EBP Subbasin GSP Progress Update

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East Bay Plain Subbasin – Groundwater Sustainability Plan
Technical Advisory Committee Meeting

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Near-Term Activities

- Subtask 4.1: Data Compilation and Data Gap Analysis
- Subtask 4.2: Hydrogeologic Conceptual Model (HCM)
- Subtask 4.3: Model Objectives and Model Selection

Subtask 4.1 Data Compilation/Data Gaps

- Compilation of available data including: well logs, water levels, water quality, water budget components, and other data types
- Mapping of spatial distribution of data and evaluation of data time-series
- Current status: Admin Draft TM recently completed and under internal review
- Schedule for release to TAC: Draft TM late October/early November

Subtask 4.1 Data Compilation/Data Gaps

- 22,433 WCRs received from DWR
- Screening of WCRs by depth/quality of record – 642 records for further processing
- GW level and GW quality – shallow zone data much more available than intermediate/deeper aquifer data (> 200 feet)
- A primary data gap area for further evaluation – north region between Oakland and Richmond
- Other smaller data gap areas for further evaluation – central and south regions of Subbasin

Subtask 4.2 HCM

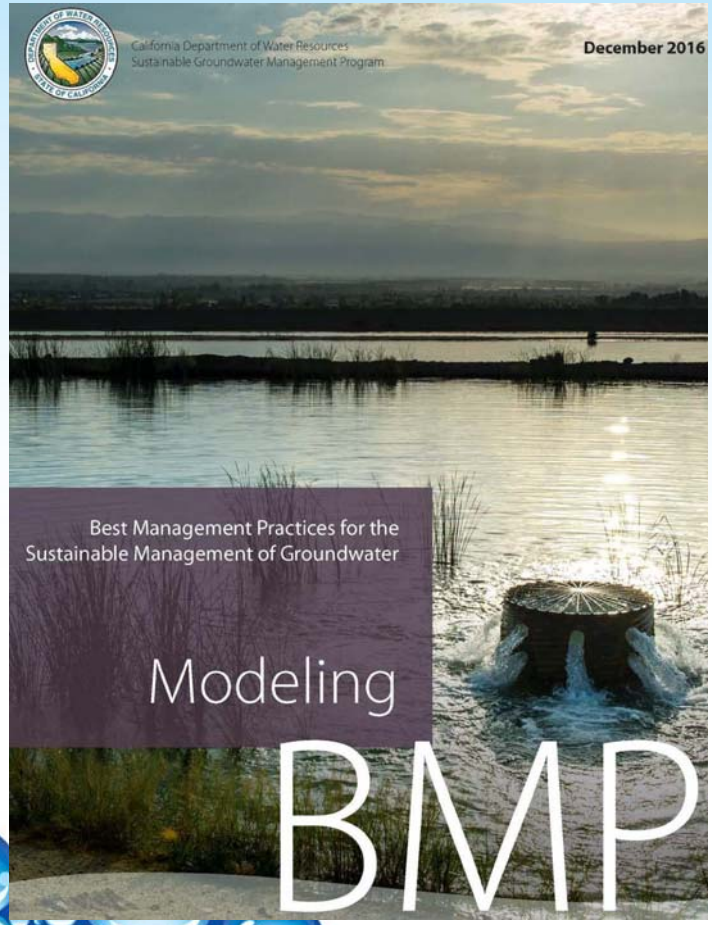
- Utilize available data/reports to evaluate geologic conditions (e.g., stratigraphy, aquifer/aquitard delineation, vertical/lateral basin boundaries)
- Utilize data/reports to evaluate GW conditions (e.g., GW level contours, GW quality, subsidence, aquifer parameters)
- Utilize data/reports to evaluate water budget components (e.g., precipitation, ET, stream infiltration, bedrock inflow, pumping)
- Current status: Admin Draft TM due in December
- Schedule for release to TAC: Q1 2020

Subtask 4.3 Model Objectives/Selection

- Evaluate key objectives for groundwater basin model
- Identify model code requirements to meet key objectives
- Make recommendation for model selection
- Current status: Admin Draft TM completed in September
- Schedule for release to TAC: October

