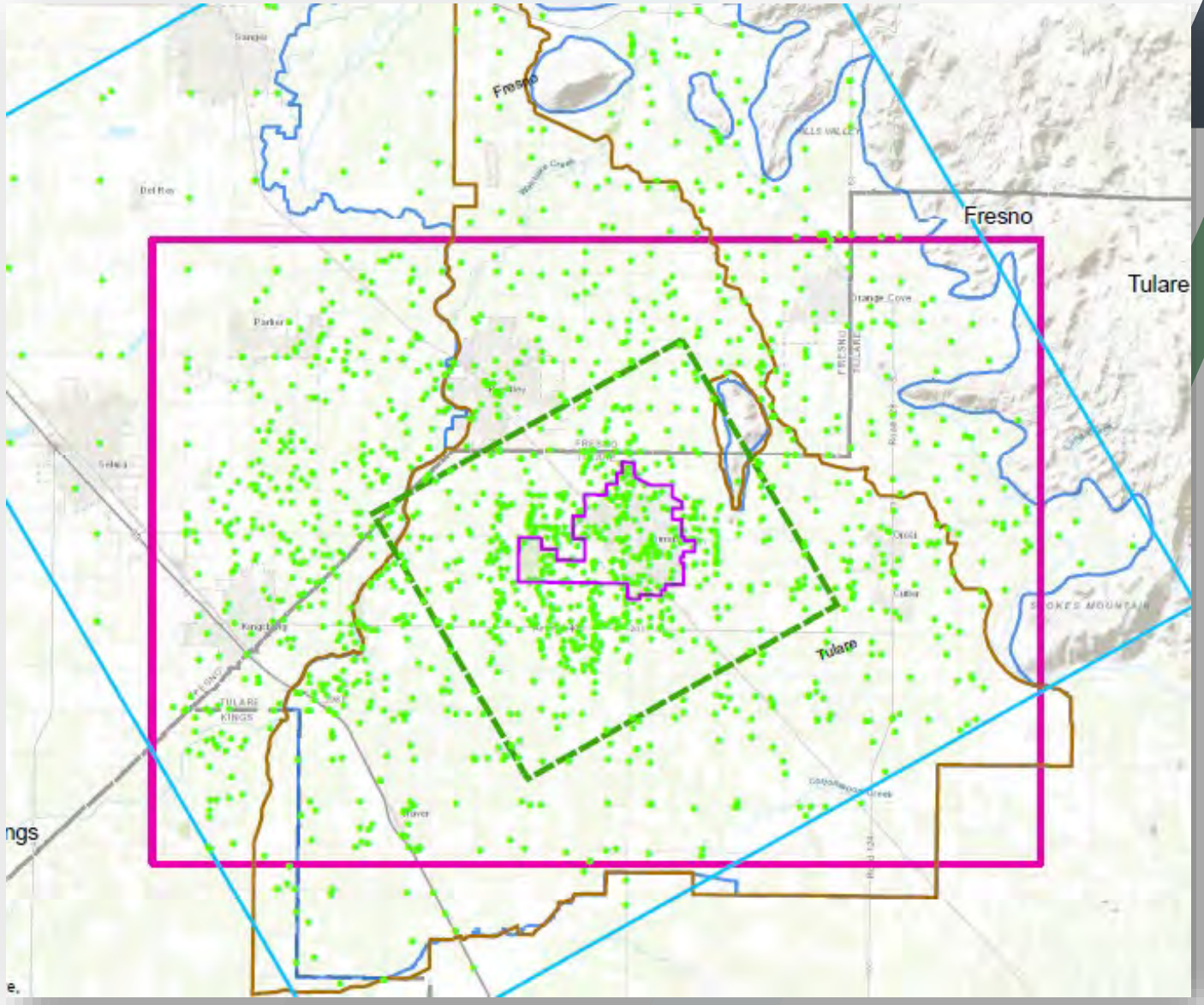
Stakeholder Advisory Group (SAG) Quarterly Meeting:

Dinuba Wellfield RI/FS Project

August 2, 2021 @ 6pm



Grant Agreement No. D1912528

www.dinuba.org

Funding Disclosure

Funding for this project has been provided in full or in part by Proposition 1 – the Water Quality, Supply, and Infrastructure Improvement Act of 2014 through an agreement with the State Water Resources Control Board. The contents of this presentation do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Grant Agreement No. SWRCB D1912528

Agenda

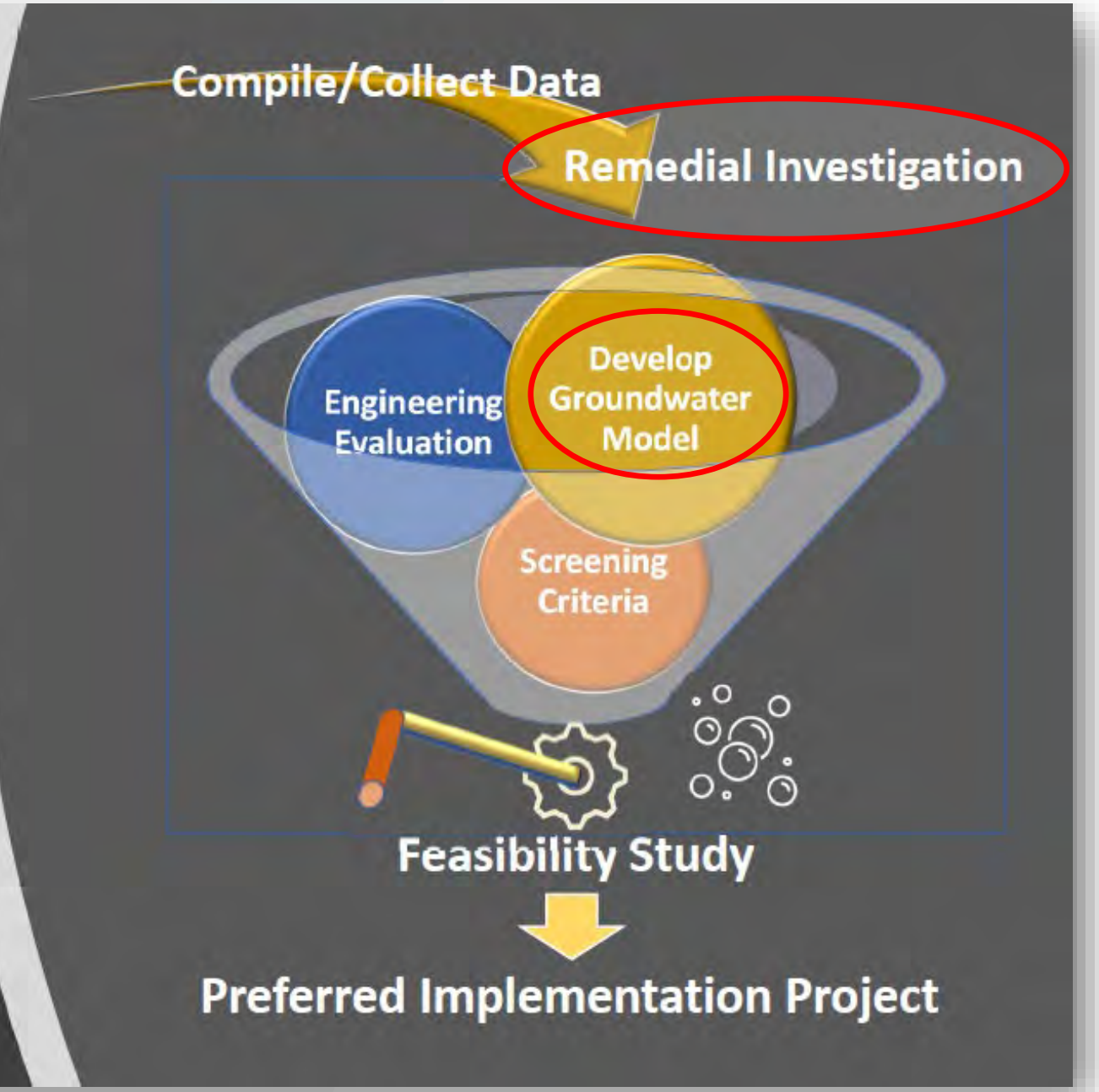
1. Project Review
2. Remedial Investigation Report - Overview
3. Hydrogeologic Conceptual Model
4. Groundwater Zone Designations
5. Contaminant Sources and Transport
6. Solute Transport Modeling
7. Schedule & Upcoming Milestones
8. Questions & General Commentary

Project Review: Goals & Benefits

Project Overview

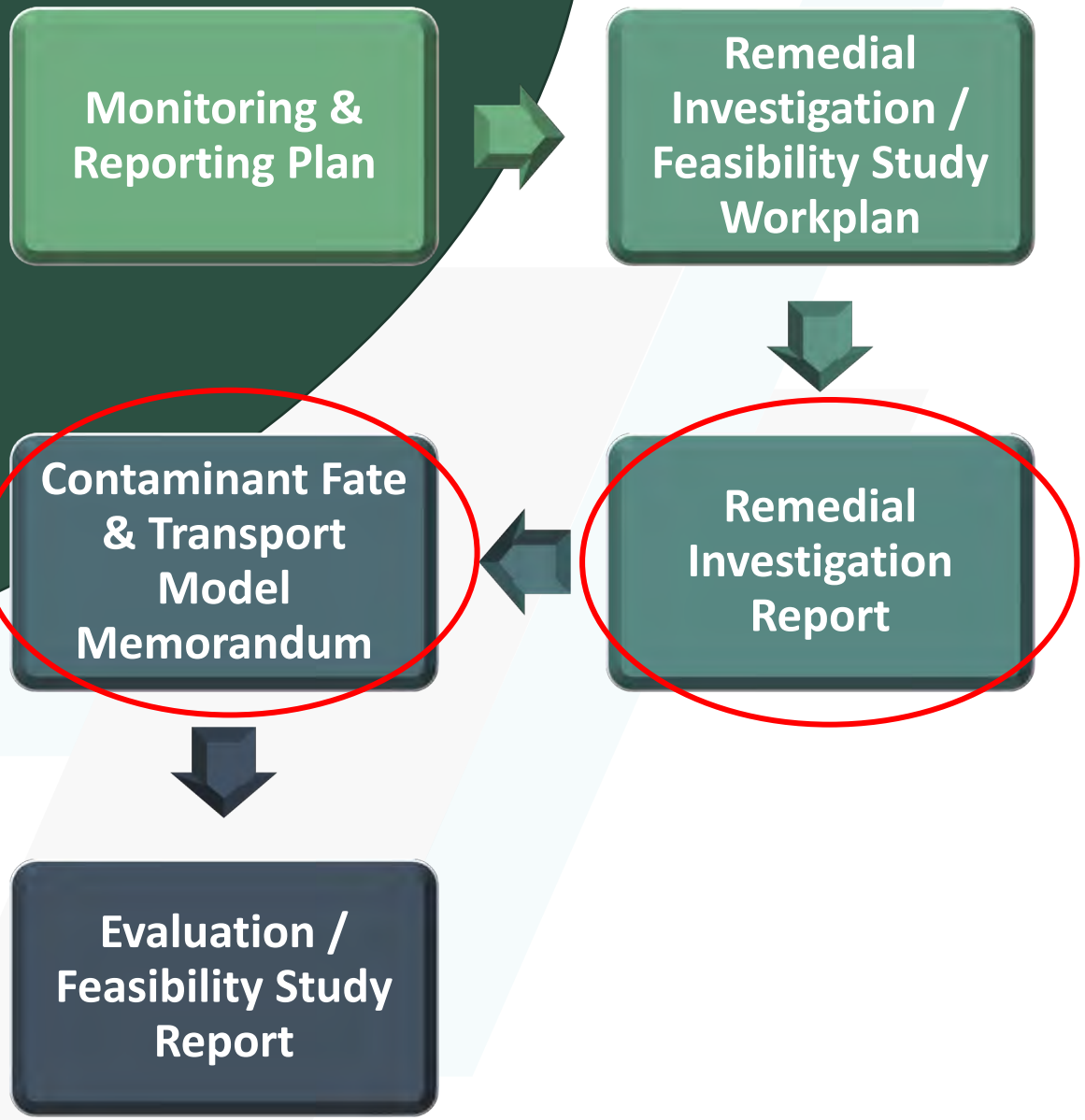
- City of Dinuba received a $1.75 million Proposition 1 Groundwater Grant from the SWRCB for the Dinuba Wellfield RI/FS Project.
- Study to develop potential implementation options to clean up or prevent the spread of non-point source pollutants in its municipal wellfield.
- Identify effective means to address nitrate, DBCP and 1,2,3-TCP, which are widespread in the shallow aquifers in the region and identify projects which can be funded under future implementation grants to help assure a more secure and higher quality water supply for the City.

Project Overview and Status



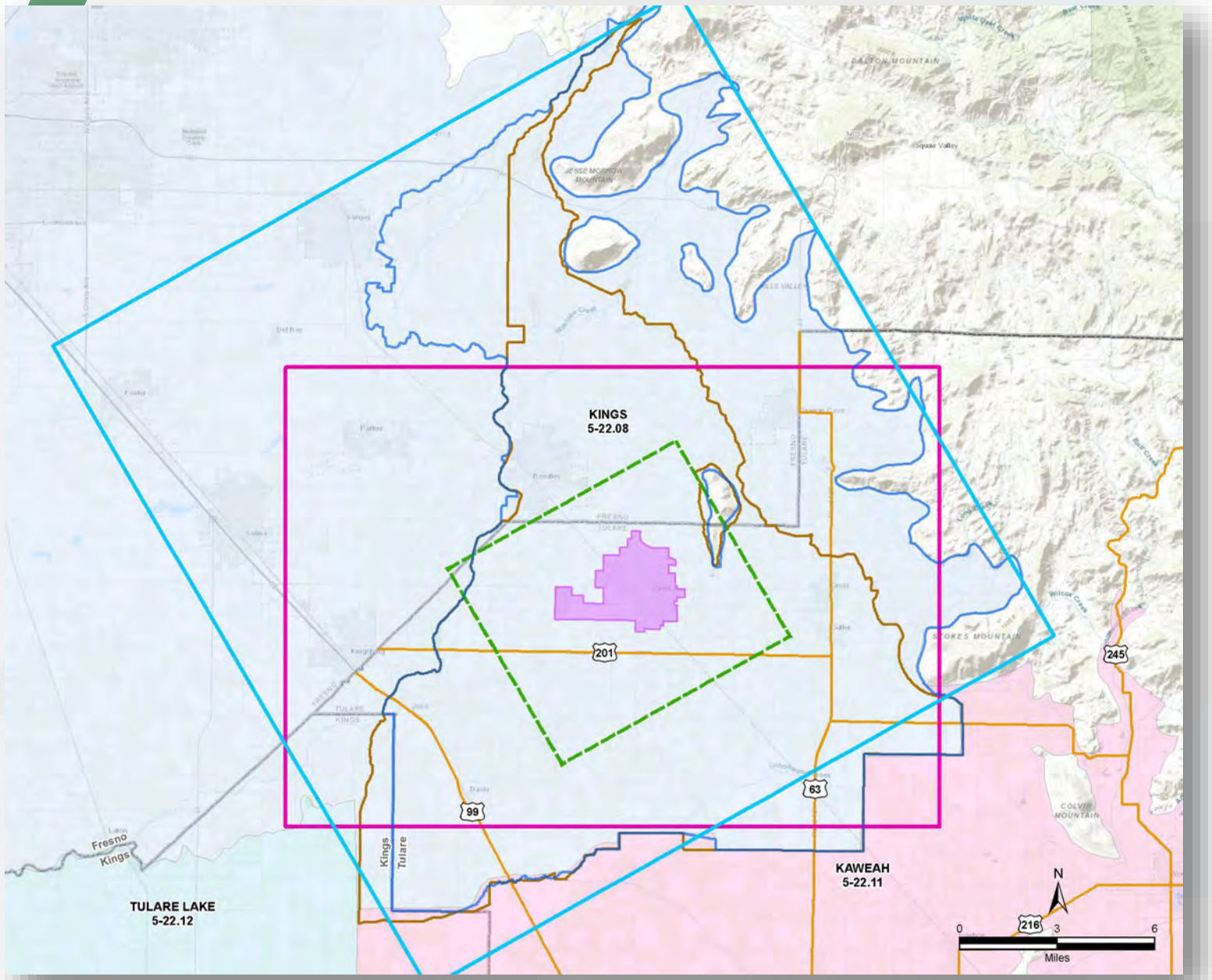
FORMATION ENVIRONMENTAL

Major Project Deliverables



Remedial Investigation (RI) Report Table of Contents

Setting



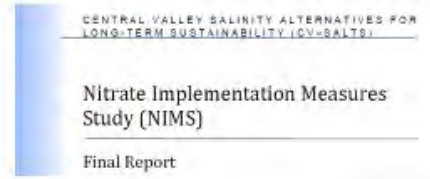
Legend

- Dinuba Water Service Area
- Dinuba Refined Model
- Alta Irrigation District
- Contaminat Contour Data Analysis
- Dinuba Subregional Model
- Kings River East Groundwater Sustainability Agency
- Counties
- Highways

Groundwater Sub-basins

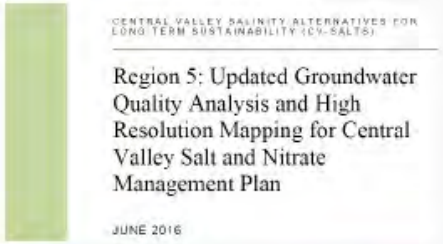
- KAWEAH
- KINGS
- TULARE LAKE

Setting and Background


CENTRAL VALLEY SALINITY ALTERNATIVES FOR LONG-TERM SUSTAINABILITY (CV-SALTS)

