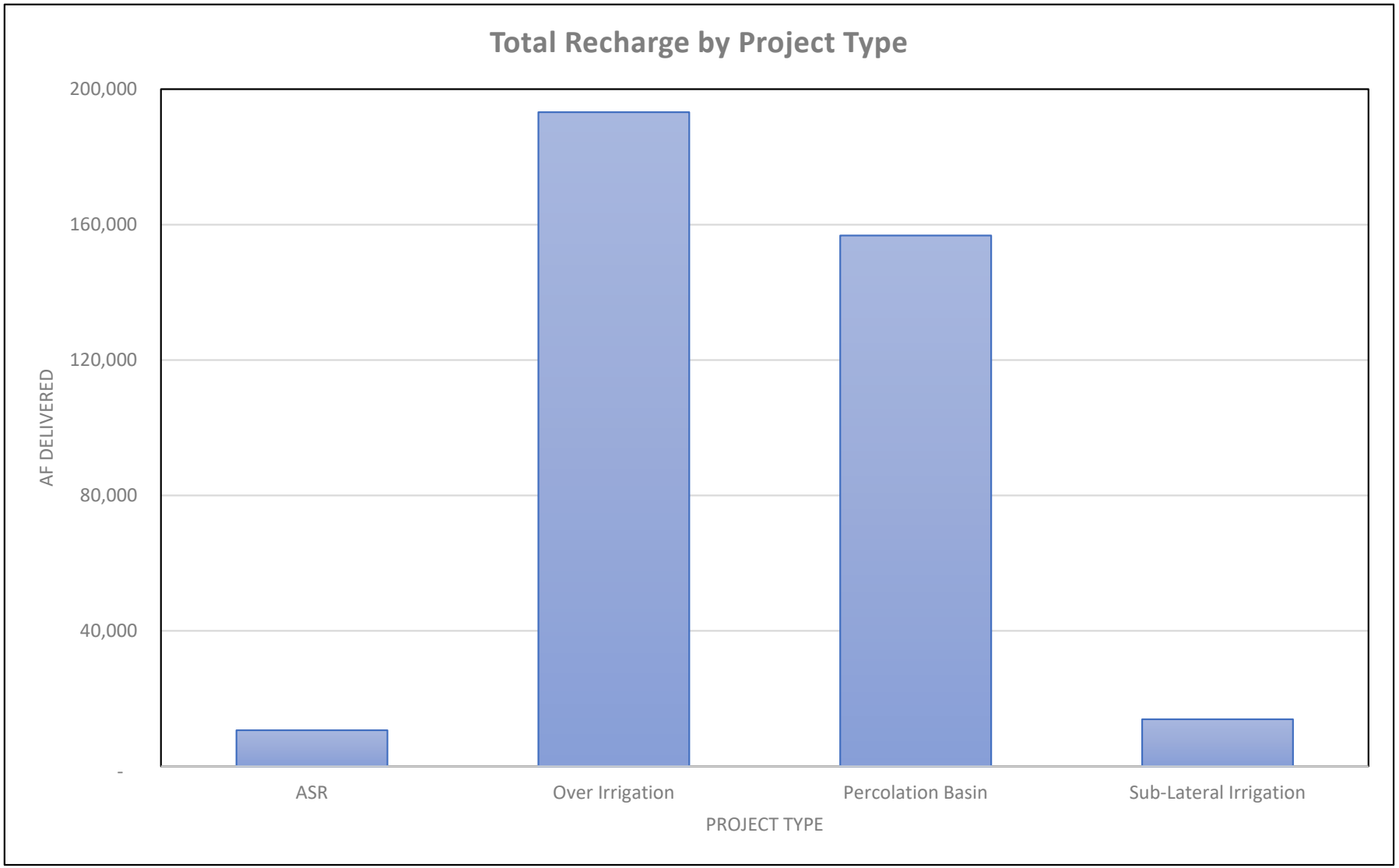
- 260 Active Projects
- 31 TAF of Active Recharge