Subtask 4.3 Model Objectives/Selection

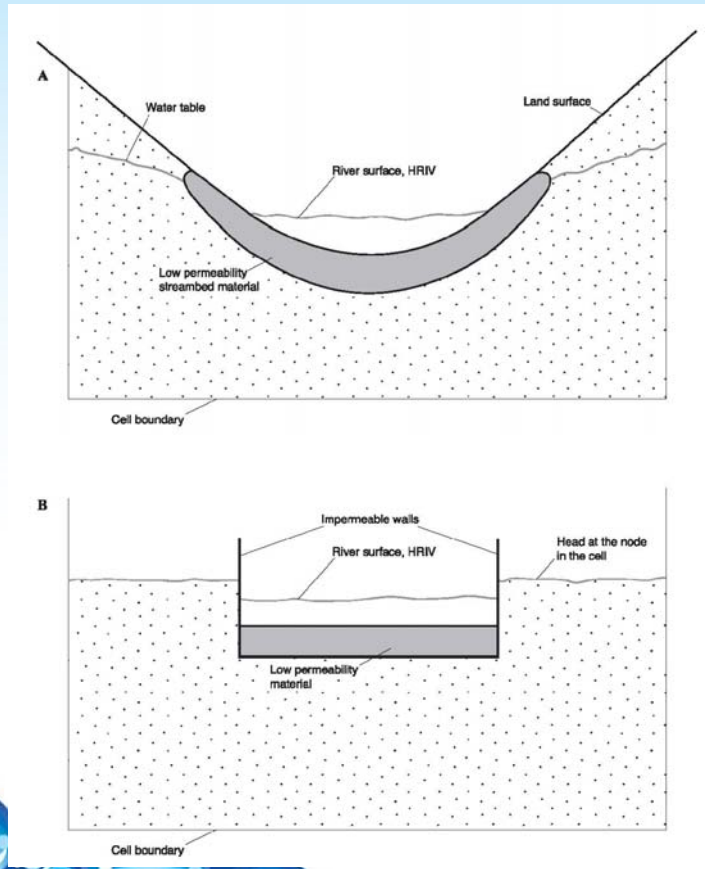
- A numerical GW flow model will be developed for the EBP Subbasin to support GSP development.
- In accordance with DWR's BMP guidance, the model will provide a framework that includes conceptual understanding, available data, and science.
- Public domain software with established credibility.



Subtask 4.3 Model Objectives/Selection

The model will be an important tool to:

- Estimate sustainable yield
- Quantify water budget
- Analyze GW – SW interaction
- Evaluate GDEs
- Develop monitoring criteria and thresholds
- Evaluate and plan future projects
- Guide management actions



Subtask 4.3 Model Objectives/Selection

The model software and platform will include capability to represent:

- 3-D GW flow
- Heterogeneity/anisotropy of porous media in 3-D
- Confined and unconfined aquifers
- Aquifer storage capacity and temporal change in storage
- GW pumping and injection
- Fault structures

Subtask 4.3 Model Objectives/Selection

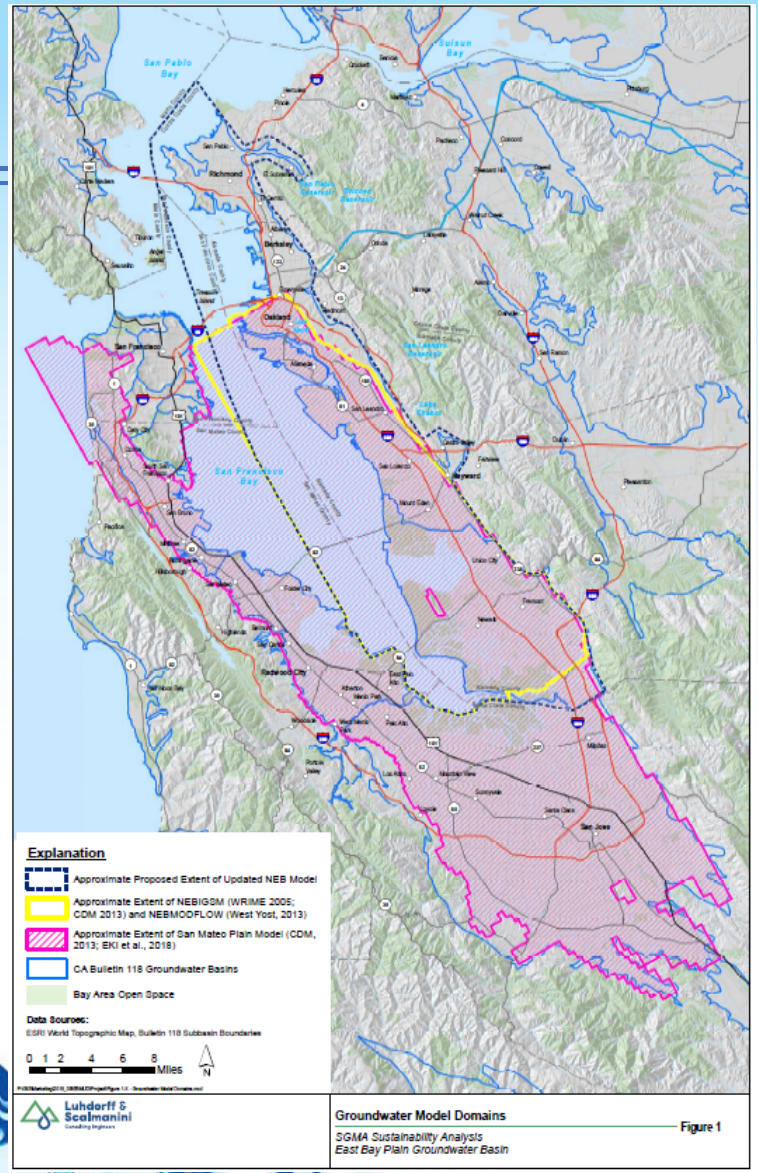
The model software and platform will include capability to represent:

- GW – SW interactions (e.g., streams, lakes, springs, etc.)
- Recharge and evapotranspiration
- GW fluxes and water budget
- Potential changes in GW quality, including SWI
- Potential subsidence from declining GW levels
- Comparison between modeled and observed data to facilitate model calibration

Subtask 4.3 Model Objectives and Selection

Incorporate information from existing models:

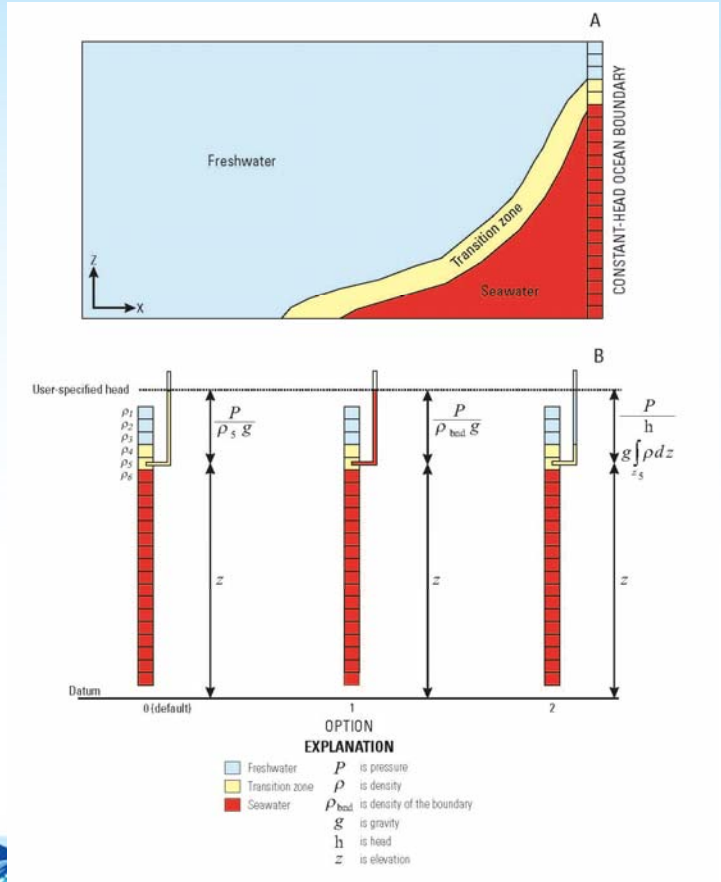
- ACWD NEBIGSM; Niles Cone and South EBP Subbasin IGSM Model– proprietary software
- EBMUD NEB MODFLOW; Niles Cone and South East Bay Plain Subbasin MODFLOW model – based on NEBIGSM
- San Mateo County SMPGM; San Mateo Plain Subbasin MODFLOW



Subtask 4.3 Model Objectives/Selection

Groundwater Modeling Software Considered (public- domain)

- MODFLOW – USGS - 3D finite difference, saturated flow, subsidence
- SEAWAT – USGS - 3D finite difference, variable density, multi-species transport and heat transport (similar to MODFLOW)
- IWFM –DWR - 3D finite element groundwater & surface water flow model (improvement on IGSM)
- SUTRA – USGS - 2D/3D finite element, sat/unsat, variable density fluid flow, transport, heat flow



Subtask 4.3 Model Objectives/Selection

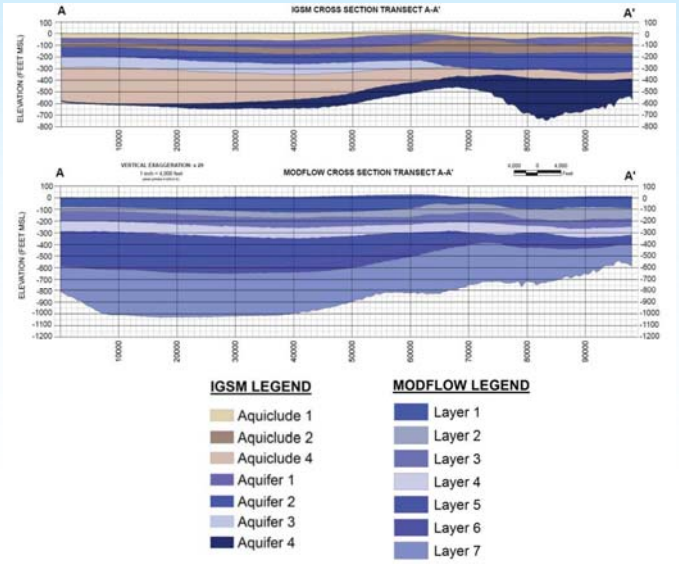
MODFLOW - Recommended Modeling Software

- Most widely used software for GW modeling
- Thorough documentation and established credibility
- Support and upgrades by USGS
- Portability between public-domain and widely-used commercial GUIs
- Efficient coupling with data-base platforms
- Sufficient ability to represent GW – SW interaction (simulation of variably saturated flow in vadose zone not needed for EBP Subbasin)