Nitrate Implementation Measures Study (NIMS)

Final Report


CENTRAL VALLEY SALINITY ALTERNATIVES FOR LONG-TERM SUSTAINABILITY (CV-SALTS)

Region 5: Updated Groundwater Quality Analysis and High Resolution Mapping for Central Valley Salt and Nitrate Management Plan

JUNE 2016


Memorandum

TECHNICAL MEMORANDUM

Alta Irrigation District Management Zone: Aggressive Restoration Alternative Modeling Scenario Results

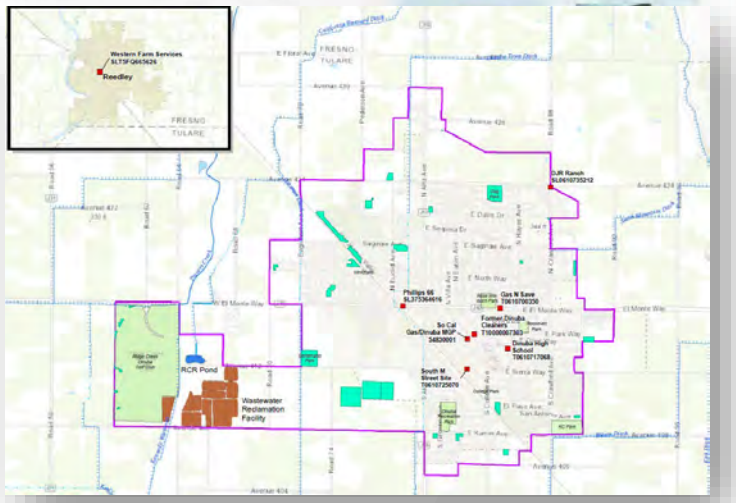
Prior Investigations

Kings Subbasin
Groundwater Sustainability Agencies

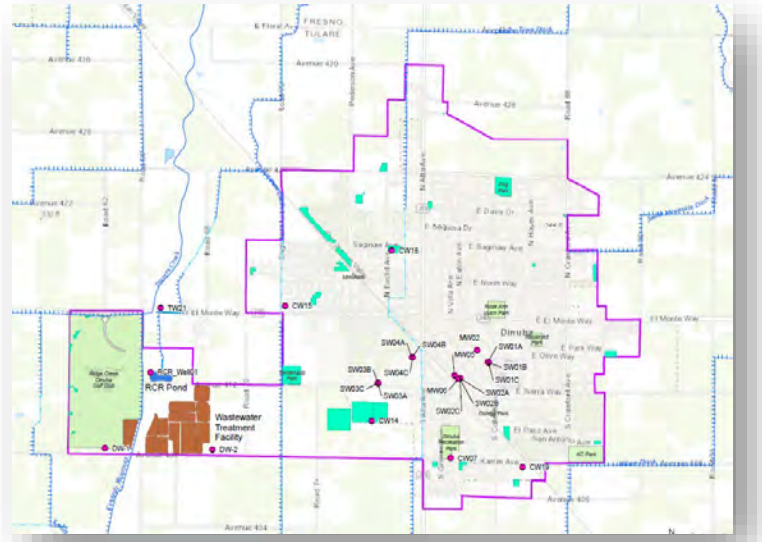
Groundwater Sustainability Plan
Adopted December 13, 2019

Groundwater Sustainability Annual Report

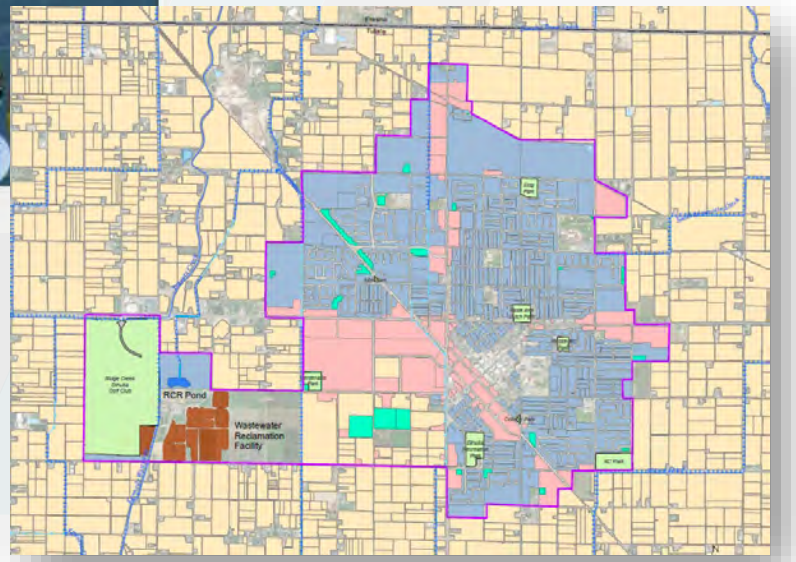

CV-SALTS Management Zone Archetype Analysis: Alta Irrigation District



Contaminated Site



Surface Water Features

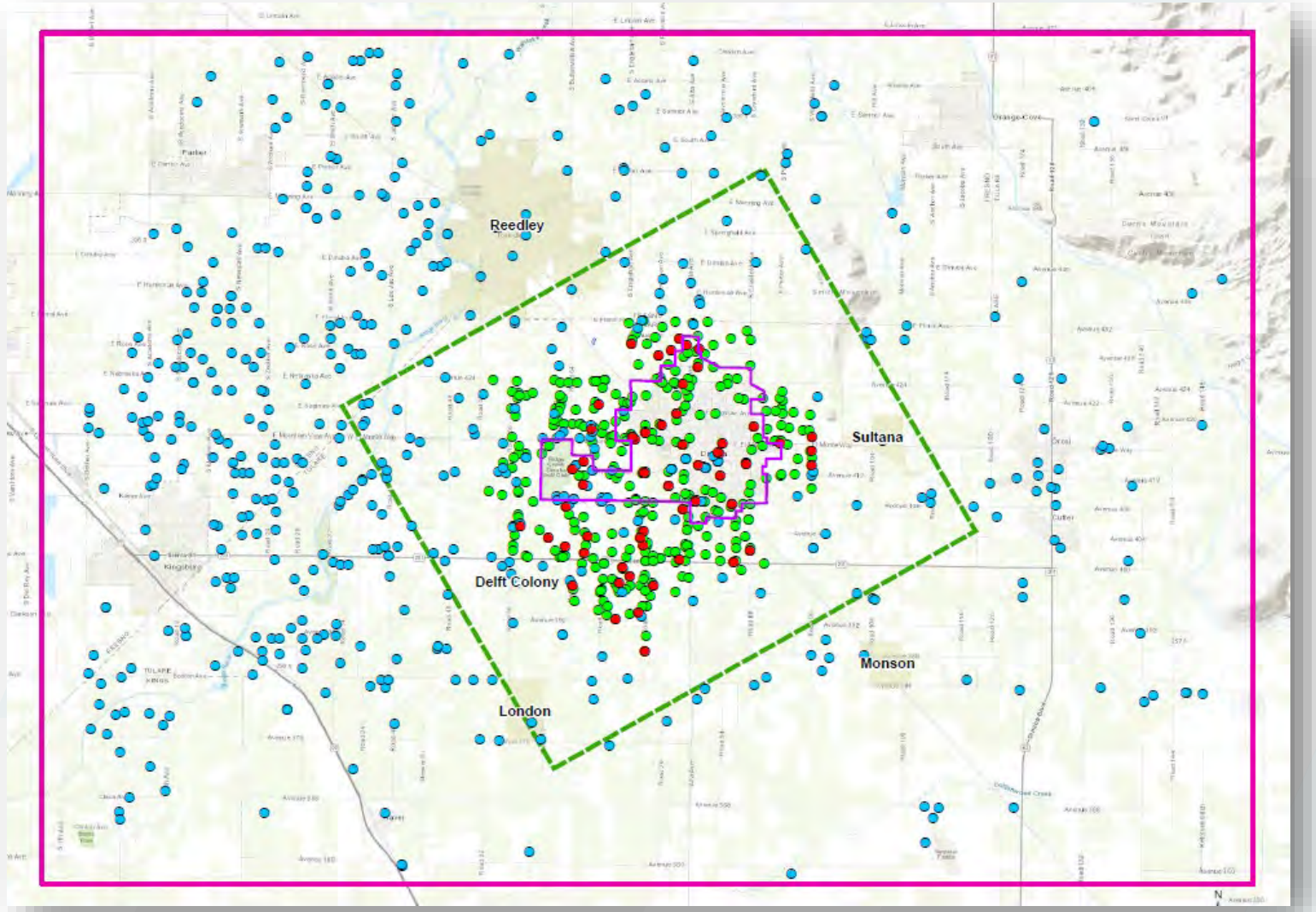


Land Use

RI Data Summary

- **26** Wells/boreholes sampled for Remedial Investigation
- **36** Wells used to compile groundwater extraction data
- **57** Wells used for specific capacity analysis
- **387** Wells used for textural model analysis
- **140** Wells with construction and analytical data from 2015-2021 used for contaminant contour map development within the DRM
- **520** Wells with construction and analytical data from 2015-2021 used for contaminant contour map development within the DSRM

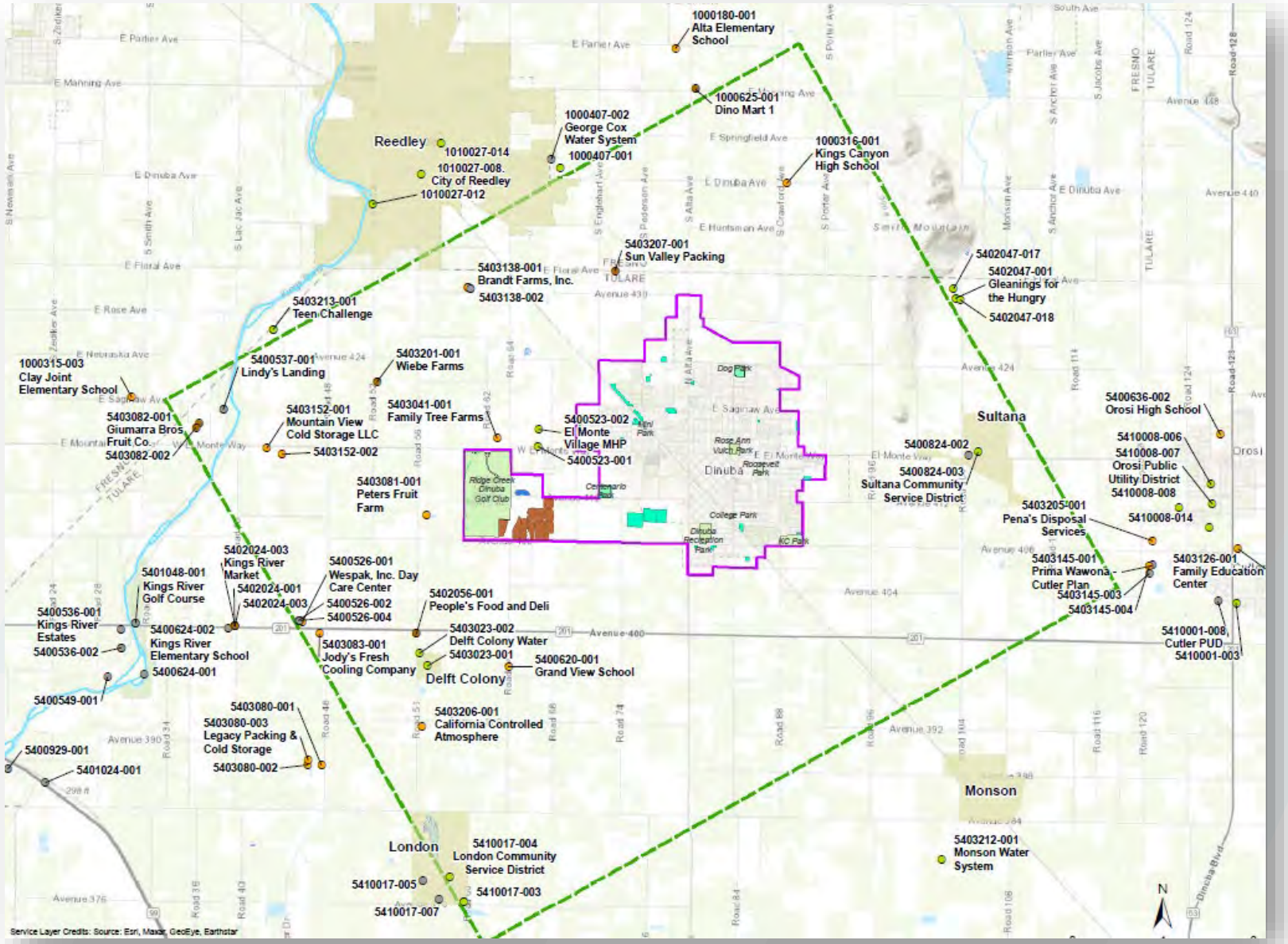
Data Analysis Boundaries



Legend

- Wells Used for Contaminant Contour Analysis
- Wells Used for Aquifer Textural and Specific Capacity Analysis
- Wells Used for Aquifer Textural Analysis
- Contaminant Contour Data Boundary
- Dinuba Refined Model Boundary
- Dinuba Water Service Area

Small Water System Wells



Legend

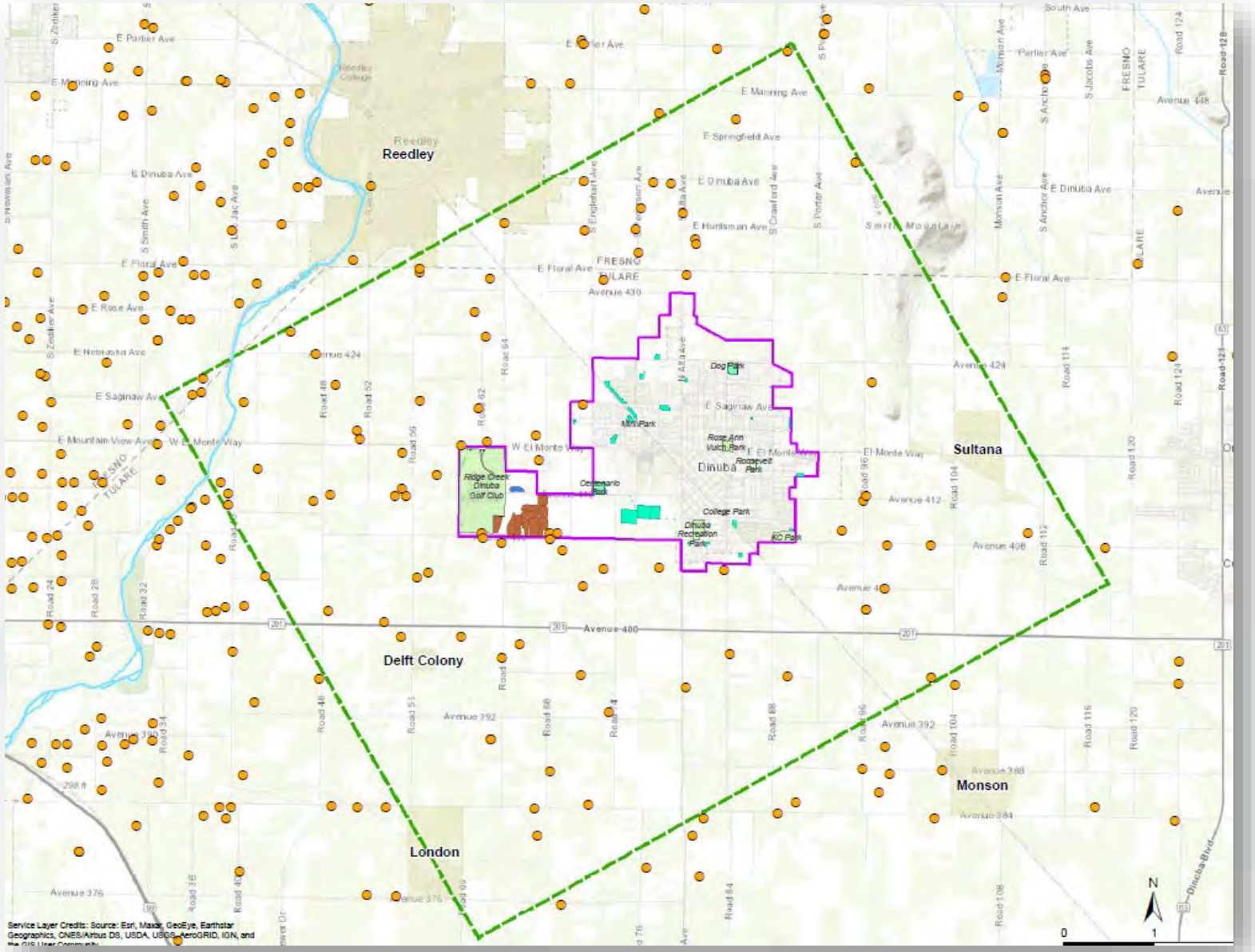
Public Supply Wells

- Other
- Community
- Non-Community
- Non-Transient Non-Community
- Dinuba Water Service Area
- Dinuba Refined Model Boundary
- City Boundaries
- Parks

Water Bodies (USGS NHD)

- Lake or Pond
- Reservoir
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Domestic Wells