WWD

Item 5- GW Recharge Update



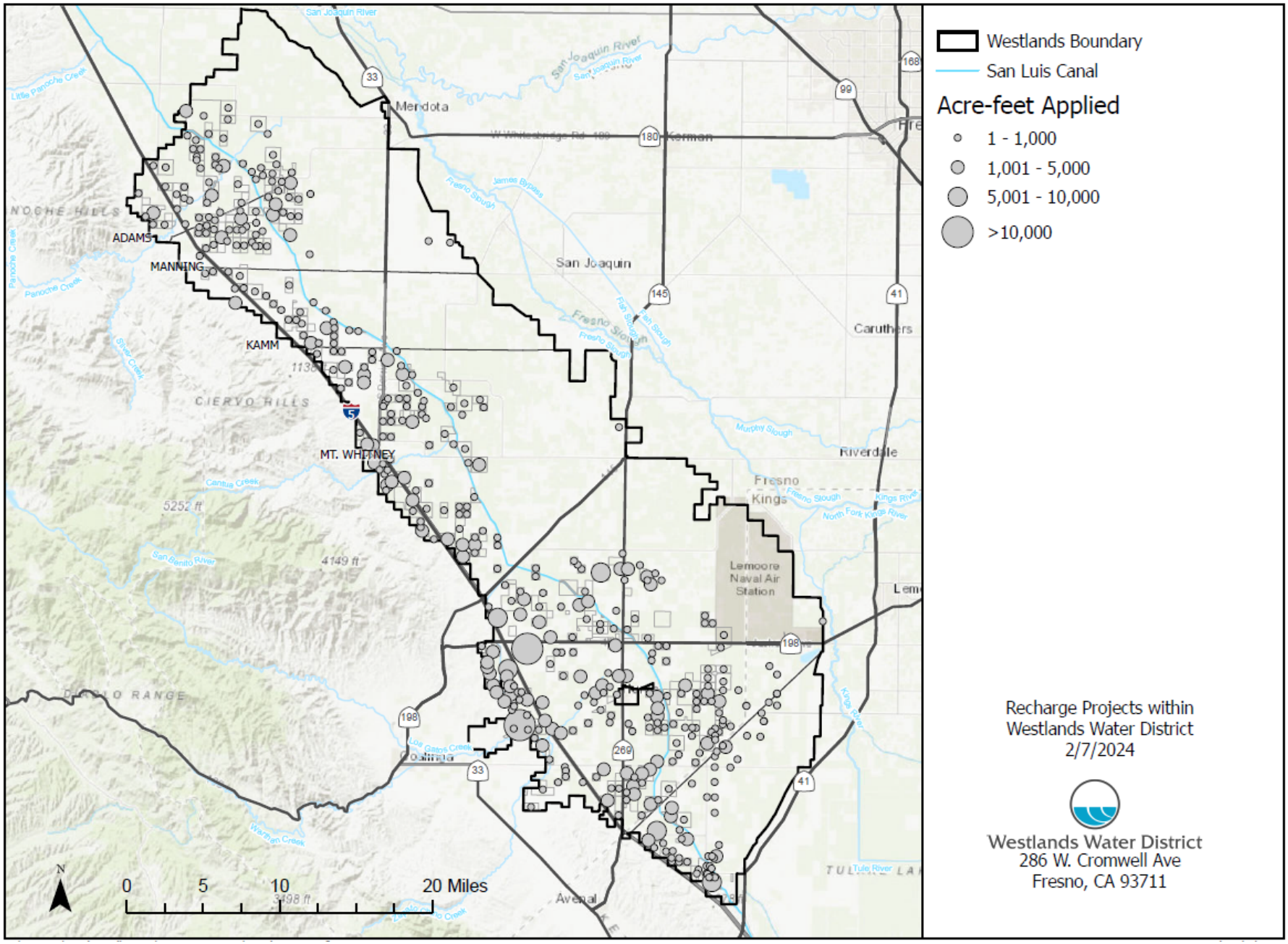
2023 Recharge Stats to date



**Note: Chart represents AF Applied to Recharge Project*

WWD

Item 5 - GW Recharge Update



Recharge Projects within
Westlands Water District
2/7/2024

Westlands Water District
286 W. Cromwell Ave
Fresno, CA 93711

WWD

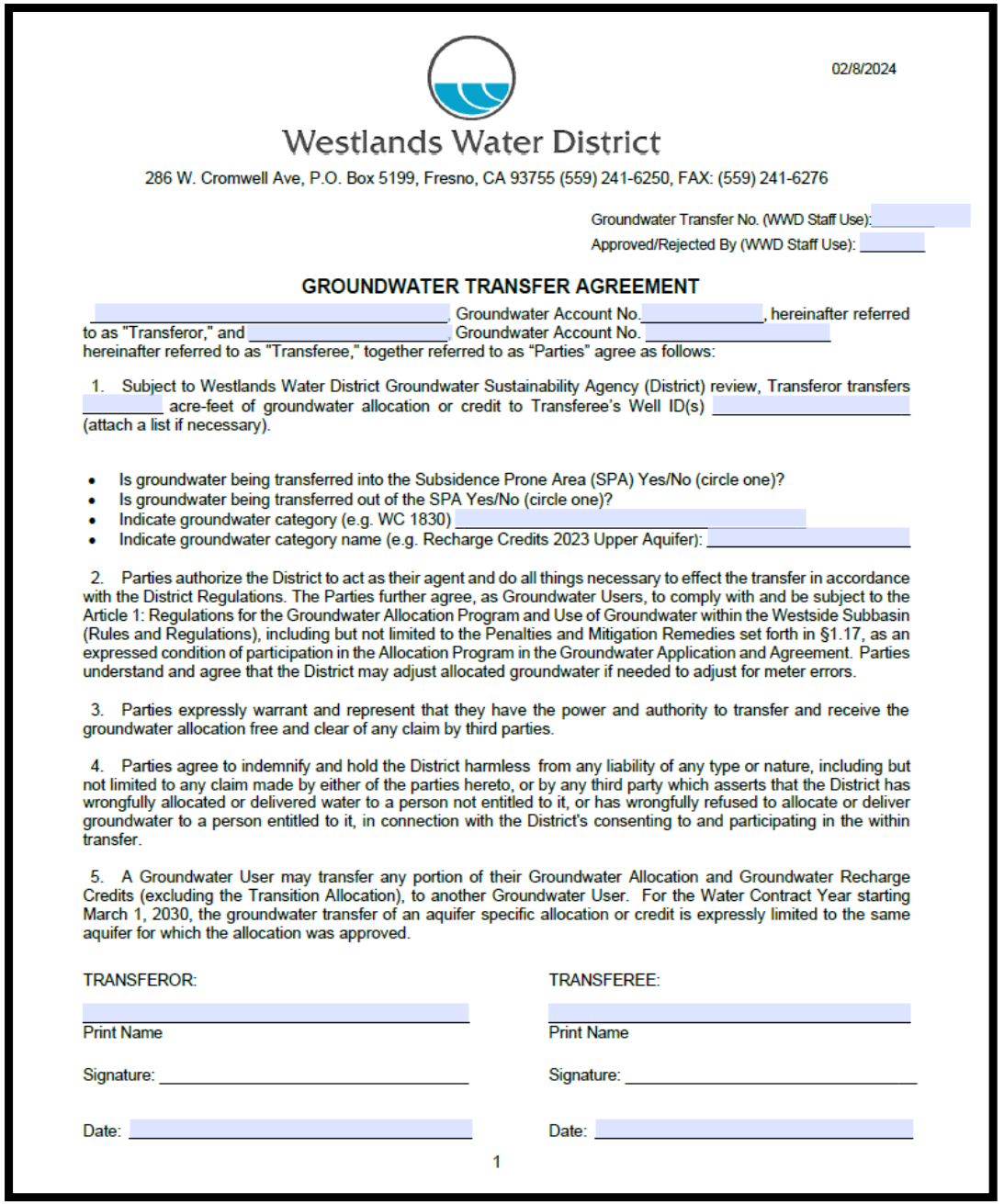
Item 5 - GW Recharge Update

- Total District Recharge (Present) = 347,000 AF
  Delivered for Recharge
  - 31,000 AF delivered in February
  - 115,000 AF delivered to Projects with WWD Agreements

- 2023 Groundwater Recharge Application
  - 2023 GW Application
- ASR Program
  - ASR Program Application
- Groundwater Recharge Guidance Document
  - Groundwater Recharge Guidance Document

Item 6: Update on the Groundwater Transfer Form

- GW Transfer Form Updated
- Simplified to reference Article 1
- Updated to reference errors related to meters



02/8/2024

Westlands Water District

286 W. Cromwell Ave, P.O. Box 5199, Fresno, CA 93755 (559) 241-6250, FAX: (559) 241-6276

Groundwater Transfer No. (WWD Staff Use):

Approved/Rejected By (WWD Staff Use):

GROUNDWATER TRANSFER AGREEMENT

_____ Groundwater Account No._____, hereinafter referred to as "Transferor," and _____ Groundwater Account No. _____ hereinafter referred to as "Transferee," together referred to as "Parties" agree as follows:

1. Subject to Westlands Water District Groundwater Sustainability Agency (District) review, Transferor transfers _____ acre-feet of groundwater allocation or credit to Transferee's Well ID(s) _____ (attach a list if necessary).