Subtask 4.3 Model Objectives/Selection

MODFLOW – GMS Recommended Modeling Software and Database Platform

- NEBIGSM converted to MODFLOW (EBMUD, 2013), expansion and upgrade most efficient with MODFLOW
- Conversion of NEBIGSM to MODFLOW conducted using GMS – a GW modeling system platform for MODFLOW developed by US DOD
- GMS facilitates efficient and powerful integration of MODFLOW with GIS, specifically ArcGIS and Arc Hydro Groundwater
- GMS recommended for development of expanded and updated EBP Subbasin GW model

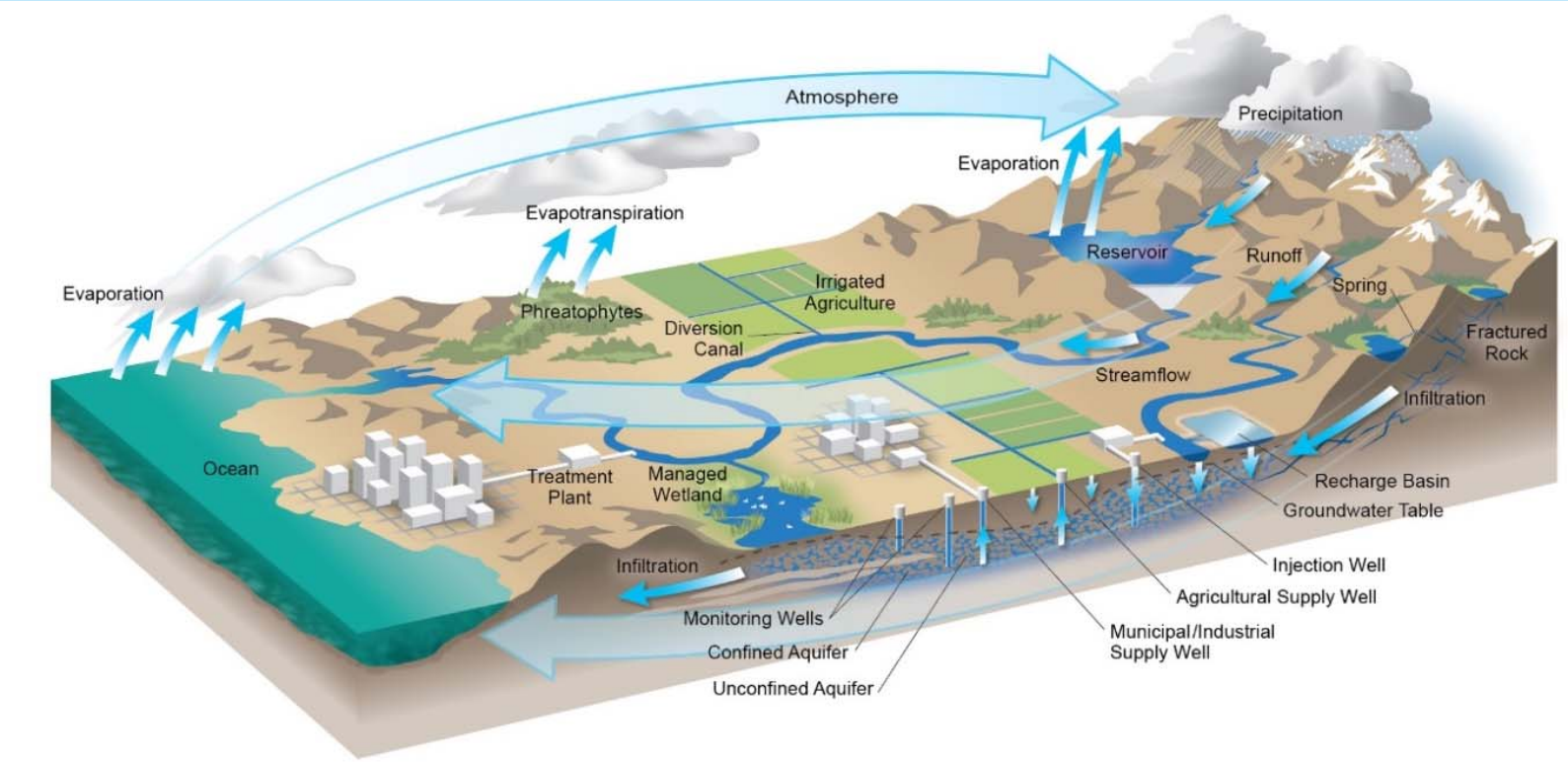


Subtask 4.3 Model Objectives/Selection

MODFLOW's Ability to Simulate Other Processes

- Coupled with MODPATH to simulate particle tracking to trace GW flow
- Subsidence due to GW pumping
- MODFLOW-2005, MODFLOW-NWT, and MODFLOW-6 can simulate variable density interfaces (if needed) to evaluate potential for saltwater intrusion
- Can be used to develop a SEAWAT model, which explicitly simulates variable-density groundwater flow and dispersive solute transport (if needed)
- Can be coupled with solute transport software MT3DMS and/or chemical reaction software such as RT3D to simulate chemical reactions and changing concentrations with time