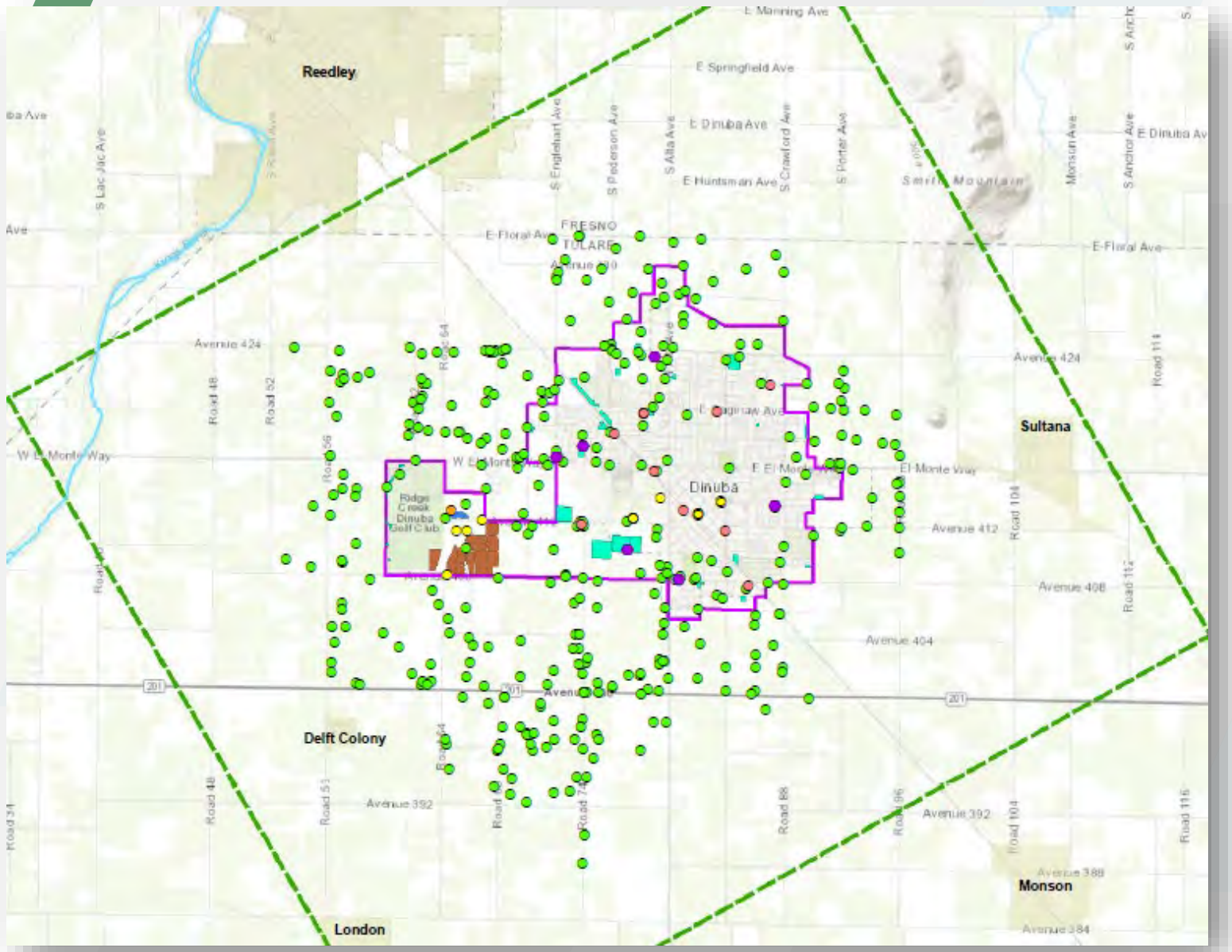


Legend

- Domestic Wells
- Dinuba Water Service Area
- Dinuba Refined Model Boundary
- City Boundaries
- Parks
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Hydrogeologic Conceptual Model

Wells Used for Aquifer Textural Analysis



Legend

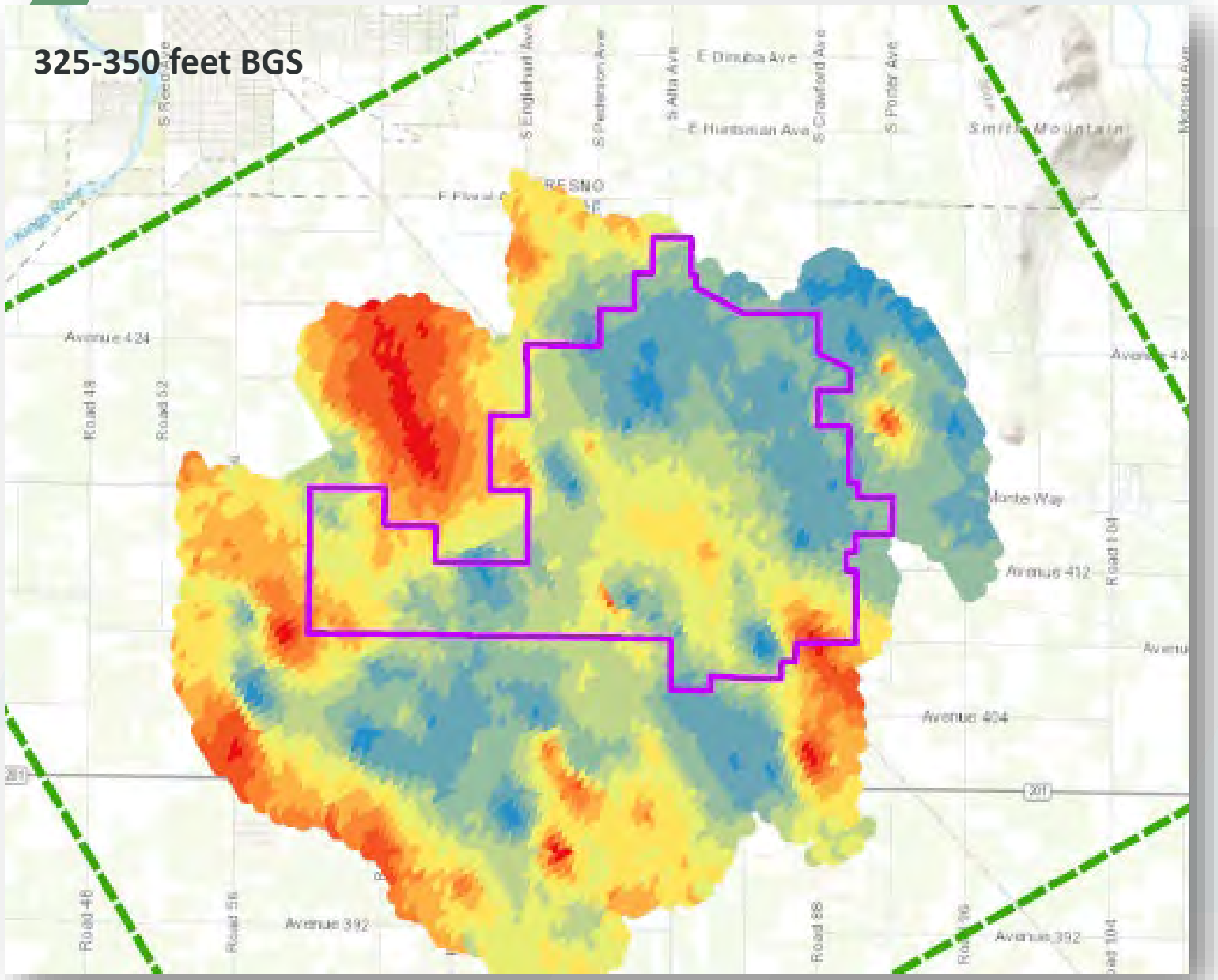
Wells Used In Lithological Analysis

Well Type

- Other Well
- Monitoring Well
- City of Dinuba Supply Well
- City of Dinuba Irrigation Well
- Test Well/Borehole

- Dinuba Water Service
- Dinuba Refined Model Boundary
- City Boundaries
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Aquifer Textural Analysis



Legend

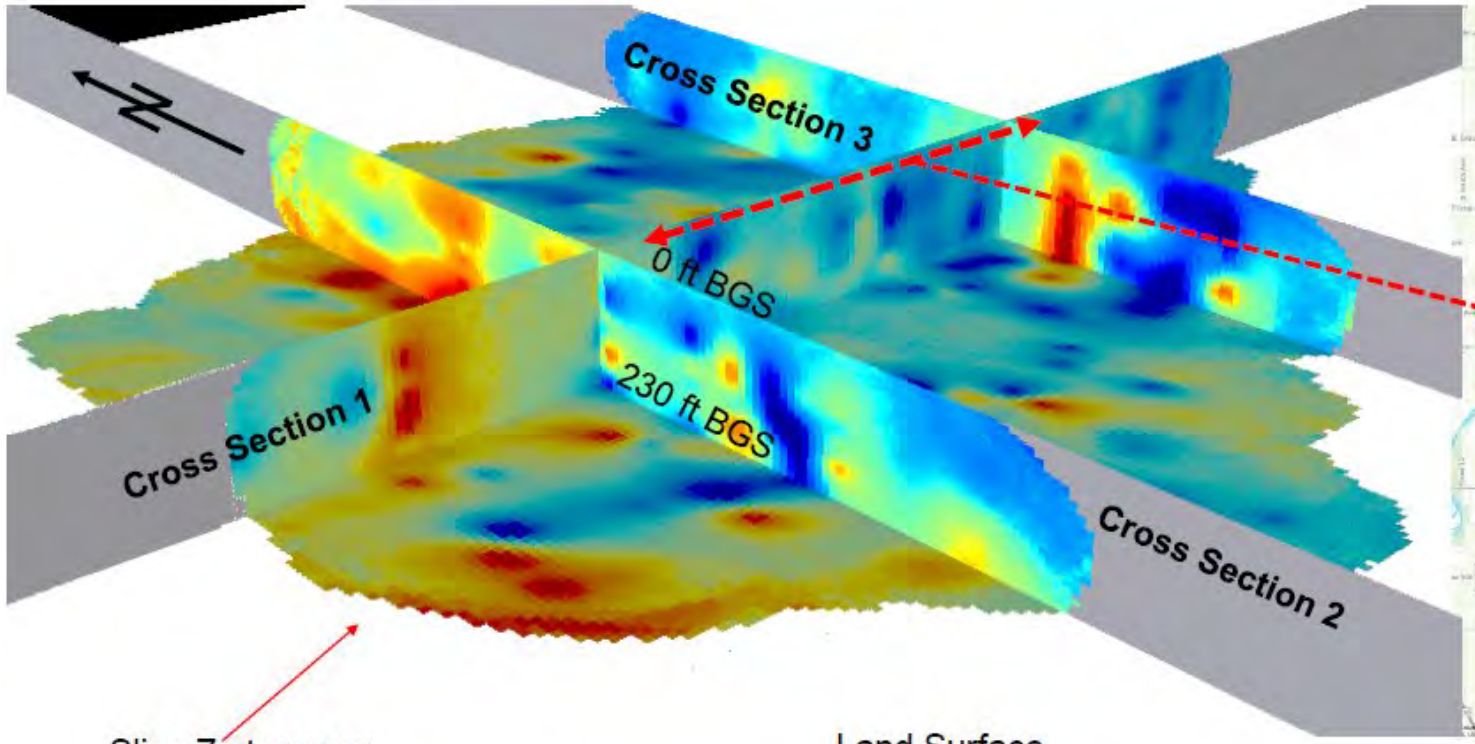
- Dinuba Water Service Area
- Dinuba Refined Model Boundary

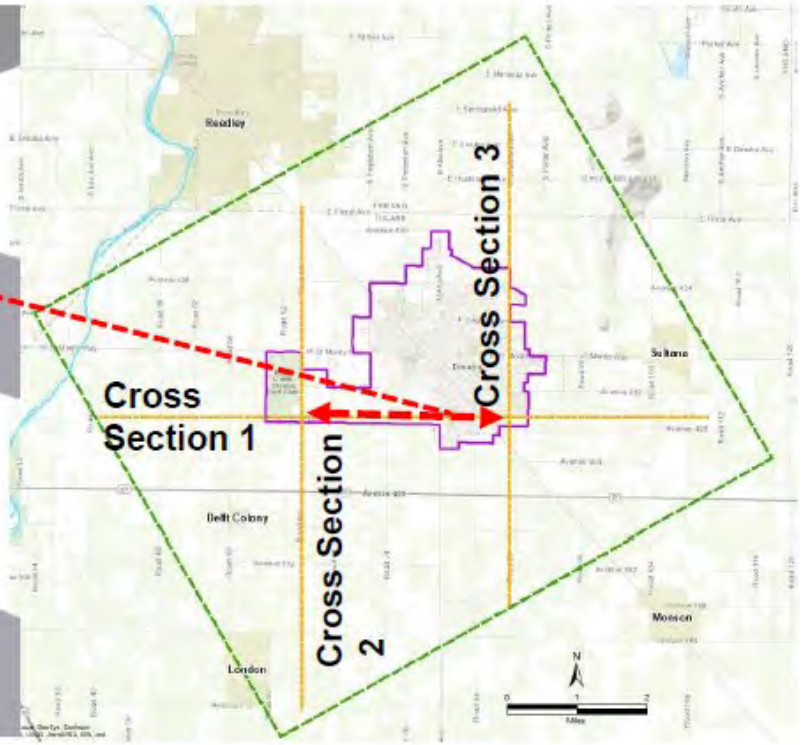
Percentage Coarse Sediment

- 0 - 15
- 16 - 26
- 27 - 34
- 35 - 41
- 42 - 48
- 49 - 55
- 56 - 63
- 64 - 72
- 73 - 82
- 83 - 100

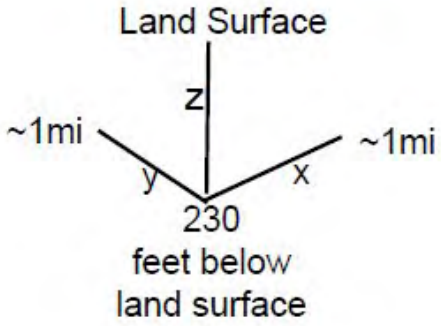
Note: Grain size defined as sand and gravel in the Unified Soil Classification System.