- Is groundwater being transferred into the Subsidence Prone Area (SPA) Yes/No (circle one)?
- Is groundwater being transferred out of the SPA Yes/No (circle one)?
- Indicate groundwater category (e.g. WC 1830) _____
- Indicate groundwater category name (e.g. Recharge Credits 2023 Upper Aquifer): _____

2. Parties authorize the District to act as their agent and do all things necessary to effect the transfer in accordance with the District Regulations. The Parties further agree, as Groundwater Users, to comply with and be subject to the Article 1: Regulations for the Groundwater Allocation Program and Use of Groundwater within the Westside Subbasin (Rules and Regulations), including but not limited to the Penalties and Mitigation Remedies set forth in §1.17, as an expressed condition of participation in the Allocation Program in the Groundwater Application and Agreement. Parties understand and agree that the District may adjust allocated groundwater if needed to adjust for meter errors.

3. Parties expressly warrant and represent that they have the power and authority to transfer and receive the groundwater allocation free and clear of any claim by third parties.

4. Parties agree to indemnify and hold the District harmless from any liability of any type or nature, including but not limited to any claim made by either of the parties hereto, or by any third party which asserts that the District has wrongfully allocated or delivered water to a person not entitled to it, or has wrongfully refused to allocate or deliver groundwater to a person entitled to it, in connection with the District's consenting to and participating in the within transfer.

5. A Groundwater User may transfer any portion of their Groundwater Allocation and Groundwater Recharge Credits (excluding the Transition Allocation), to another Groundwater User. For the Water Contract Year starting March 1, 2030, the groundwater transfer of an aquifer specific allocation or credit is expressly limited to the same aquifer for which the allocation was approved.

TRANSFEROR:

_____
Print Name

Signature: _____

Date: _____

TRANSFEREE:

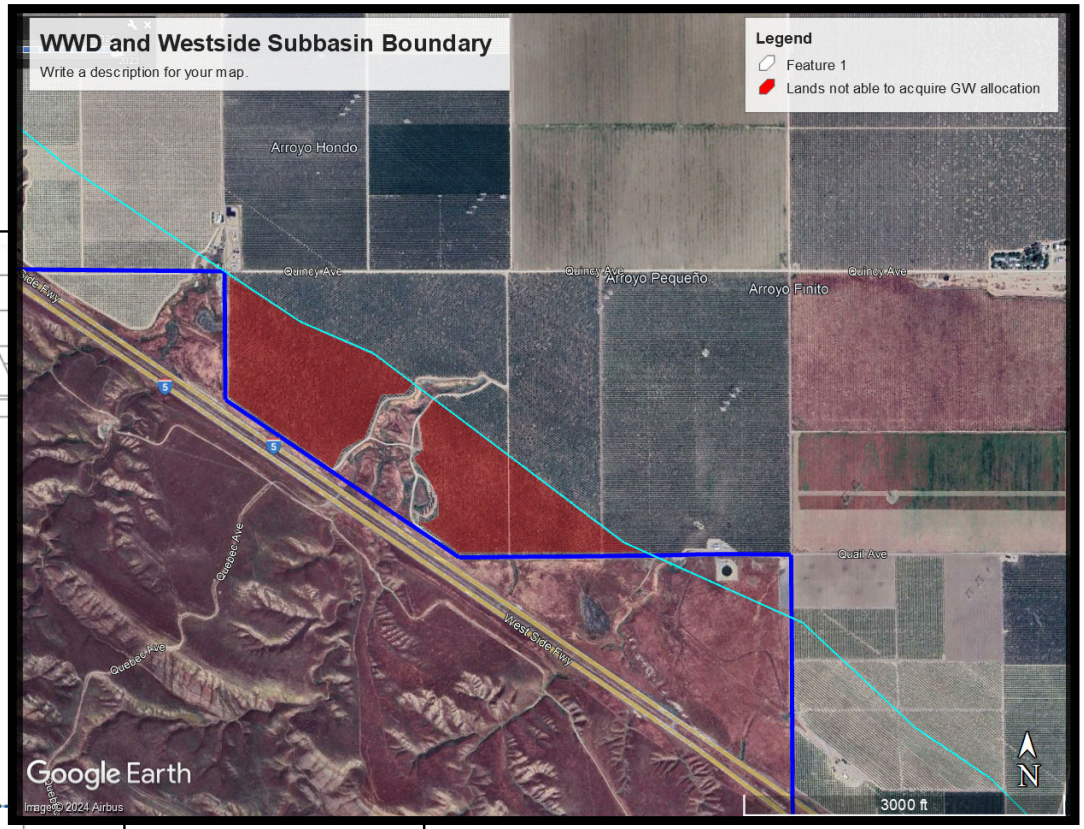
_____
Print Name

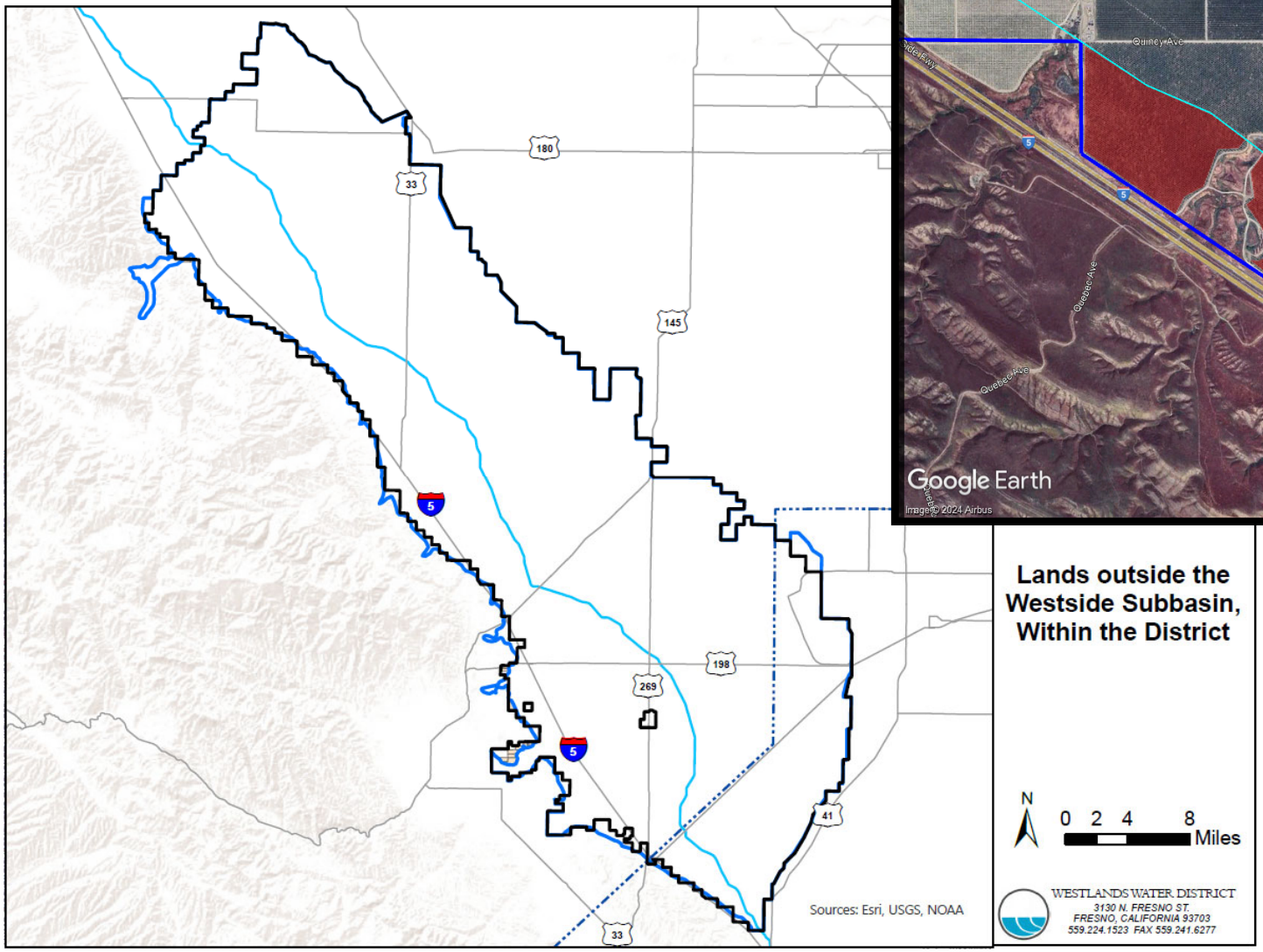
Signature: _____

Date: _____

1

Item 7: Potential Changes to the Westside Subbasin Boundary