Questions

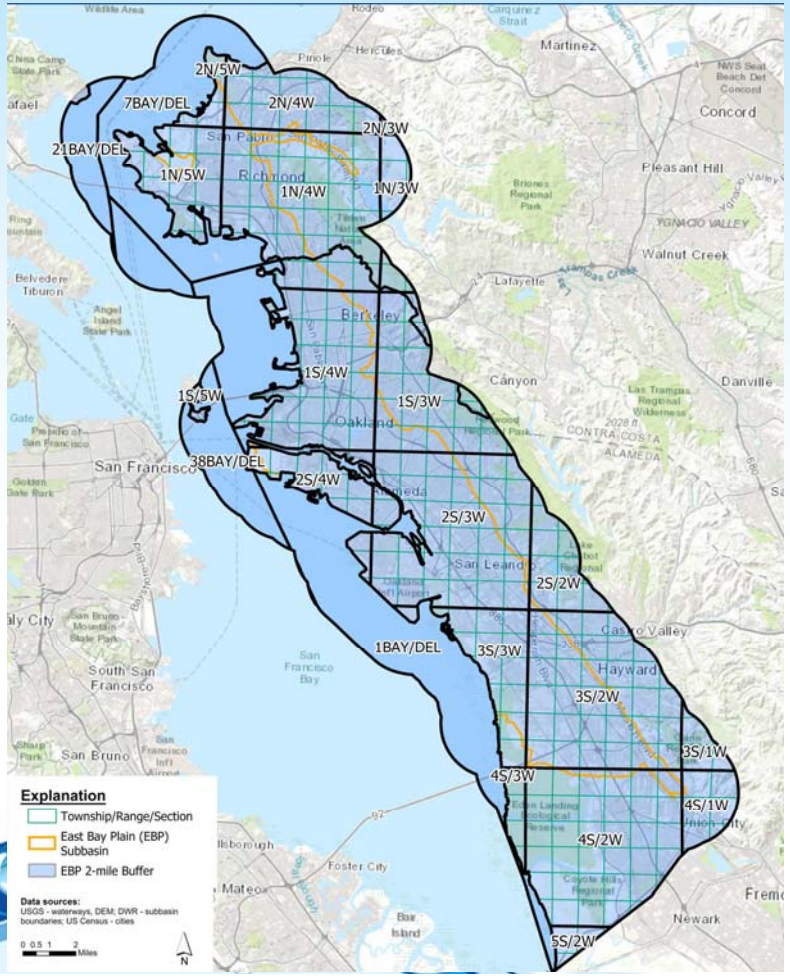


The Hydrologic Cycle, DWR Water Budget BMP, 2016

Extra Slides

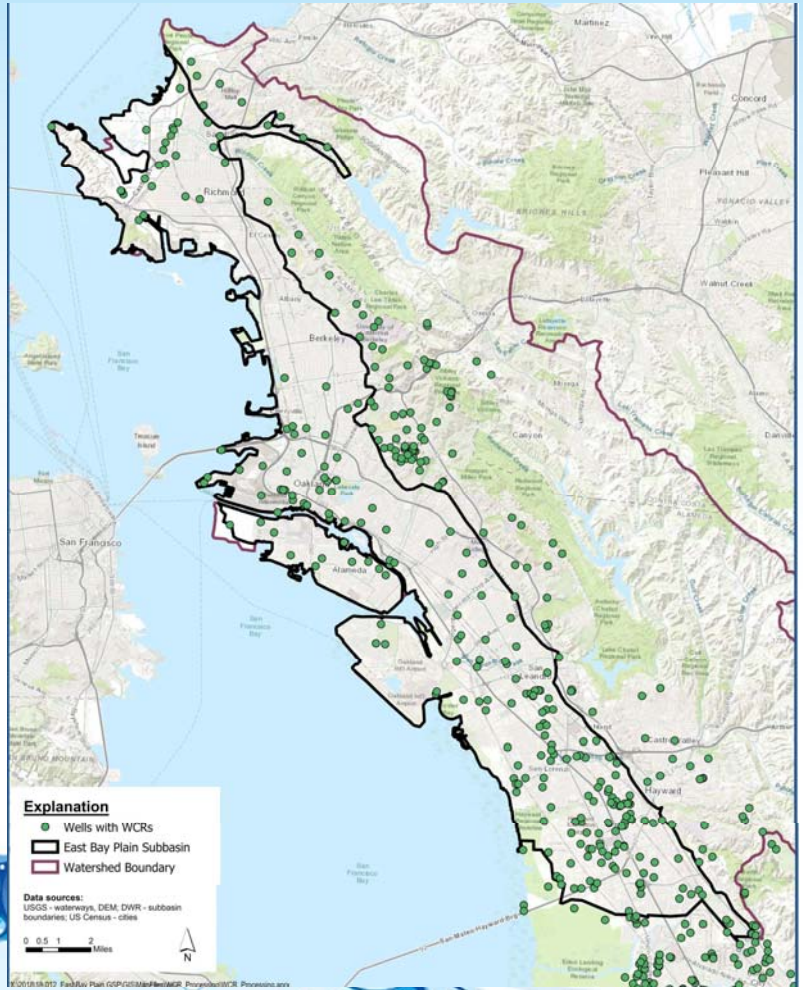
Subtask 4.1 Data Compilation/Data Gaps

- Compilation of DWR well completion reports (WCRs)
- 22,433 WCRs received
- Initial screening > 200 feet; supplemented by > 100 feet