Textural Analysis Cross Sections

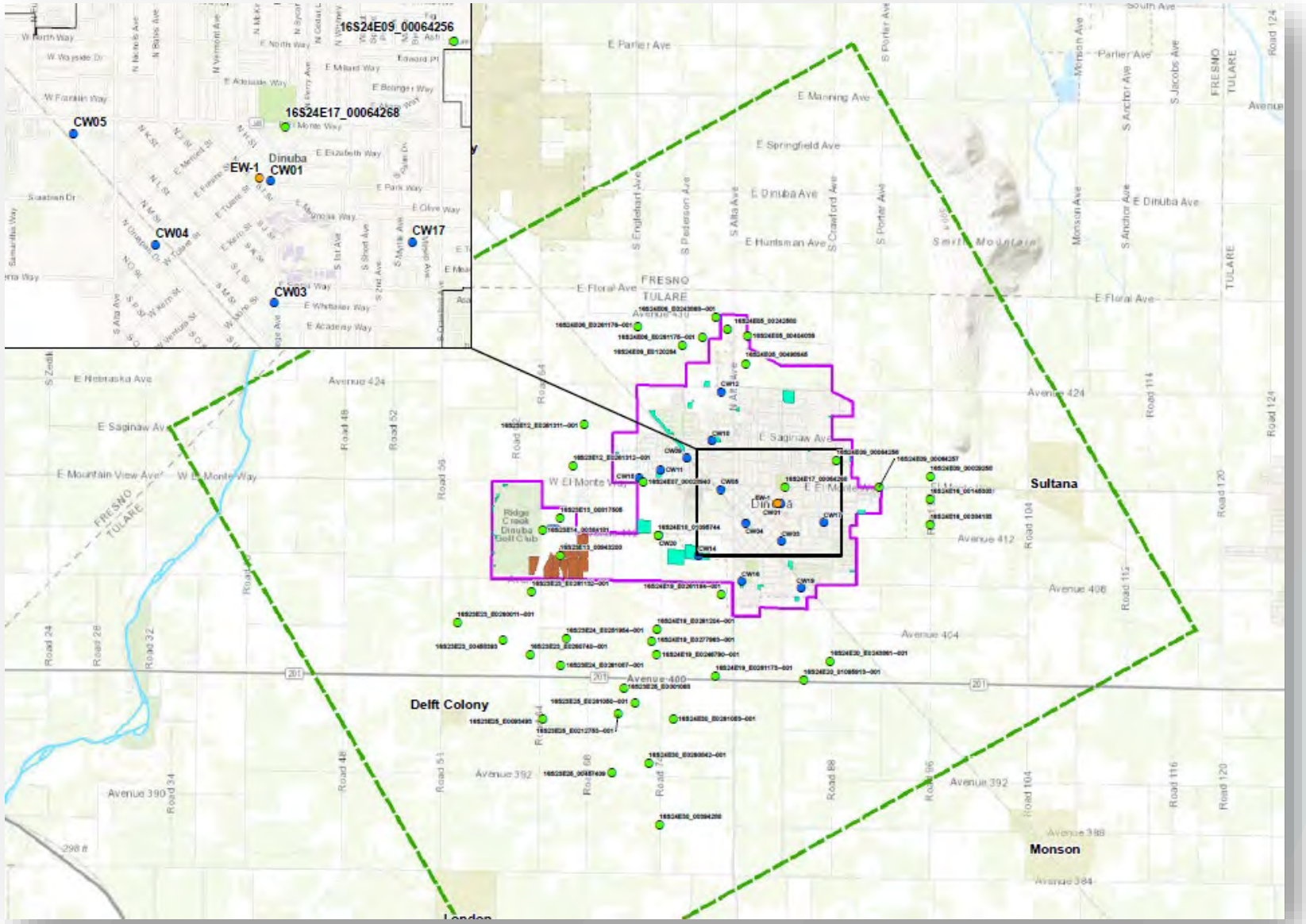




Slice Z at approx.
230 feet below ground surface



Wells Used for Specific Capacity Data Analysis



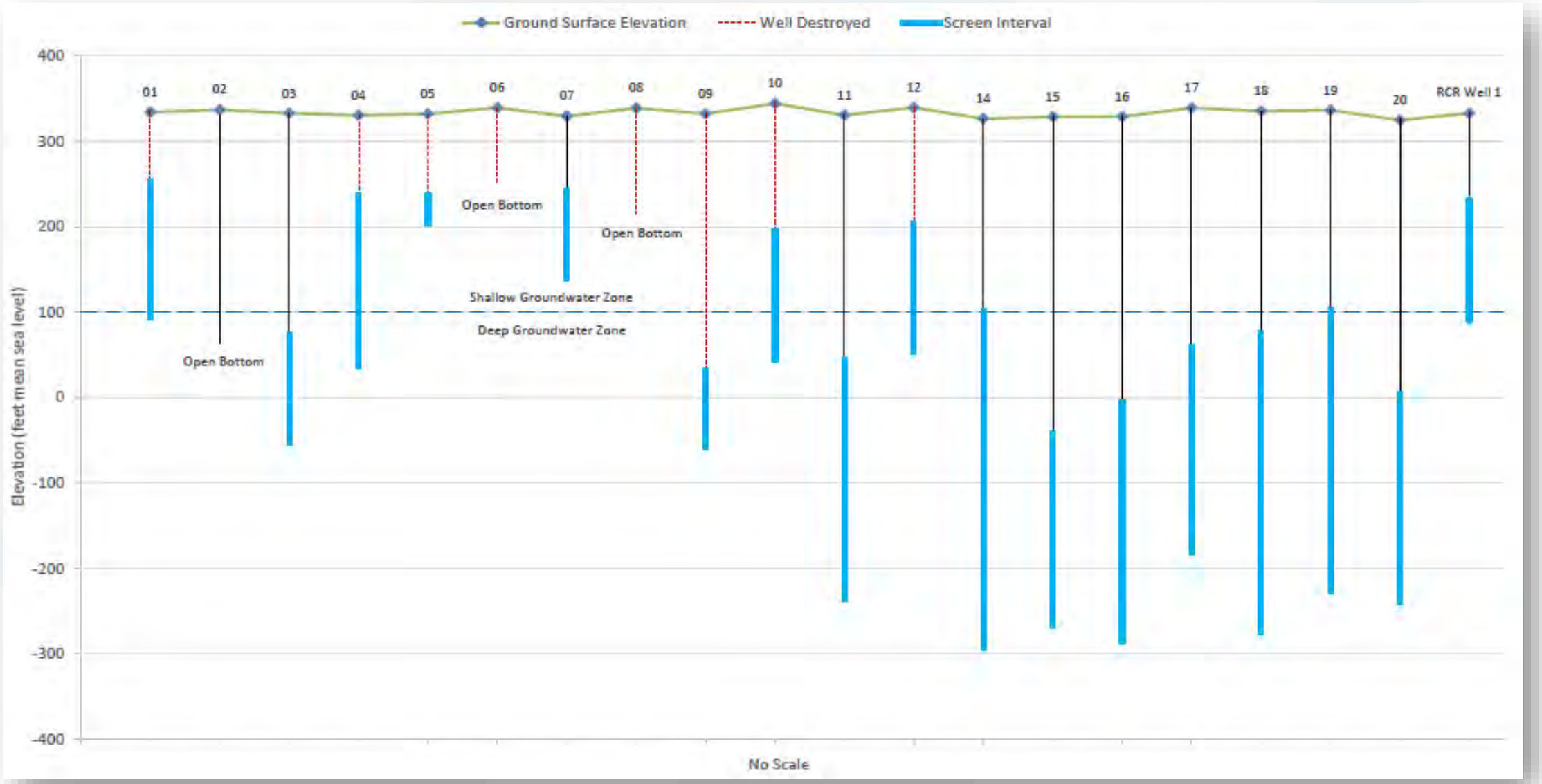
Legend

Well Type

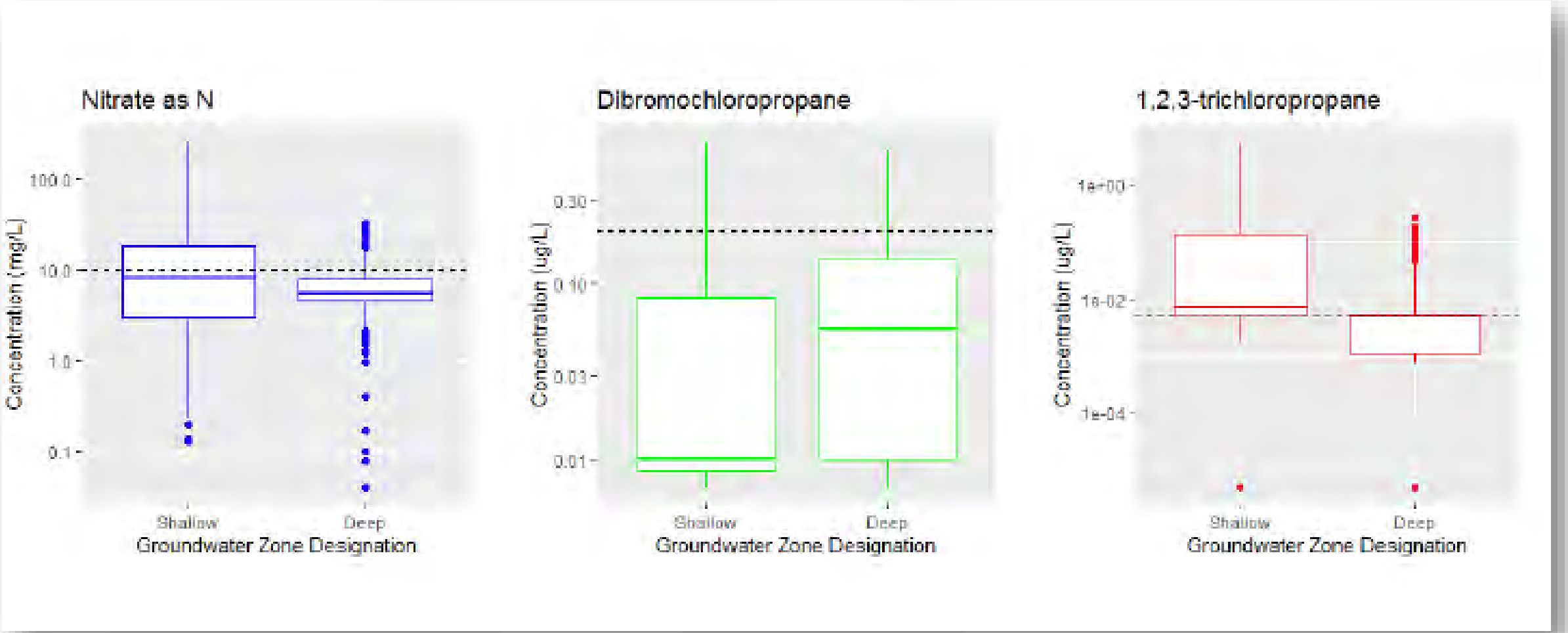
- Other Well
- Gas N Save Extraction Well
- City of Dinuba Well
- Dinuba Water Service Area
- Dinuba Refined Model Boundary
- City Boundaries
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Groundwater Zone Designations

Supply Well Screen Intervals

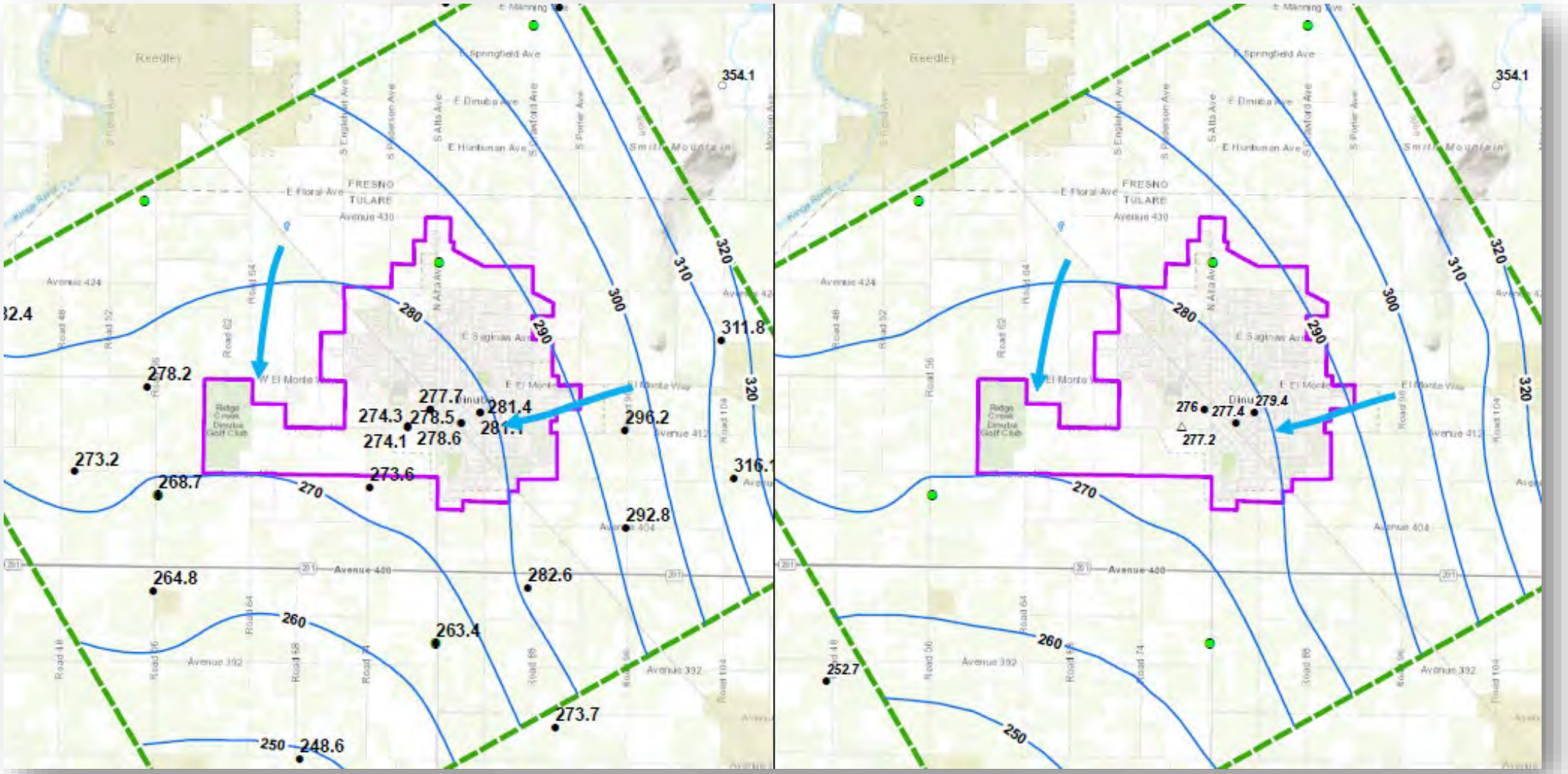


Contaminant Distribution with Depth



Groundwater Occurrence and Flow

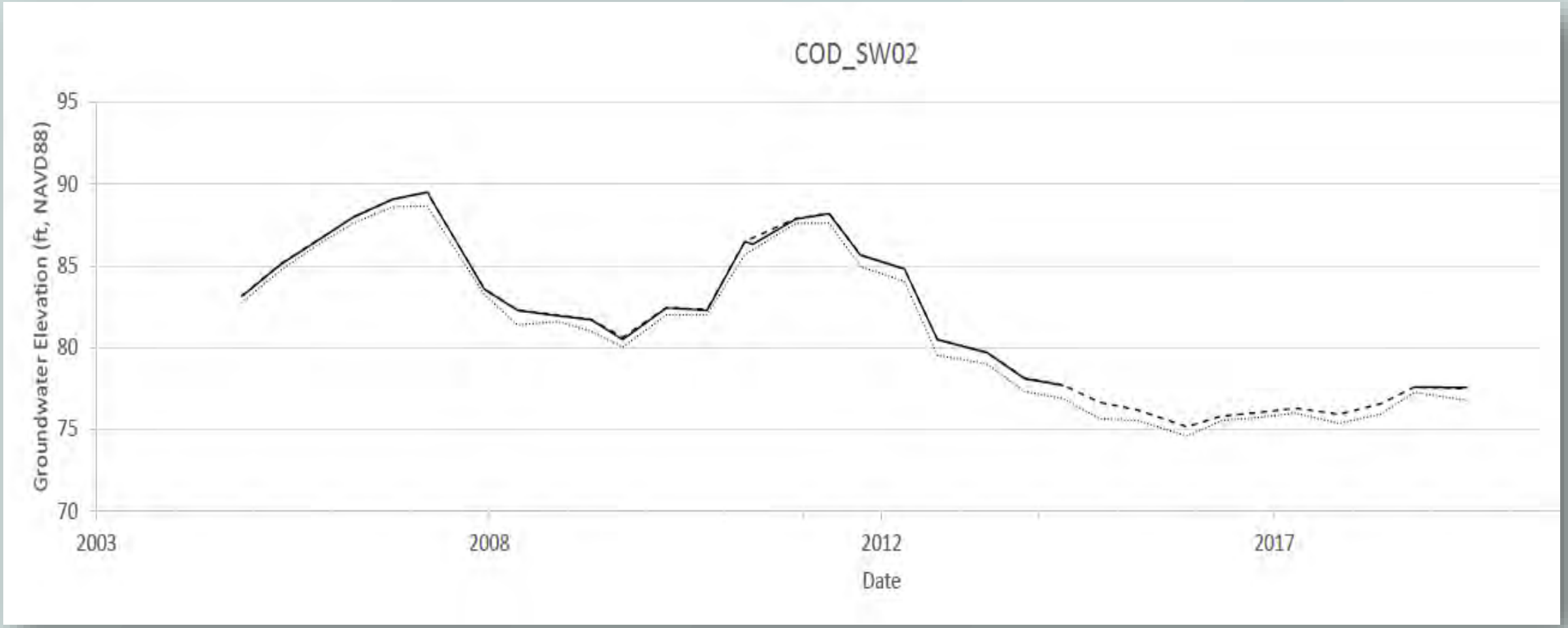
Groundwater Elevations Spring 2005



Shallow Groundwater <230 feet bgs

Deep Groundwater > 230 feet bgs

Example Nested Sentinel Monitoring Well Hydrographs



Contaminant Sources and Transport

Geochemical Data - Nitrate

Sources

- Agricultural Fertilizers
- Concentrated Animal Feeding Operations (CAFOs)
- Municipal Wastewater
- Septic Systems

Transport

- Assume no sorption or retardation

Fate

- Assume no chemical transformation or losses below the rootzone

- Simulate loading at water table using SWAT and adjust to achieve observed shallow groundwater concentrations

Geochemical Data - DBCP

Sources

- Soil fumigant; widely applied to grapes in Dinuba area
- Use starting in 1950s and banned in 1977
- Current concentrations decreasing

Transport

- Weakly sorbed, K_d reported as 0.06 to 0.07 (mg/kg soil per mg/L water) in low carbon aquifers near Fresno
- K_{oc} reported as 1.6 to 2.11 (g organic carbon/g soil), like 1,2,3-TCP

Fate

- Biodegradation insignificant below root zone
- Half life estimated as 6.1 to 141 years in oxic aquifers in the absence of significant biodegradation

- Simulate loading at water table to match shallow groundwater concentrations, decreasing at observed rate at City Well 14

Geochemical Data – 1,2,3-TCP

Sources

- Constituent of soil fumigants; annual and fruit crops, may persist in hydro-carbon residue from early formulations
- Used starting in 1940s, eliminated in 1984