Lands outside the Westside Subbasin, Within the District

N
0 2 4 8
Miles

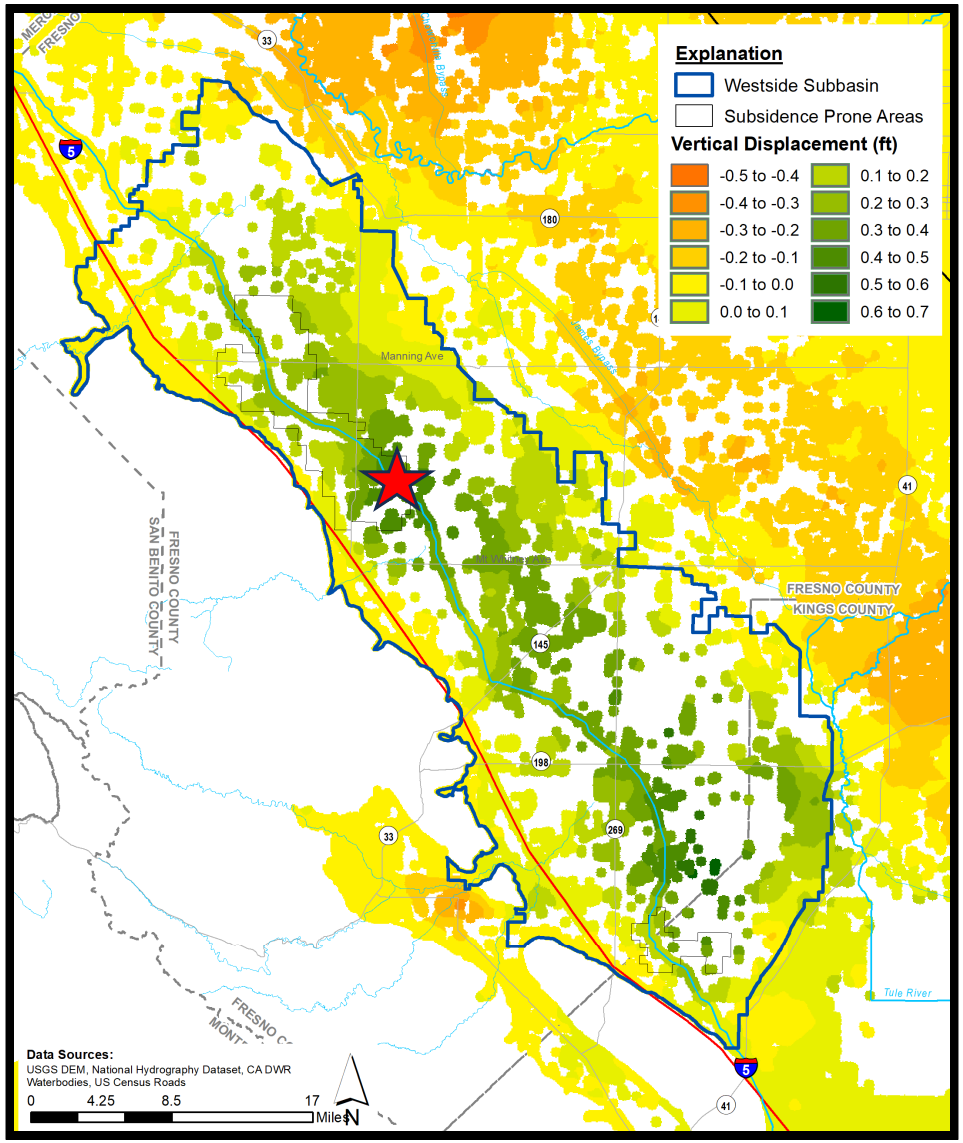
WESTLANDS WATER DISTRICT
3130 N. FRESNO ST.
FRESNO, CALIFORNIA 93703
559.224.1523 FAX 559.241.6277