- Initial screening to 848 records
- Next level screening to 642 records



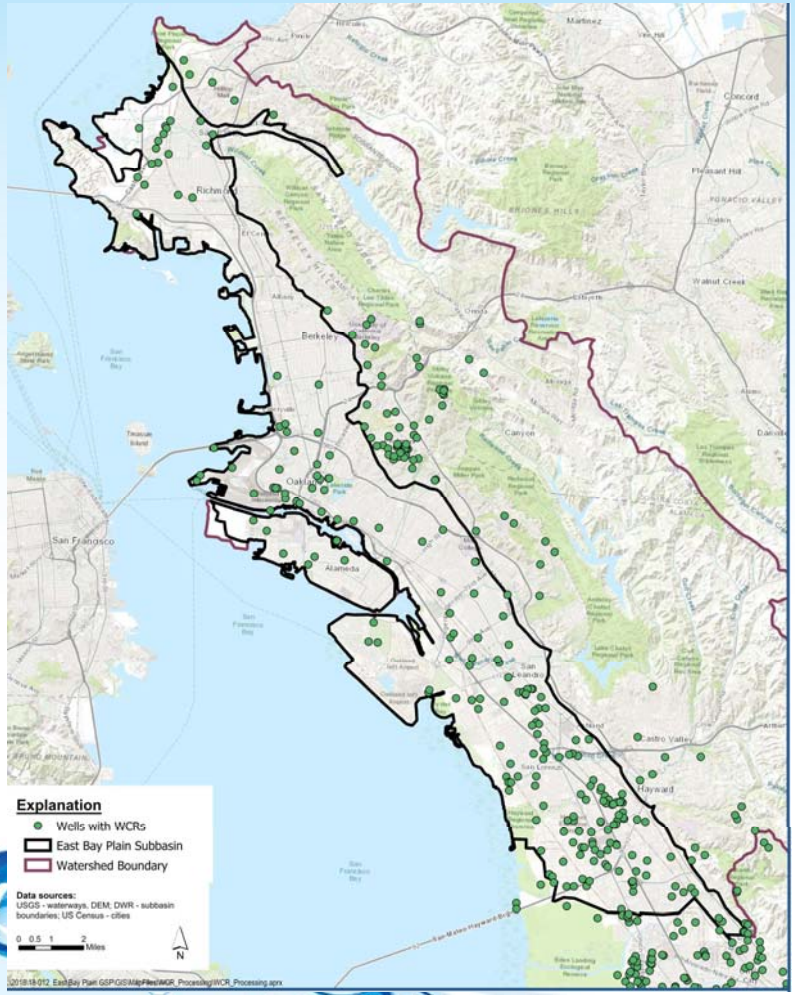
Subtask 4.1 Data Compilation/Data Gaps

- WCRs > 100 feet
- 642 records
- Located as accurately as possible; but some only by T/R/S centroid
- Some dots = more than 1 well