Transport

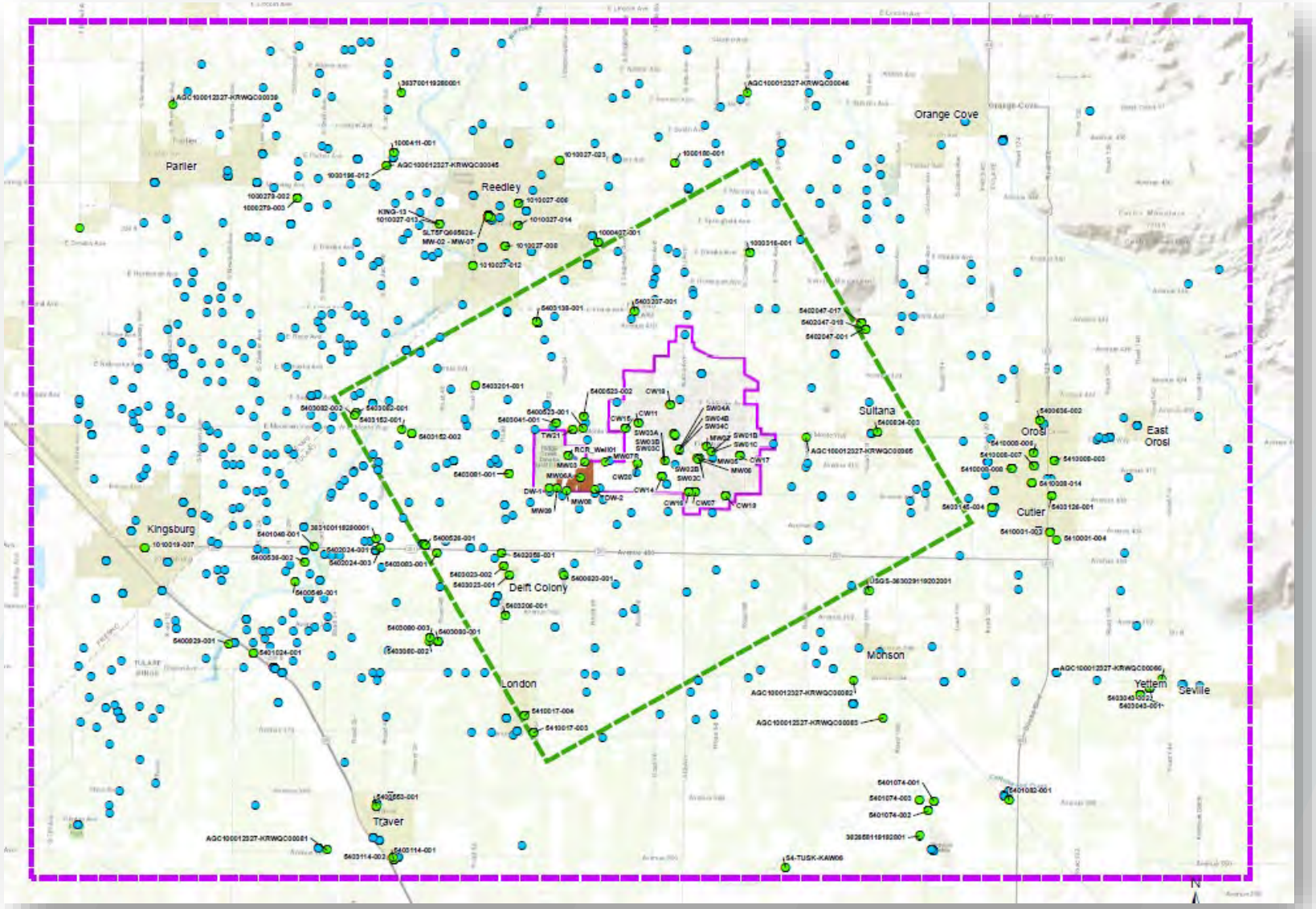
- Weakly sorbed with a sorption coefficient (K_{oc}) of 1.7 to 2.0 (g/g), similar to DBCP
- K_d is expected to be similar to DBCP

Fate

- Biodegradation insignificant below root zone
- Half life estimated from 44 to over 300 years in oxic aquifers with circum-neutral pH

- Simulate loading at water table at constant rate to match shallow detected concentrations

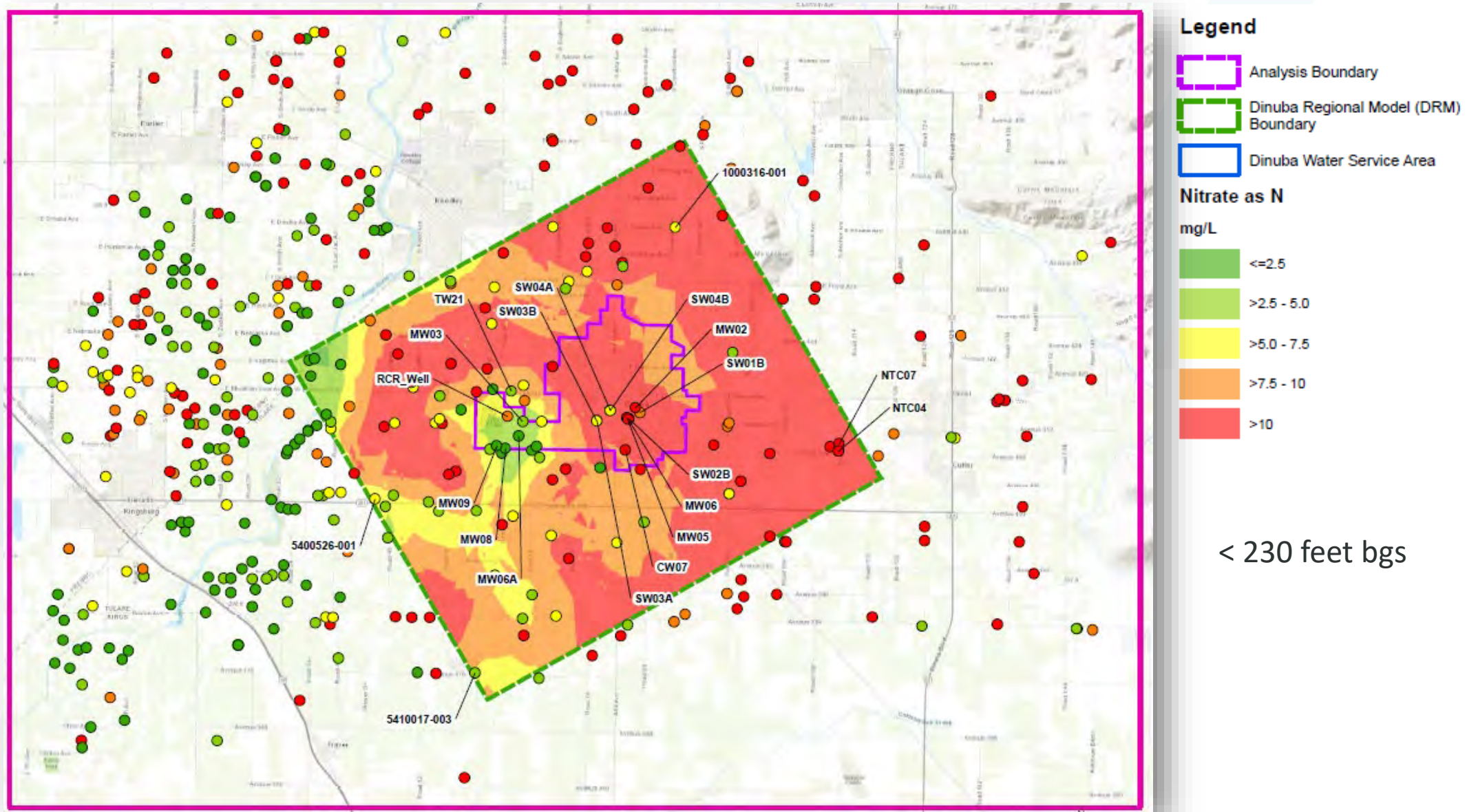
Wells Used to Contour Contaminant Data



Legend

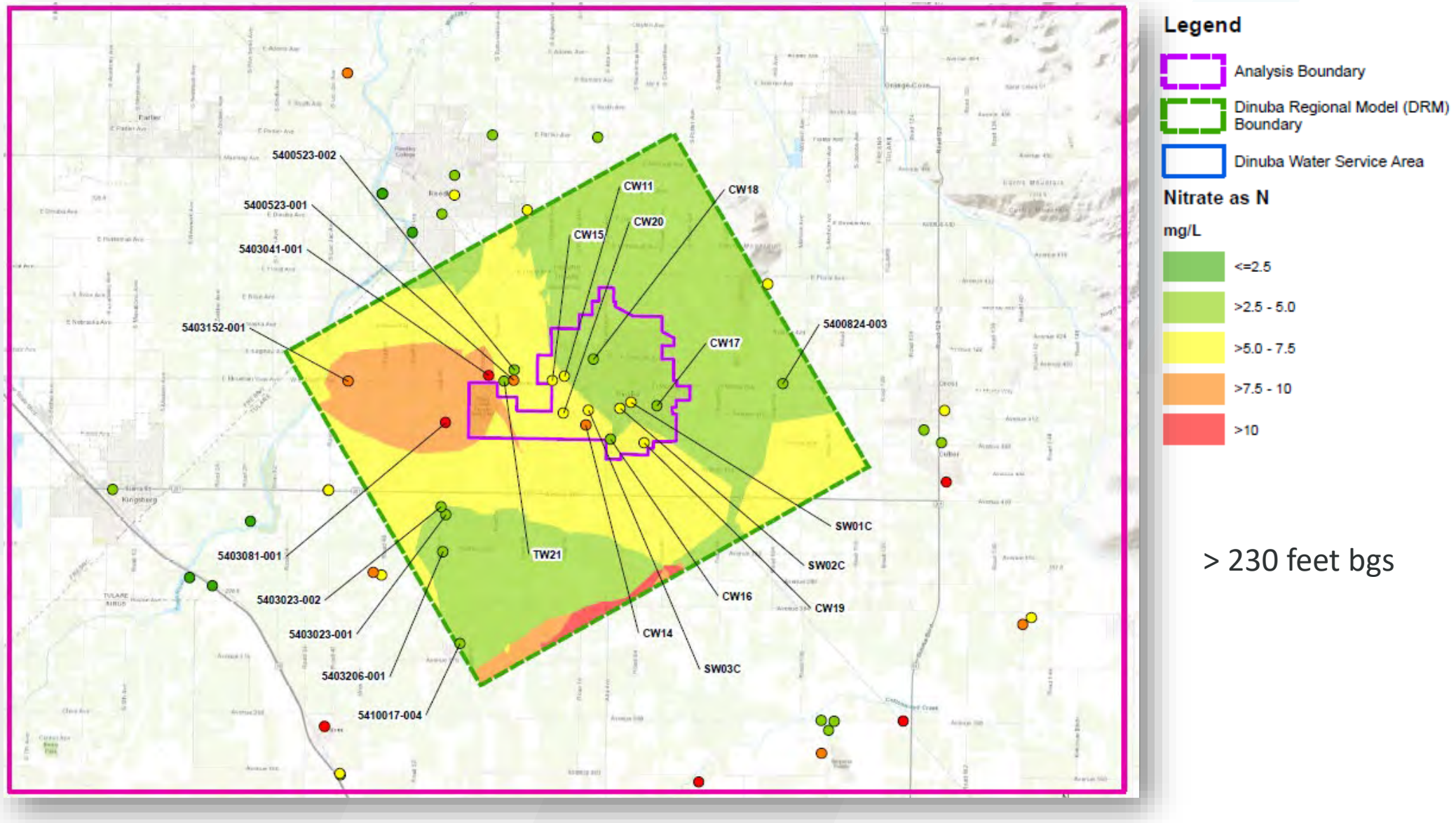
- Wells With Analytical Data and Screened Interval or Total Depth
- Wells With Analytical Data But No Screened Intervals or Total Depth
- Cities and Towns
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Dinuba Water Service Area
- Dinuba Refined Model Boundary
- Analysis Boundary

Nitrate – Shallow Groundwater Average Concentrations (mg/L)



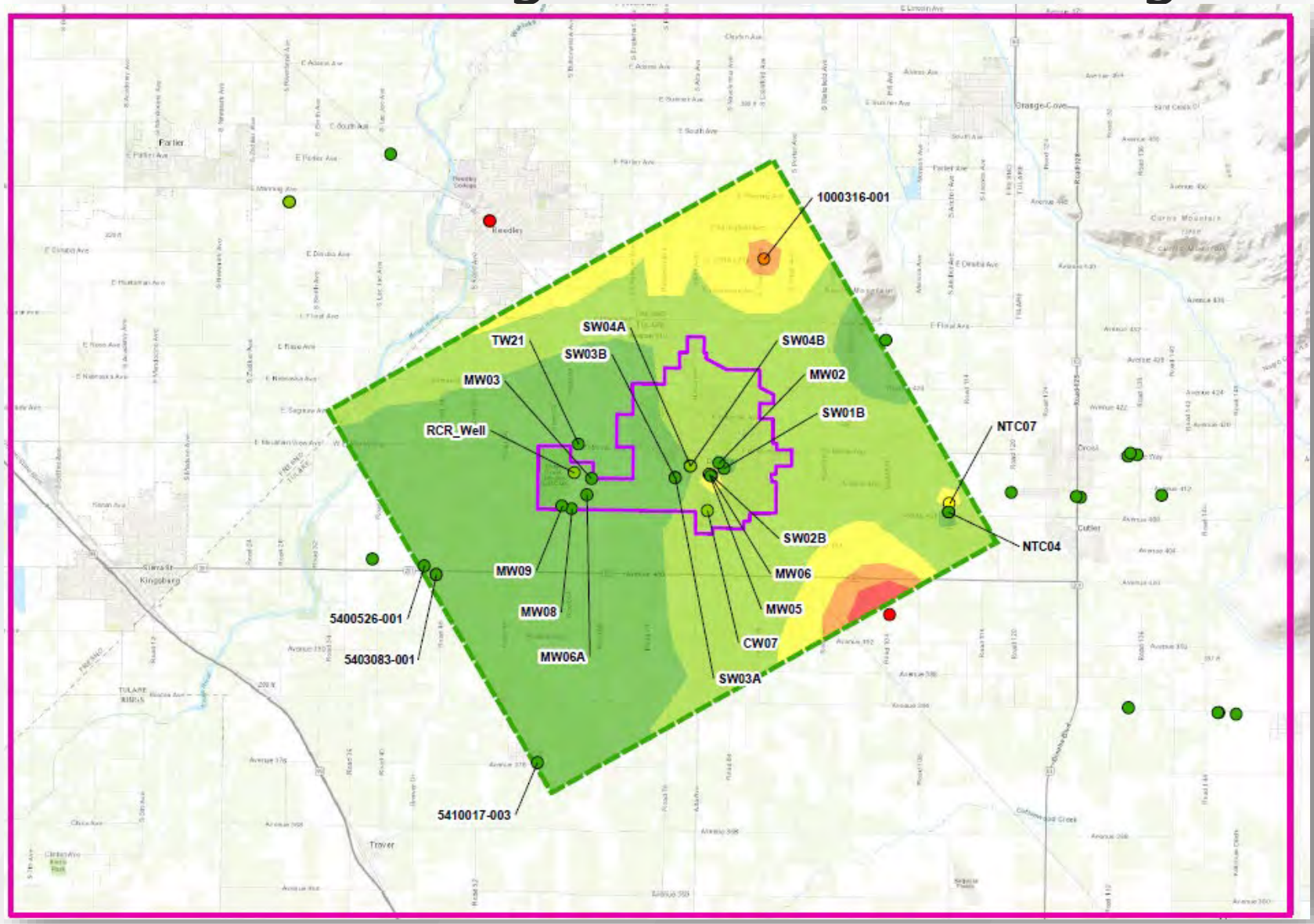
< 230 feet bgs

Nitrate – Deep Groundwater Average Concentrations (mg/L)



> 230 feet bgs

DBCP – Shallow Groundwater Average Concentrations (ug/L)



Legend

- Analysis Boundary
- Dinuba Regional Model (DRM) Boundary
- Dinuba Water Service Area

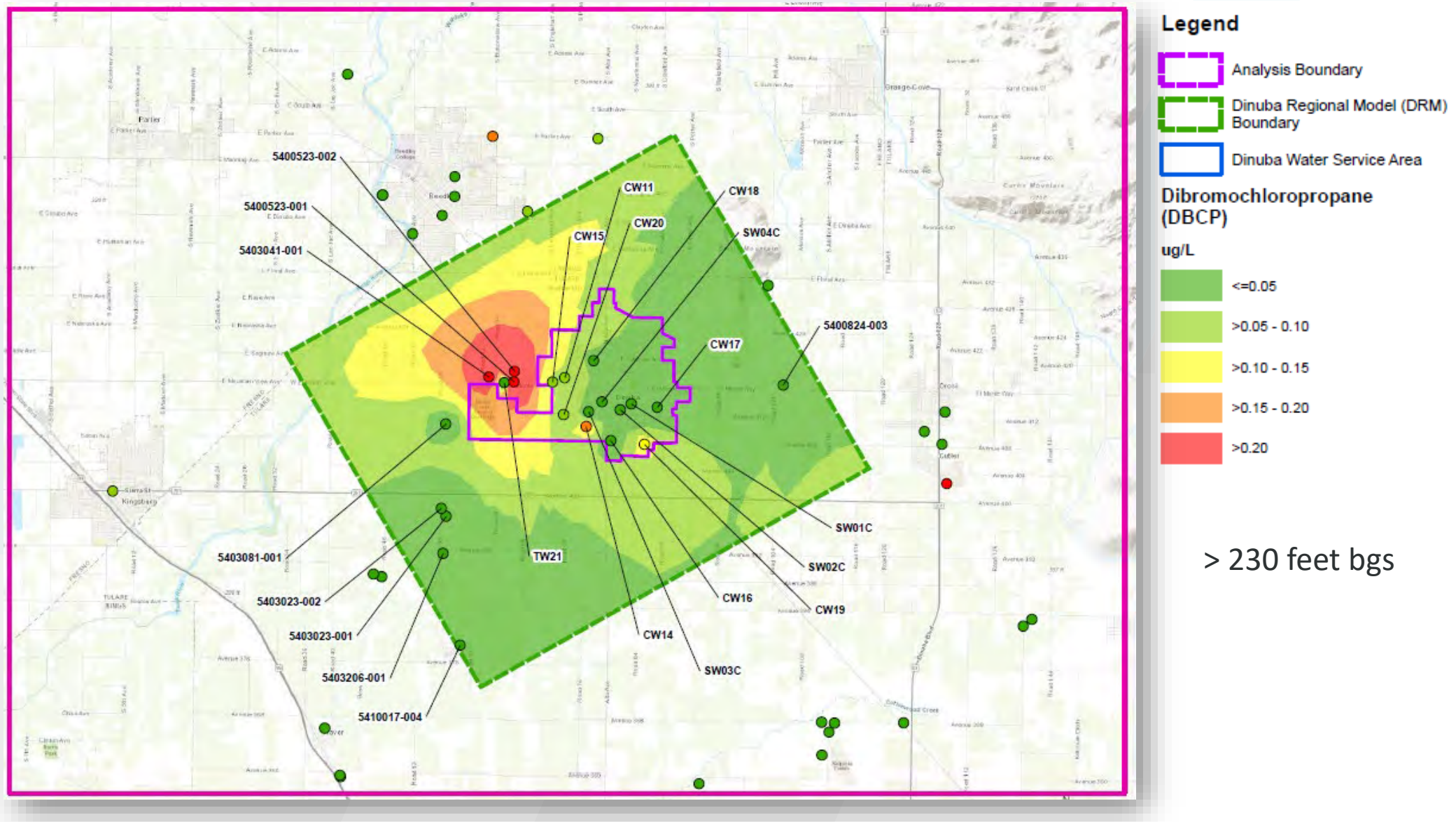
Dibromochloropropane (DBCP)