WWD

Item 8: Addressing DWR Corrective Actions on the Westside Subbasin GSP

Westlands Water District

Subsidence since 2022 GSP Amendment



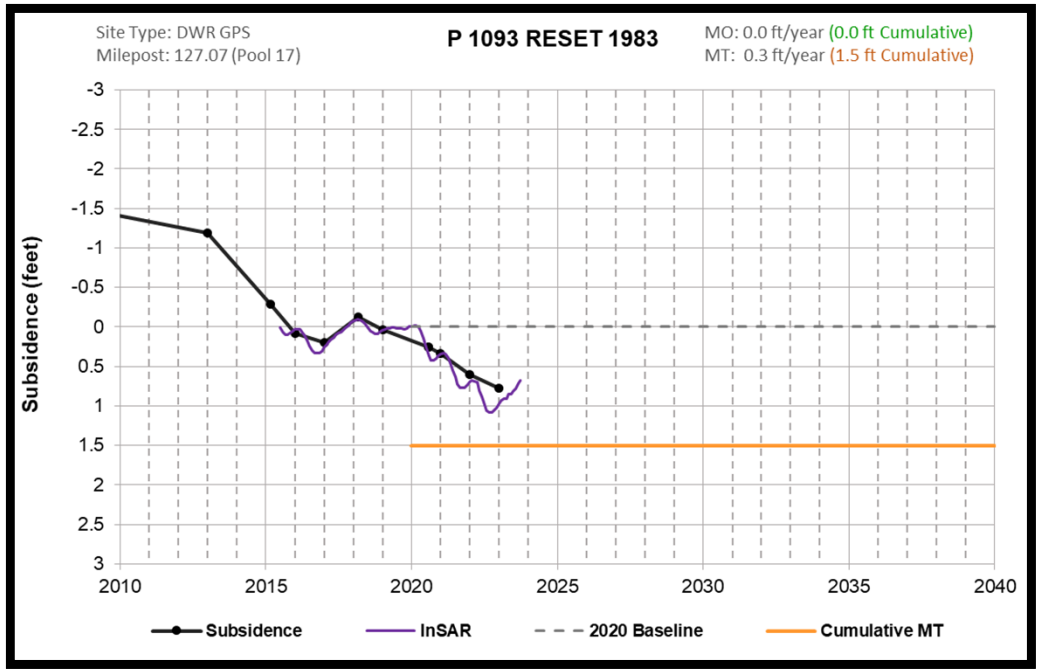
Vertical Displacement October 2022-October 2023

2022

- Historically high land subsidence in fall 2022

2023

- 100% CVP Allocation
- ~300,000 AF of aquifer recharge from ASR, infiltration basins and floodMAR
- Minimal GW pumping
- Elastic rebound in land subsidence throughout 2023



SMCs & Undesirable Results

Westlands Water District

Corrective Action	Preliminary Proposed Response
9(a) …undesirable results associated with rates of subsidence should be tied to exceedances at individual sites along the San Luis Canal rather than requiring exceedances at multiple sites.	• Tie Undesirable Results (UR) to individual sites along SLC.
9(a) Undesirable results related to rates for these areas should be evaluated at a temporal resolution that captures intra-annual (e.g., quarterly, or monthly) as well as annual changes.	• Evaluate total subsidence instead of inelastic subsidence. • Evaluate subsidence at seasonal high when SLC conveyance is most impacted (see next slide).
9(c) Revise the rate and cumulative minimum thresholds in areas adjacent to the San Luis Canal, based on available freeboard in segments of the San Luis Canal, to minimize or eliminate potential for encroachment of freeboard.	• Revise MT based on available freeboard (see next slide).