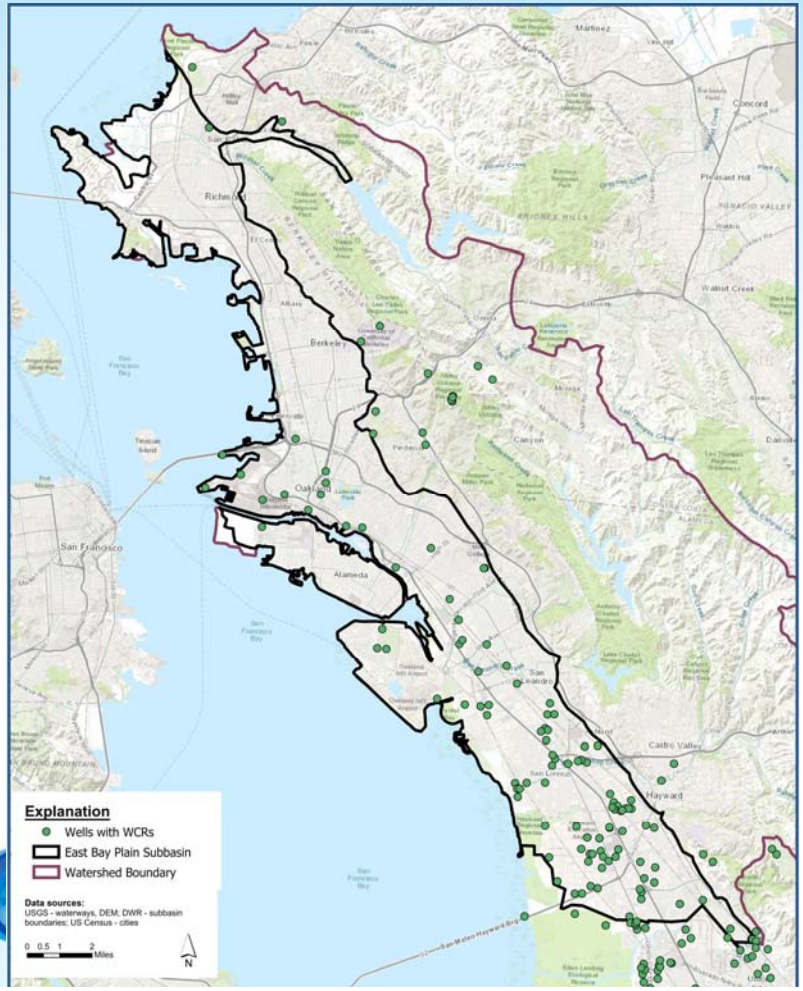
Subtask 4.1 Data Compilation/Data Gaps

- WCRs > 200 feet
- Primary screening depth
- 557 records



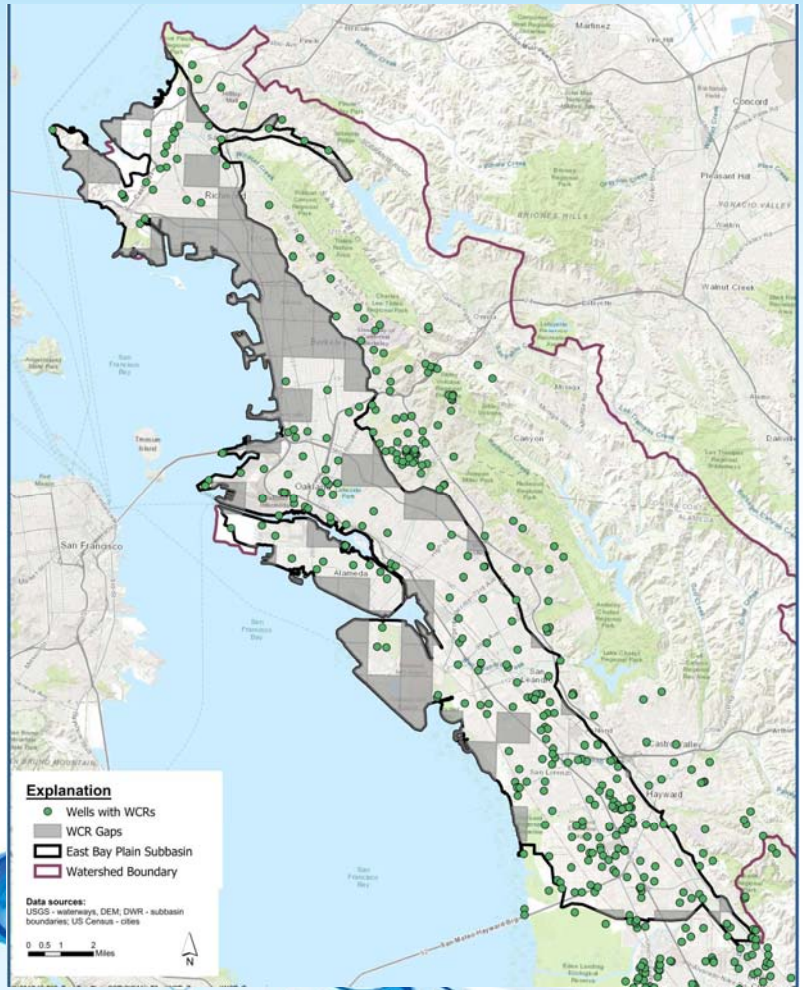
Subtask 4.1 Data Compilation/Data Gaps

- WCRs > 400 feet
- 232 records
- Limited to central and southern portion of subbasin