ug/L

- <=0.05
- >0.05 - 0.10
- >0.10 - 0.15
- >0.15 - 0.20
- >0.20

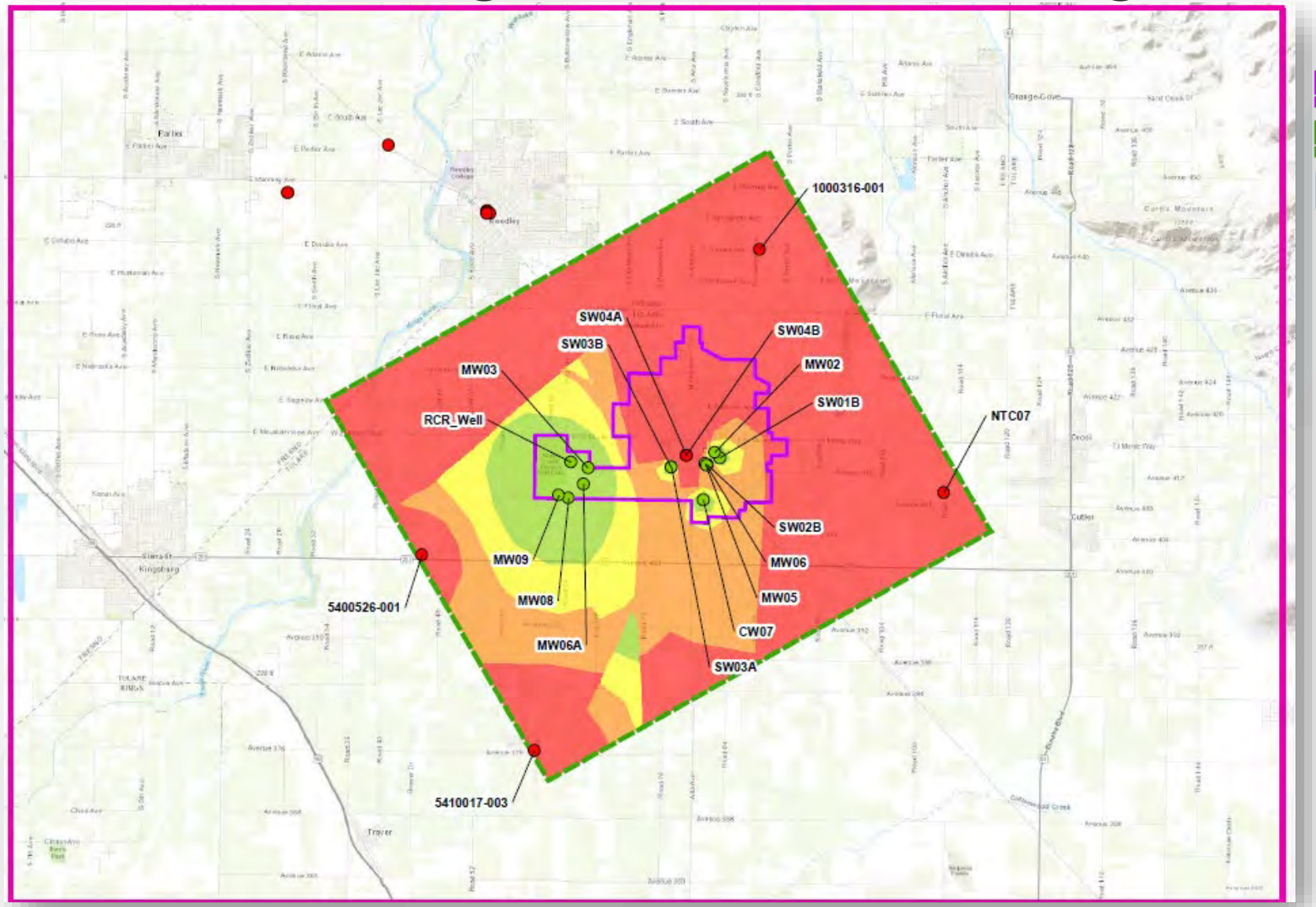
< 230 feet bgs

DBCP – Deep Groundwater Average Concentrations (ug/L)



> 230 feet bgs

1,2,3-TCP – Shallow Groundwater Average Concentrations (ug/L)



Legend

- Analysis Boundary
- Dinuba Regional Model (DRM) Boundary
- Dinuba Water Service Area

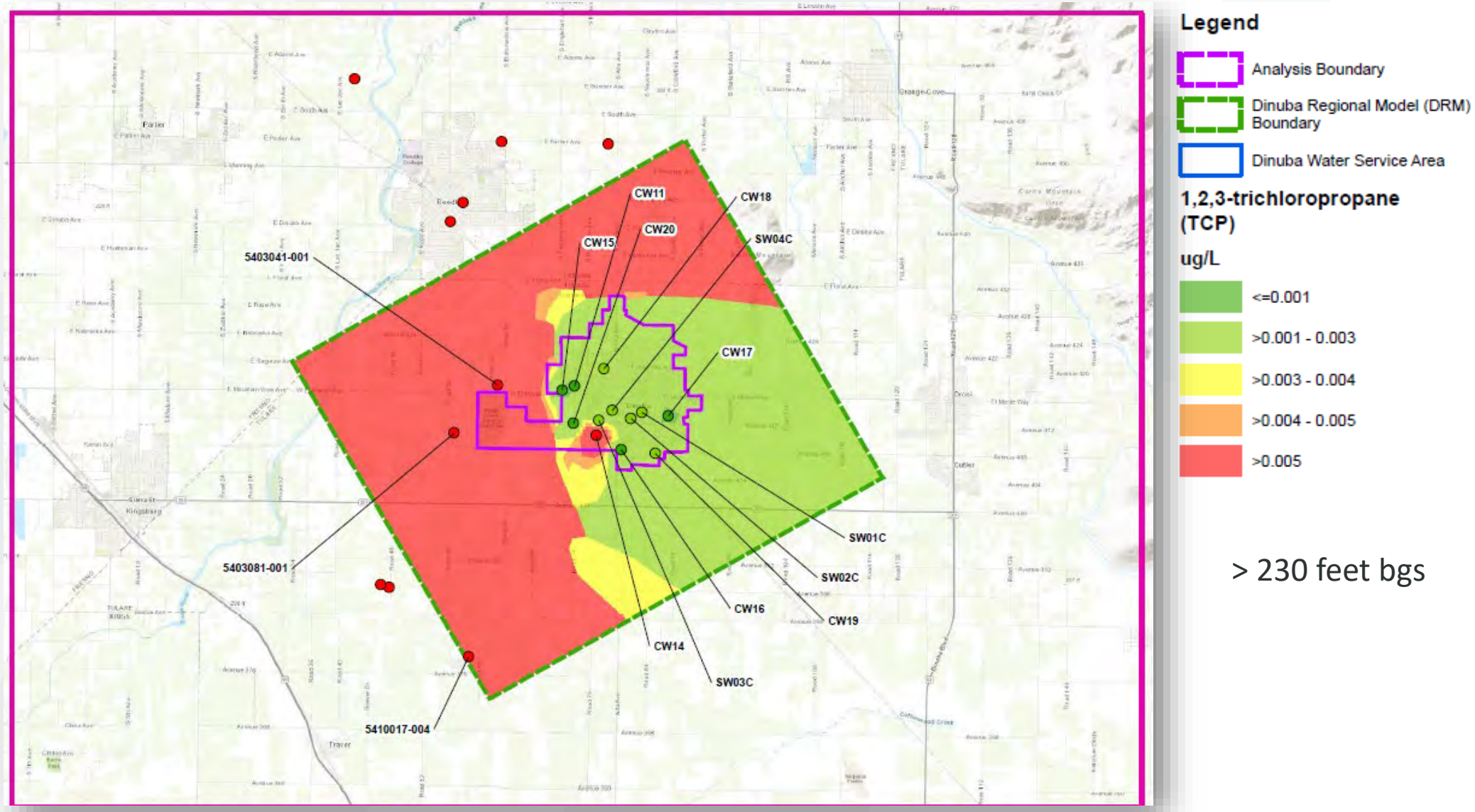
1,2,3-trichloropropane (TCP)

ug/L

- <=0.001
- >0.001 - 0.003
- >0.003 - 0.004
- >0.004 - 0.005
- >0.005

< 230 feet bgs

1,2,3-TCP – Deep Groundwater Average Concentrations (ug/L)



> 230 feet bgs

Solute Transport Model Development

RIFS Solute Transport Model

Model Development

Develop Dinuba Refined Model

- Refine model grid
- Update local hydrology and pumping
- Calibrate to heads, vertical gradients and ambient well flows

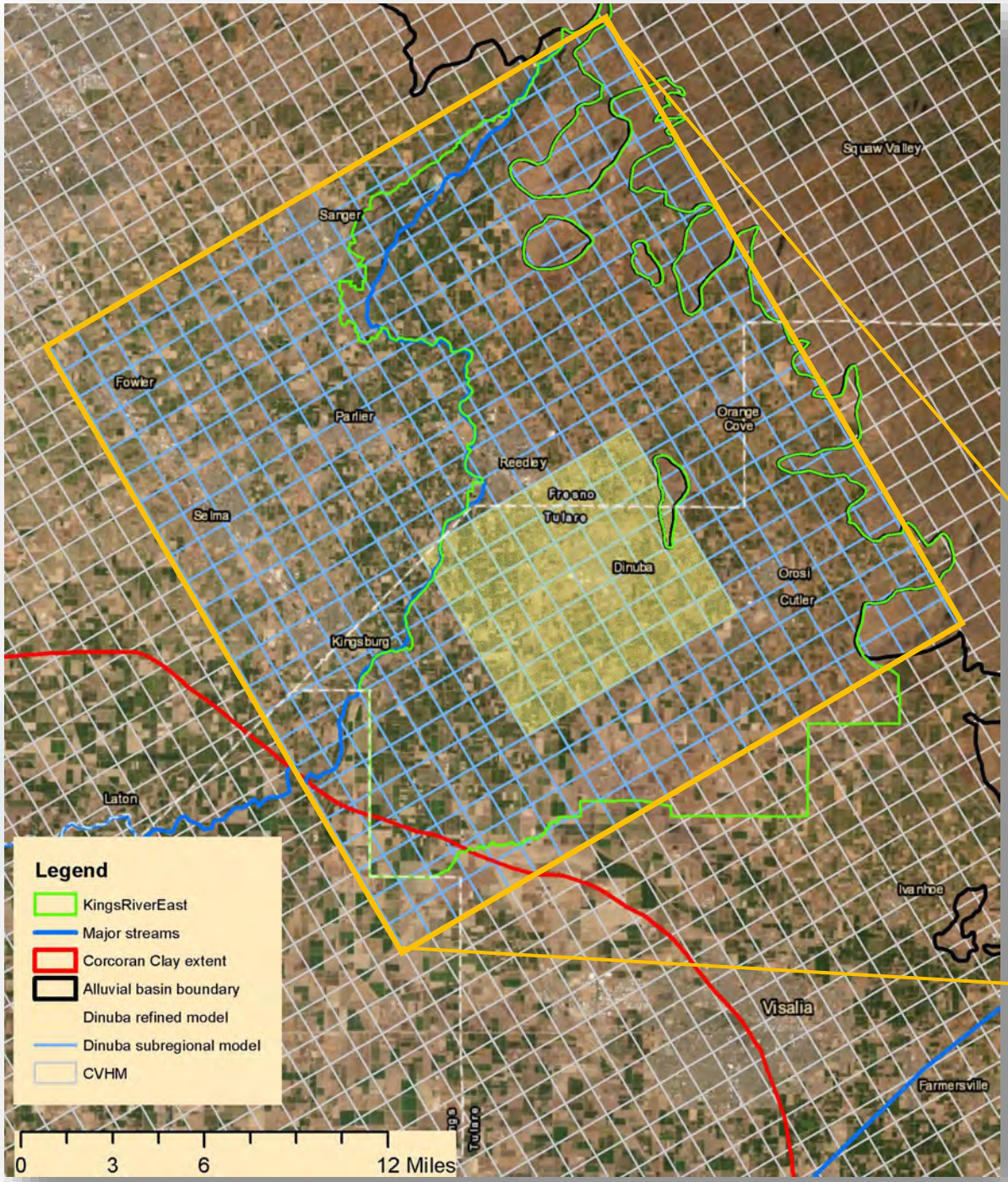
Develop Solute Transport Model

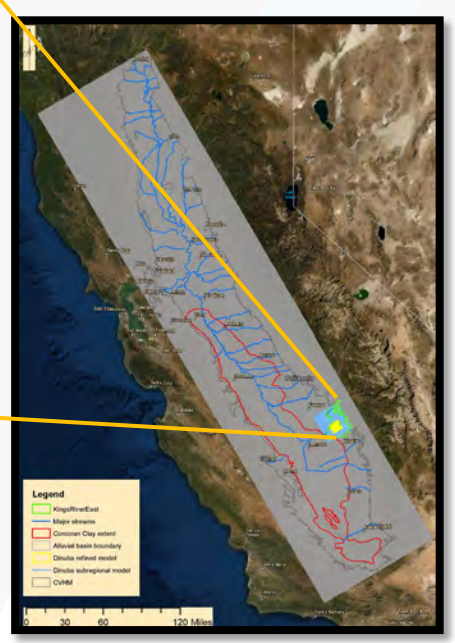
- Set initial concentrations and loading rates
- Simulate warmup period
- Adjust loading for stable concentrations close to current at end of warmup
- Add DBCP and TCP initial conditions, loading rates and retardation

Update through 2015 with data from C2VSim

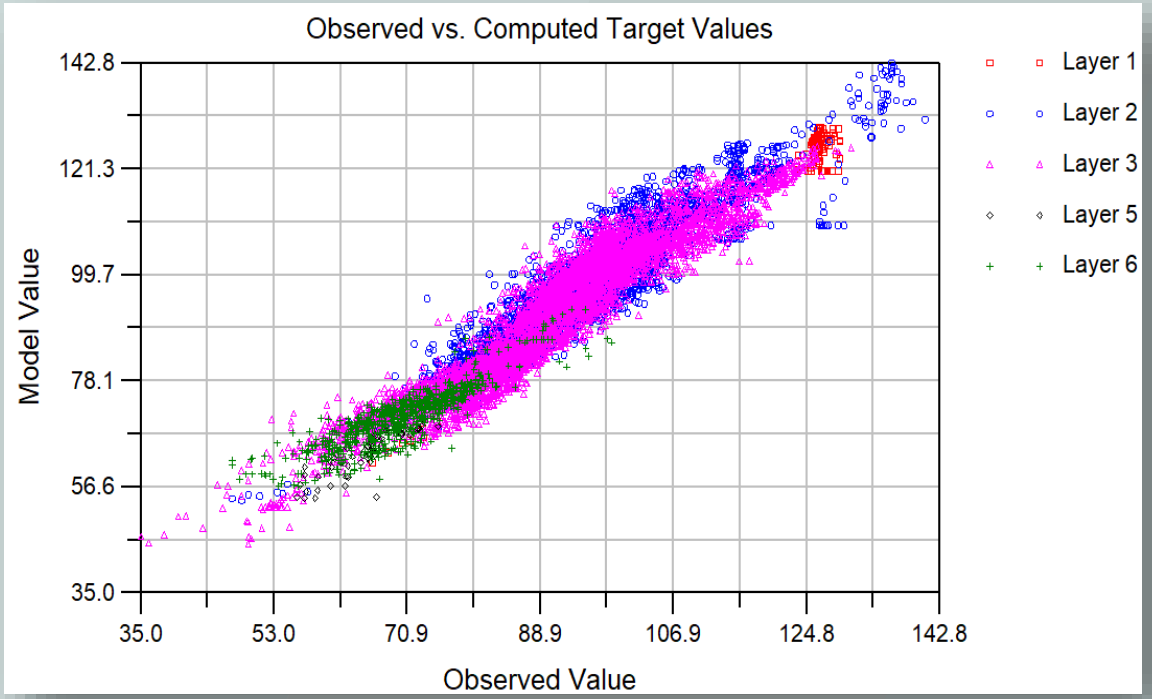
Extract Dinuba Subregional Model from USGS CVHM