SMCs & Undesirable Results

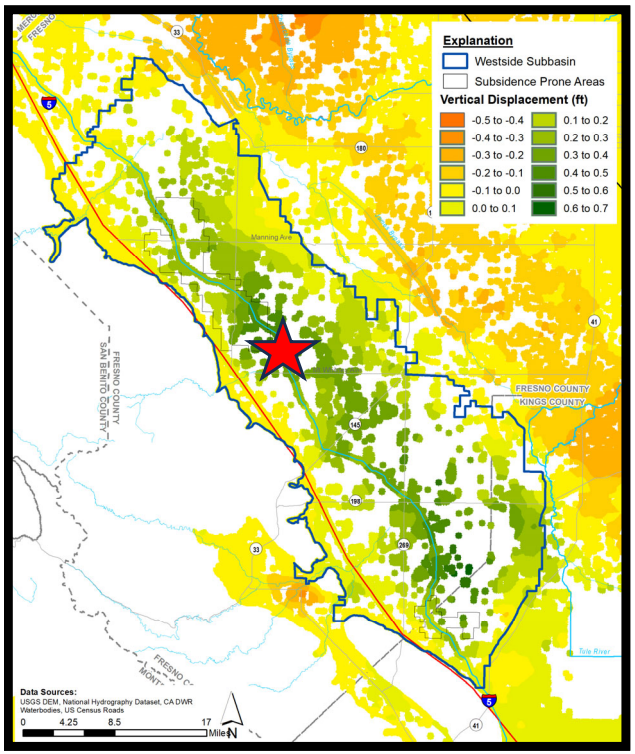
Westlands Water District

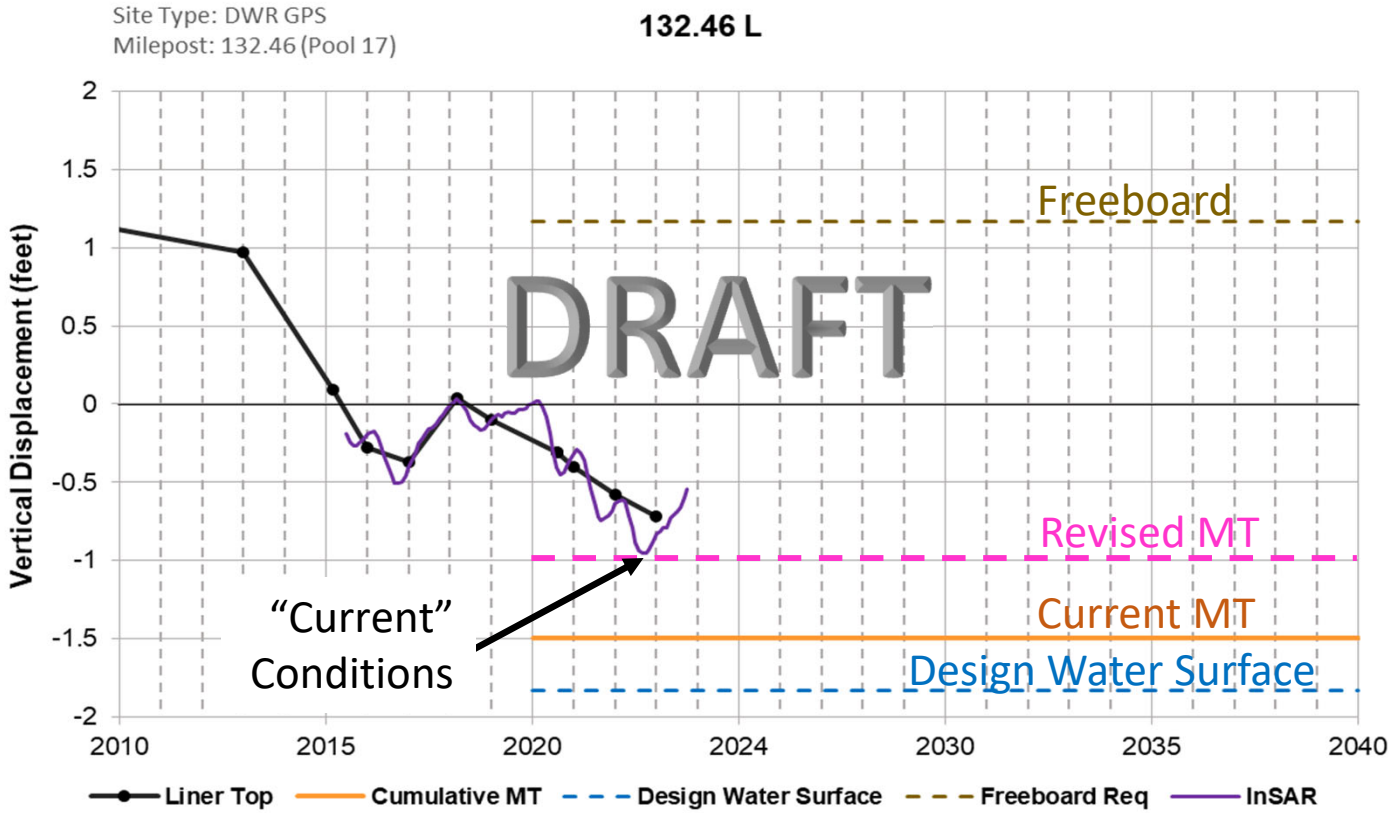
Corrective Action

9(c) For areas along the San Luis Canal that already are experiencing undesirable results (i.e., where freeboard encroachments are already occurring), revise the rate and cumulative minimum thresholds for subsidence to minimize or eliminate any further subsidence where these significant negative impacts are already occurring, or alternatively, propose and describe mitigation for the substantial interference to the San Luis Canal caused by additional, future subsidence.

Preliminary Proposed Response

- Establish MT based on "current conditions" in impaired areas of the SLC.
- Evaluation of conditions in terms of total subsidence (inelastic + elastic) at greater frequency.





Monitoring

Westlands Water District

Corrective Action

11(c) Where feasible, increase the frequency and evaluation of subsidence and compaction monitoring at extensometers and GPS benchmarks in sensitive areas to detect potential subsidence rate increases more rapidly.

11(a) Establish methods for the use of InSAR data as it becomes available, to quickly identify locations where subsidence rates may be increasing.

Discussion Topic

- Utilize quarterly InSAR for increased frequency.
- Increase frequency of evaluation internally.
- Include Subsidence in Annual Reporting to DWR.
- Coordinate with California Aqueduct Subsidence Program (CASP) branch of DWR to enhance monitoring along SLC.
- Consider additional monitoring at WWD sites to validate InSAR measurements.

QUESTIONS?

WWD