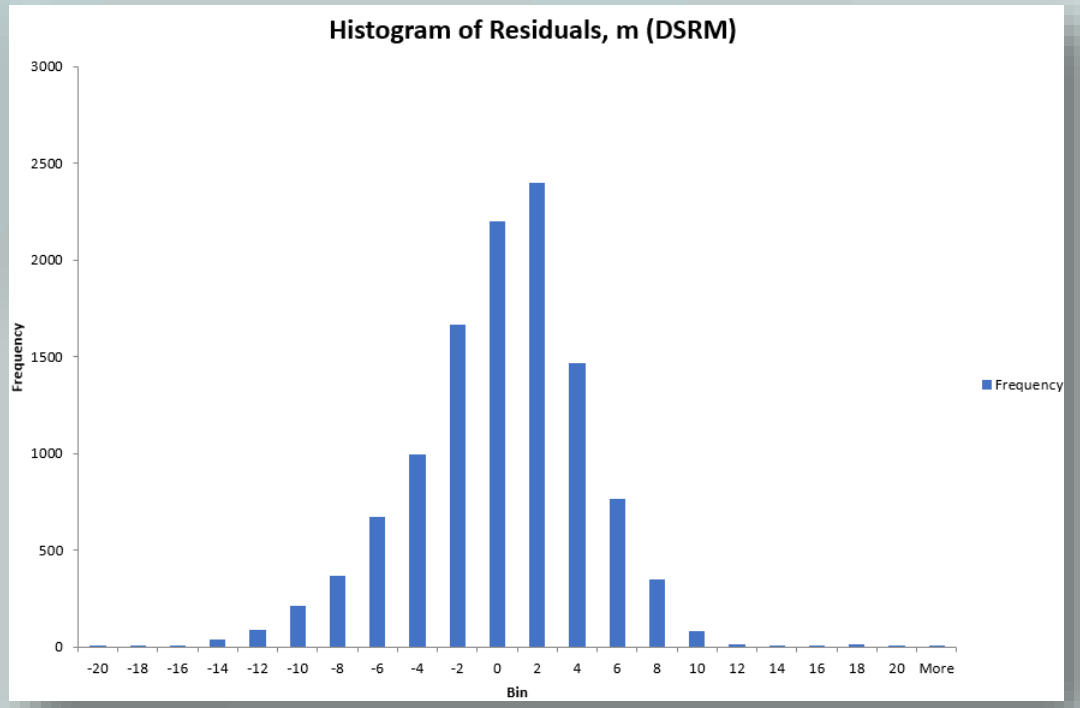
CVHM, DSRM and DRM Model Grids



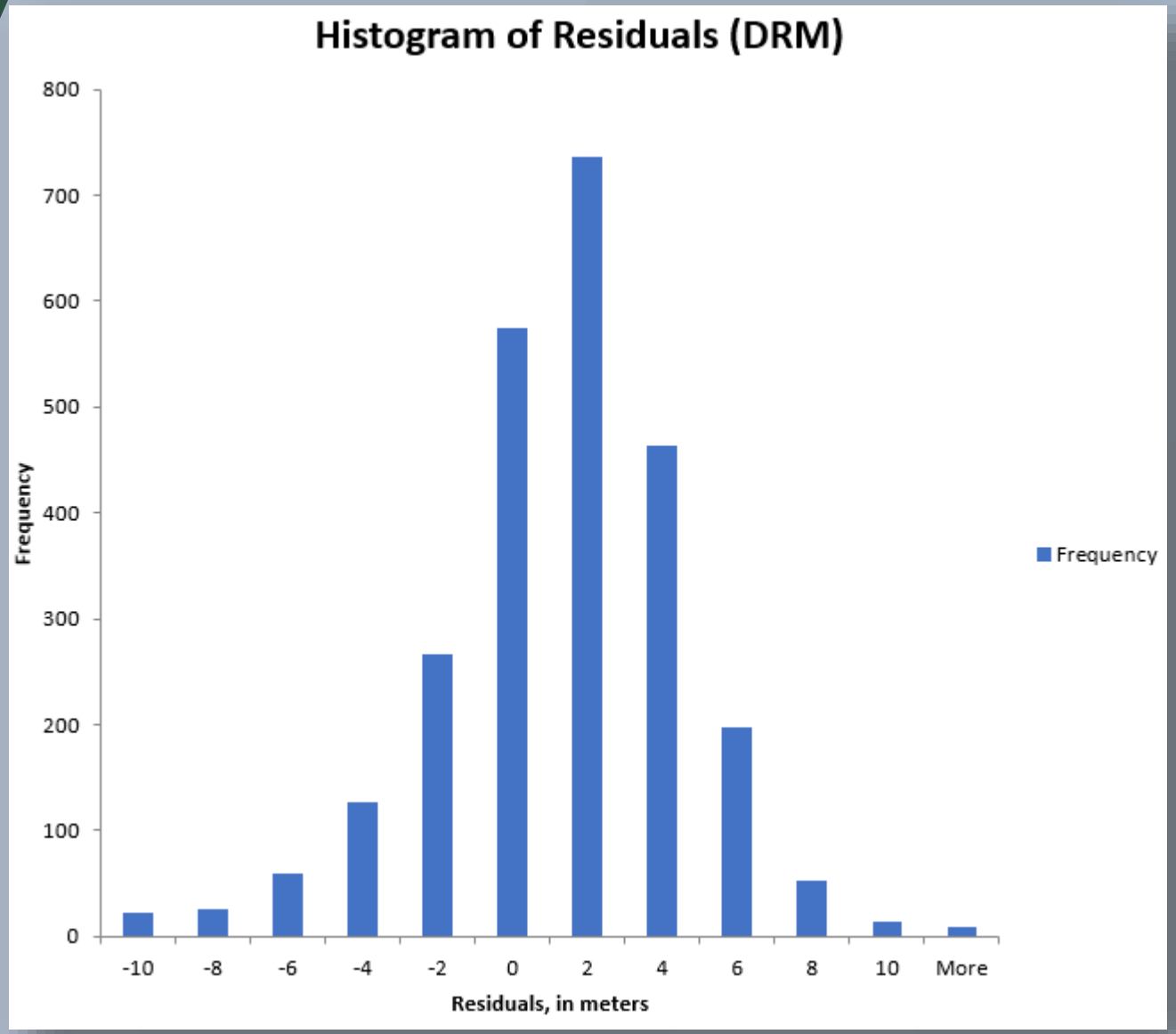


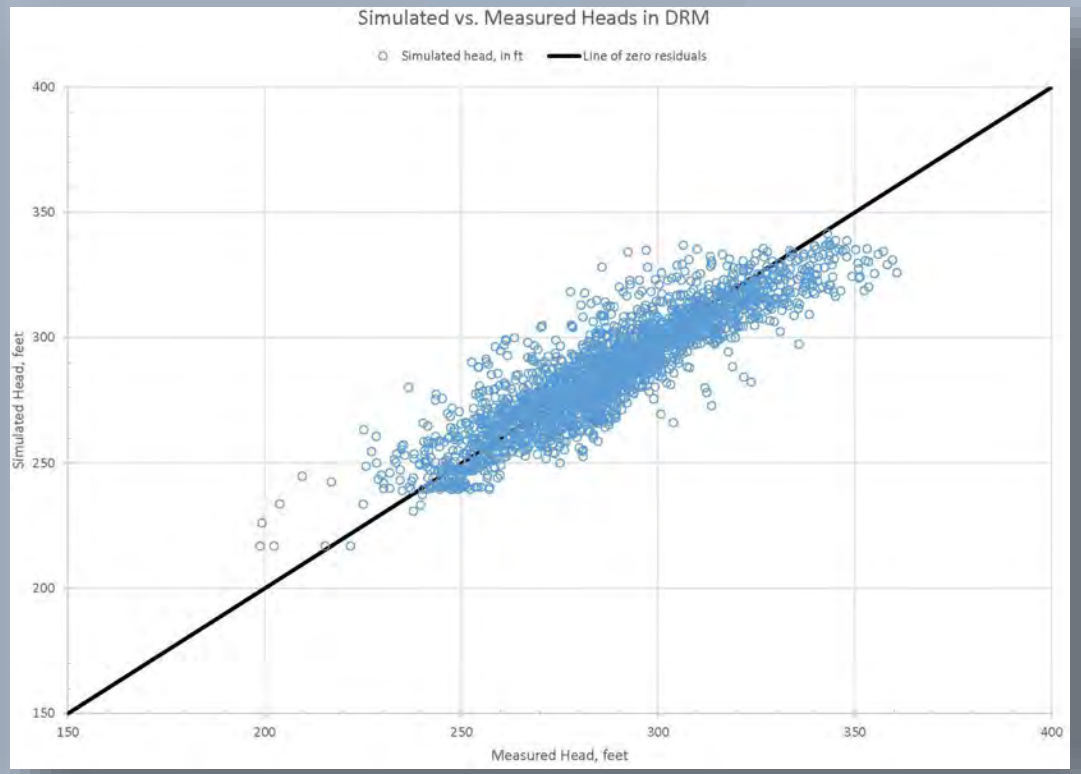
DSRM Model Calibration Results





DRM Model Calibration Results





Model Scenarios

Scenario 1 GSP Project

- Recharge surface water from AID in NE Dinuba
- Recharge surface water from AID in one or two recharge basins in NE Dinuba

Scenario 2 Rebalanced Pumping

- Capture and remove DBCP and 1,2,3-TCP from groundwater
- Increase CW14 and decrease CW 16 and 20 pumping, shallow pumping in wellfield expansion area

Scenario 3 RCR Pumping

- Construct deeper well at RCR to capture nitrate in deep groundwater
- Pump water to RCR pond and use to irrigate new 58-acre park

Scenario 4 Shallow Pumping

- Pump shallow groundwater in nitrate impacted areas
- Increase Well 7 pumping, install shallow irrigation wells and use for turf irrigation at athletic fields and new High school

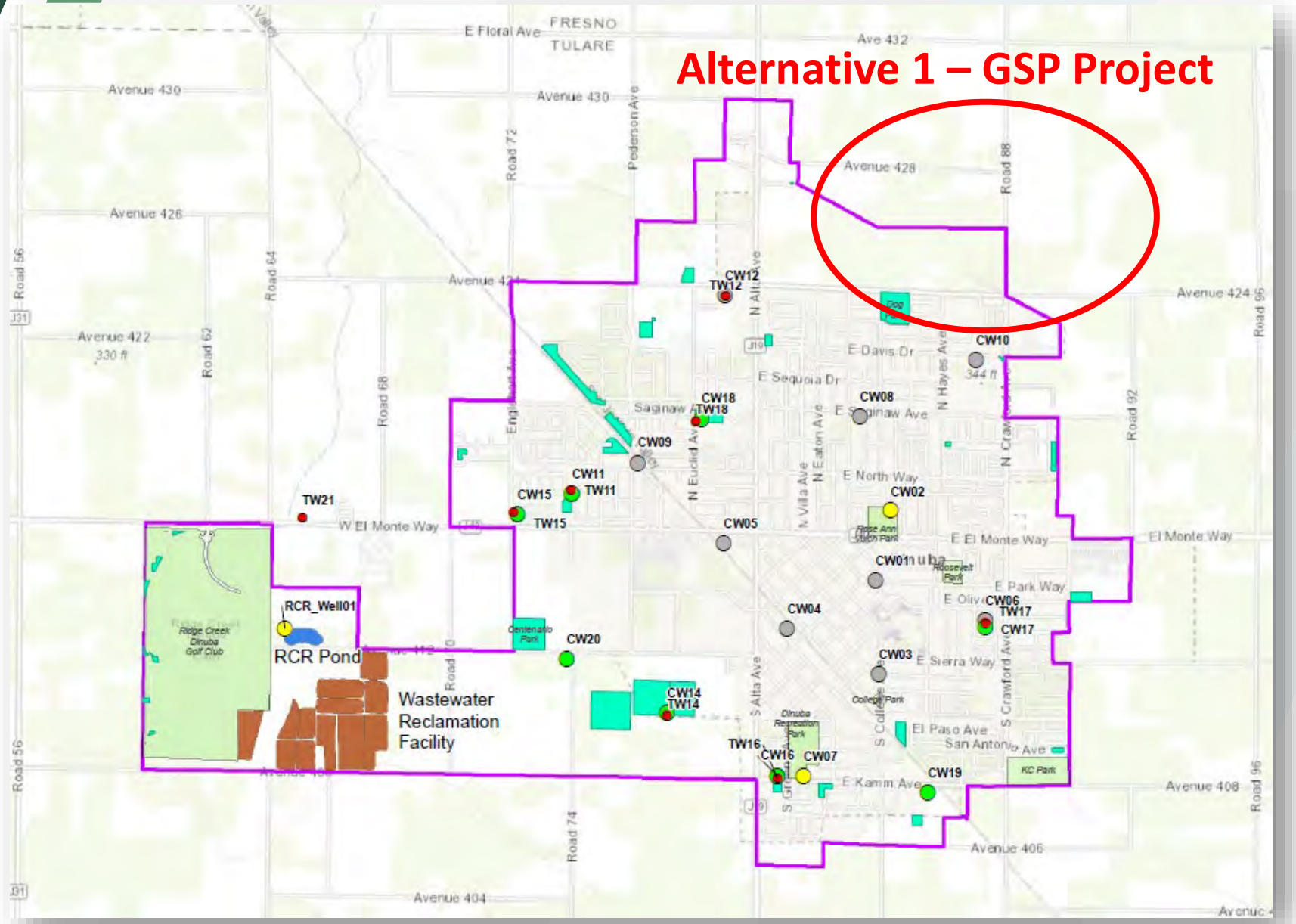
Scenario 5 Recharge & Extraction

- Recharge AID surface water; shallow groundwater extraction
- Recharge at CW14 Ponds combined with shallow groundwater extraction at new High School

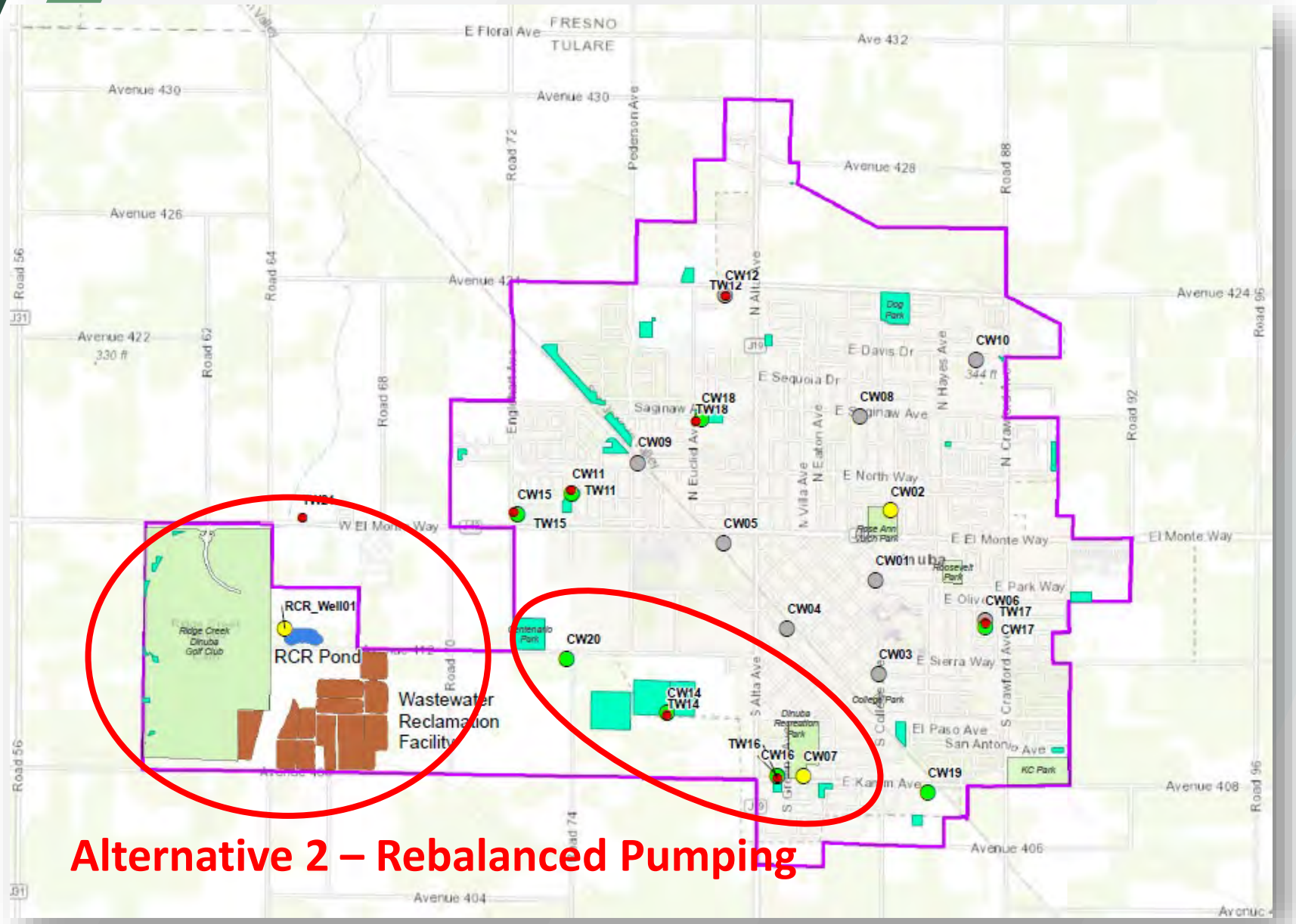
Scenario 6 Stormwater Capture

- Increase City stormwater retention basin capacity
- Increase capacity of existing retention basin system to retain all stormwater in the City during normal years

Project Locations



Project Locations



Alternative 2 – Rebalanced Pumping

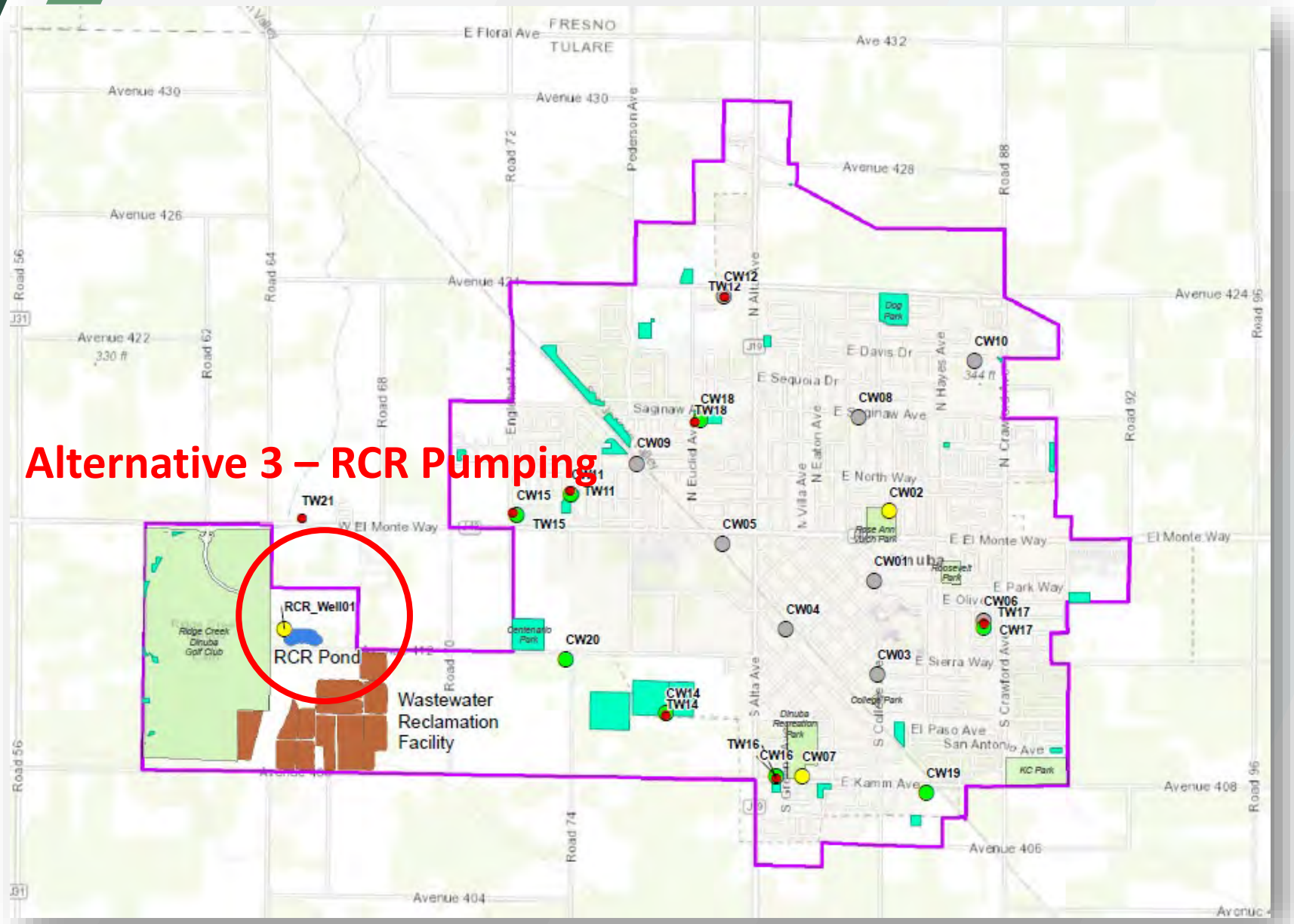
Legend

City Test and Supply Well Locations

Well Type, Status

- Test Well/Borehole, Destroyed
- Public Water Supply, Active
- Public Water Supply, Destroyed
- Public Water Supply-Irrigation, Active
- Dinuba Water Service Area
- Parks
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Project Locations



Legend

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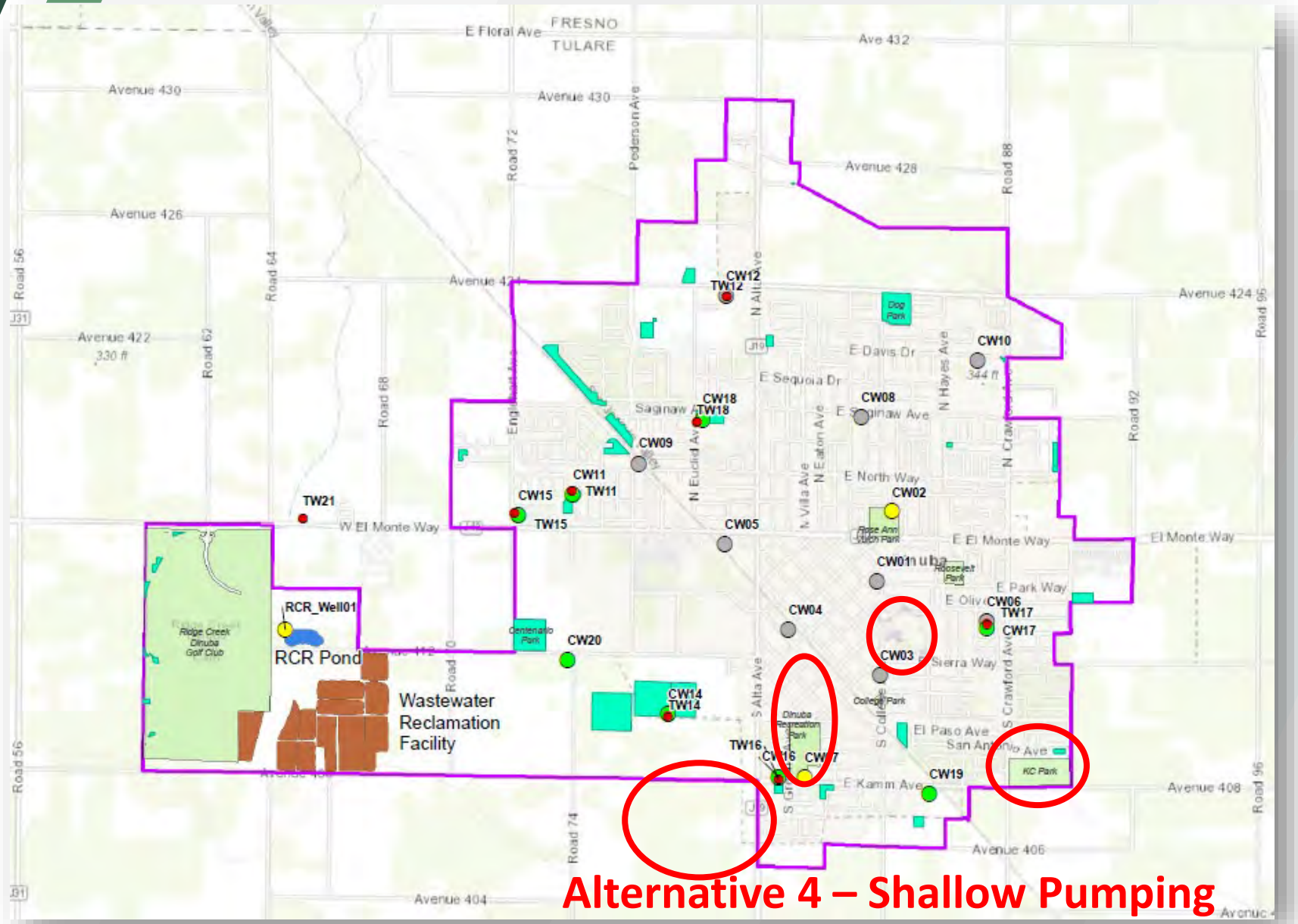
- Storm Water Retention Basin

Project Locations



Alternative 4 – Shallow Pumping

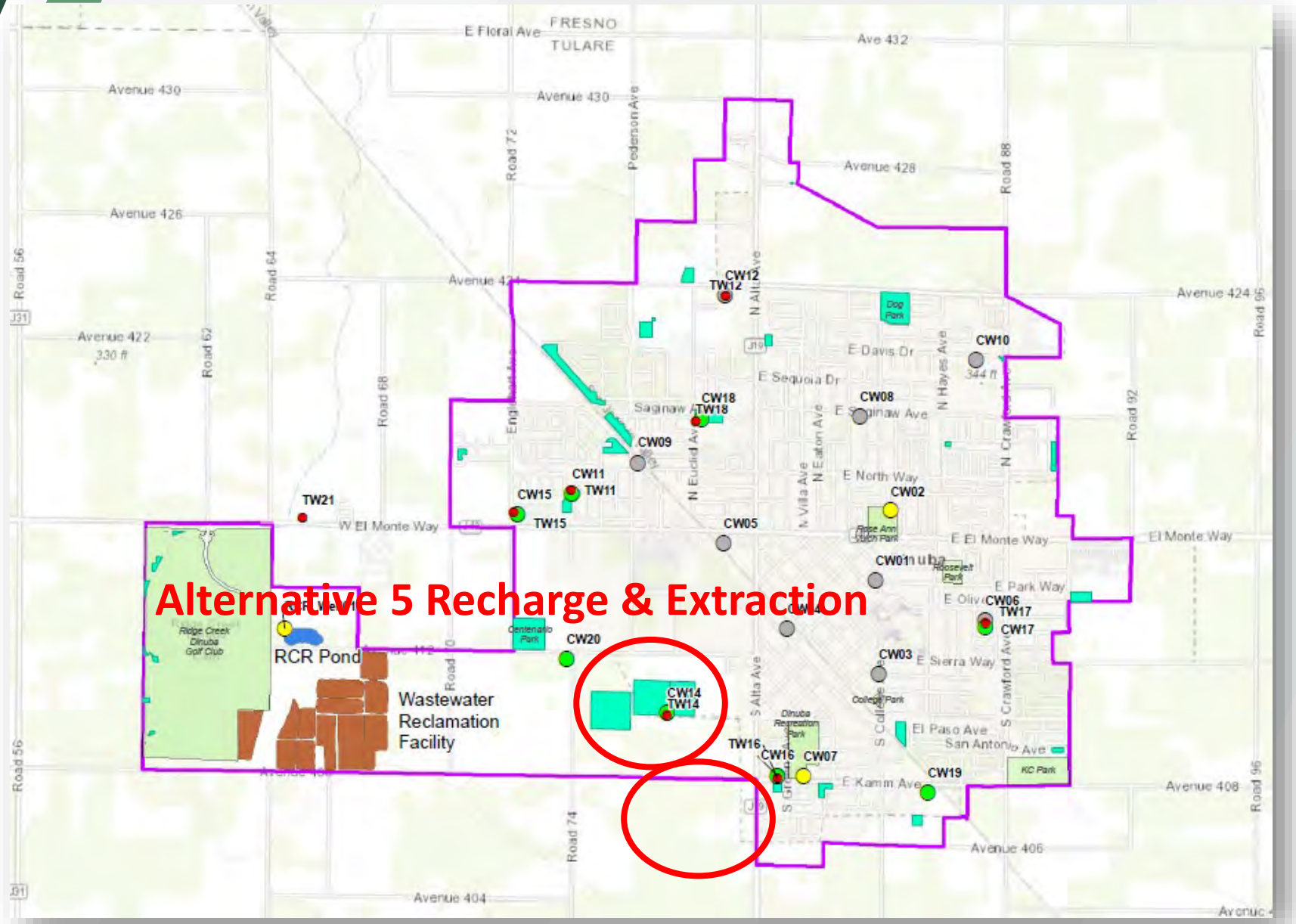
Legend

City Test and Supply Well Locations

Well Type, Status

- Test Well/Borehole, Destroyed
- Public Water Supply, Active
- Public Water Supply, Destroyed
- Public Water Supply-Irrigation, Active
- Dinuba Water Service Area
- Parks
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Project Locations



Legend

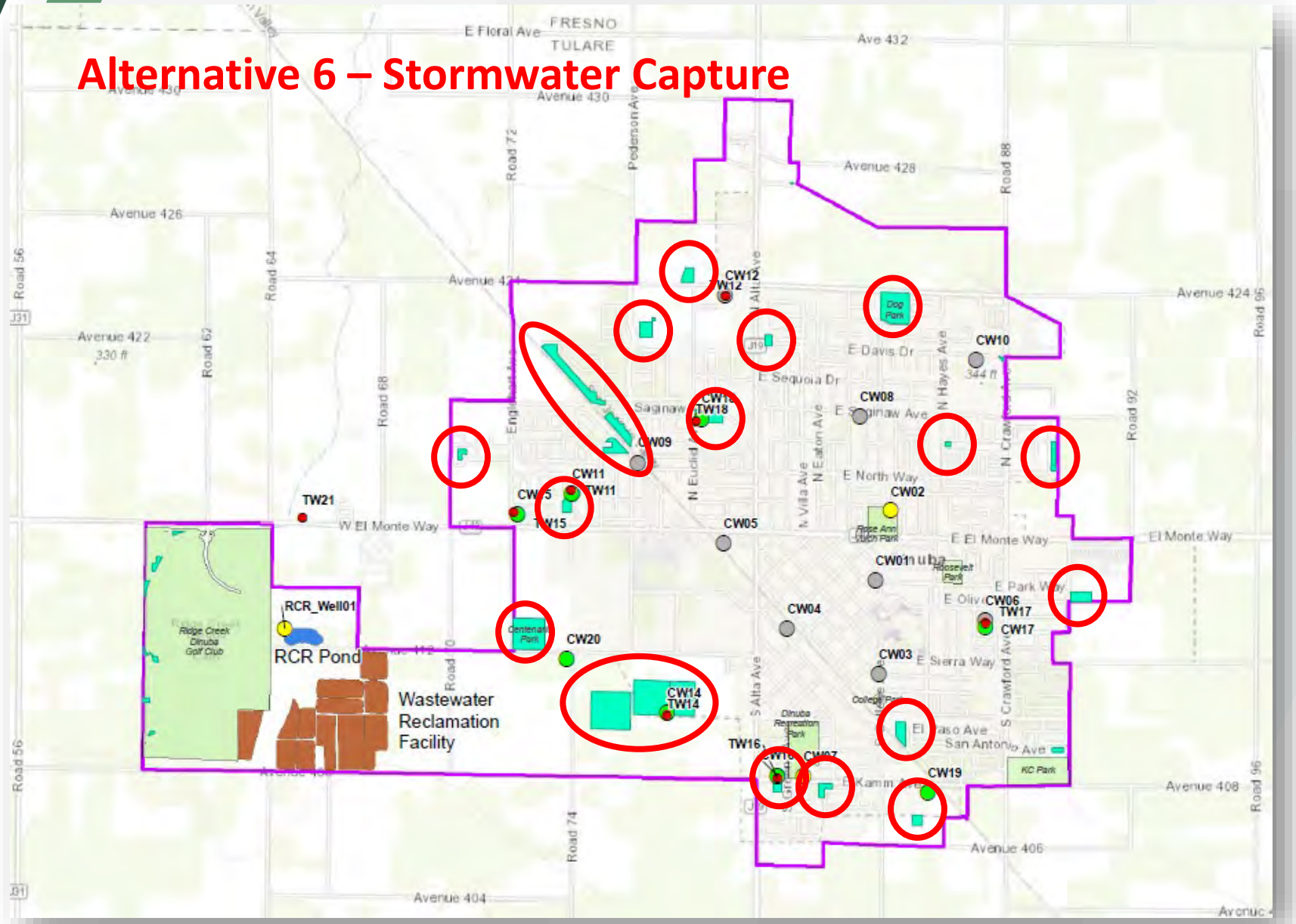
City Test and Supply Well Locations

Well Type, Status

- Test Well/Borehole, Destroyed
- Public Water Supply, Active
- Public Water Supply, Destroyed
- Public Water Supply-Irrigation, Active
- Dinuba Water Service Area
- Parks
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Project Locations

Alternative 6 – Stormwater Capture



Legend

City Test and Supply Well Locations

Well Type, Status

- Test Well/Borehole, Destroyed
- Public Water Supply, Active
- Public Water Supply, Destroyed
- Public Water Supply-Irrigation, Active
- Dinuba Water Service Area
- Parks
- City of Dinuba Wastewater Reclamation Facility
- City of Dinuba Reclamation Conservation Recreation Pond
- Storm Water Retention Basin

Next Steps
Opportunities for Involvement
Questions & Comments

Next Steps & Upcoming Project Milestones

- Draft RI Report – August 2021
- Groundwater Modeling Technical Memorandum – September 2021
- Draft FS Report – September 2021
- Requested Schedule Extension from October 2021 to January 2022 – Pending Approval
- Proposition 1 Grant Program Round 3 – Concept Proposal due September 7, 2021

	Data Sourcing & Analytics	Geodatabase & Data Management	Data Visualization & Analysis	Conceptual Site Model	Remedial Investigation	Groundwater Transport Model	Feasibility Study
3rd Quarter 20/21							
4th Quarter 20/21							
1st Quarter 21/22							
2nd Quarter 21/22							
3rd Quarter 21/22							

	Complete		In Progress		Not Started

Next Steps

- ✓ Questions?
- ✓ Review/comment on draft reports
- ✓ Next meeting September 2021
- ✓ Thank you for participating

Project Website:

http://www.dinuba.org/departments/122-public-works/598-dinuba-rifs

For more information please contact:

Ismael Hernandez at ihernandez@dinuba.ca.gov
Trilby Barton at tbarton@ppeng.com
Mike Tietze at mtietze@formationenv.com
Sarah Raker at sraker@formationenv.com