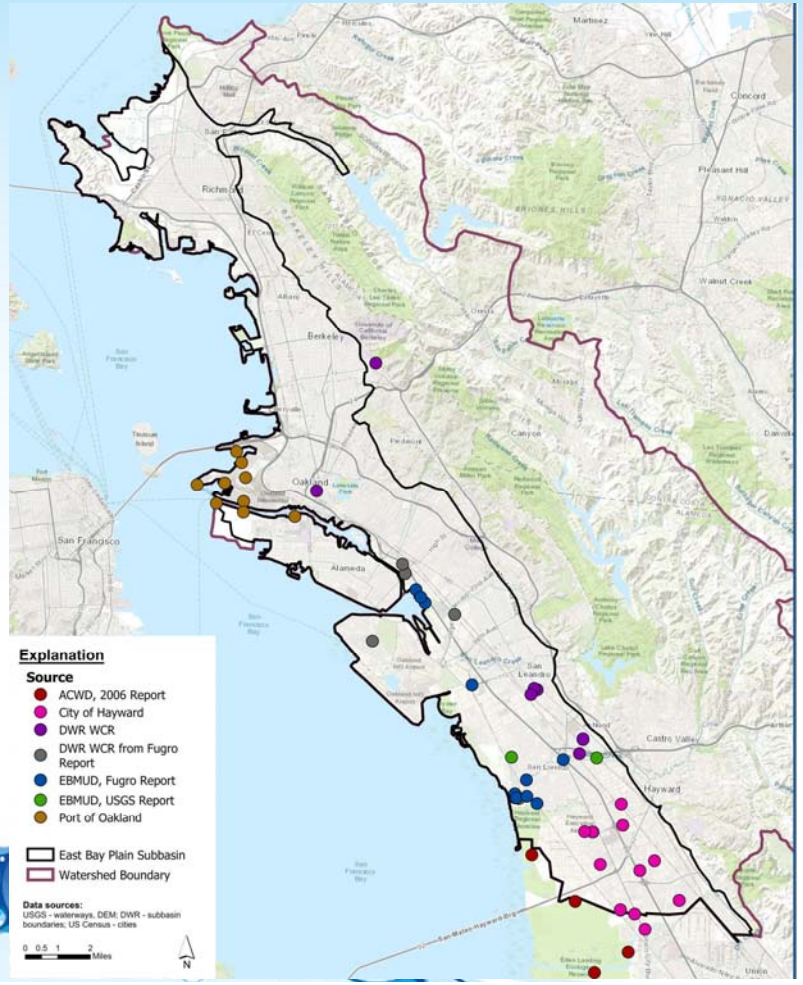
Subtask 4.1 Data Compilation/Data Gaps

- WCRs Data Gap Areas for further evaluation
- Good coverage in central to southern portion of subbasin
- Limited data in northern portion of subbasin



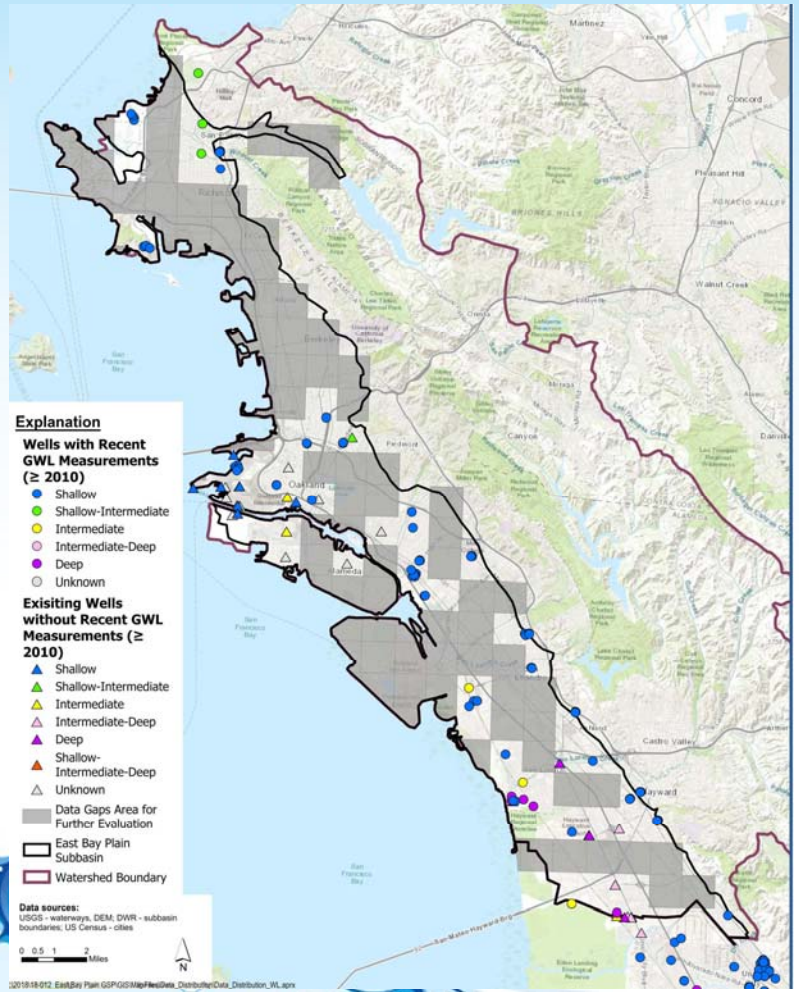
Subtask 4.1 Data Compilation/Data Gaps

- Compilation of geophysical logs
- Good coverage in southern and west central portion of subbasin



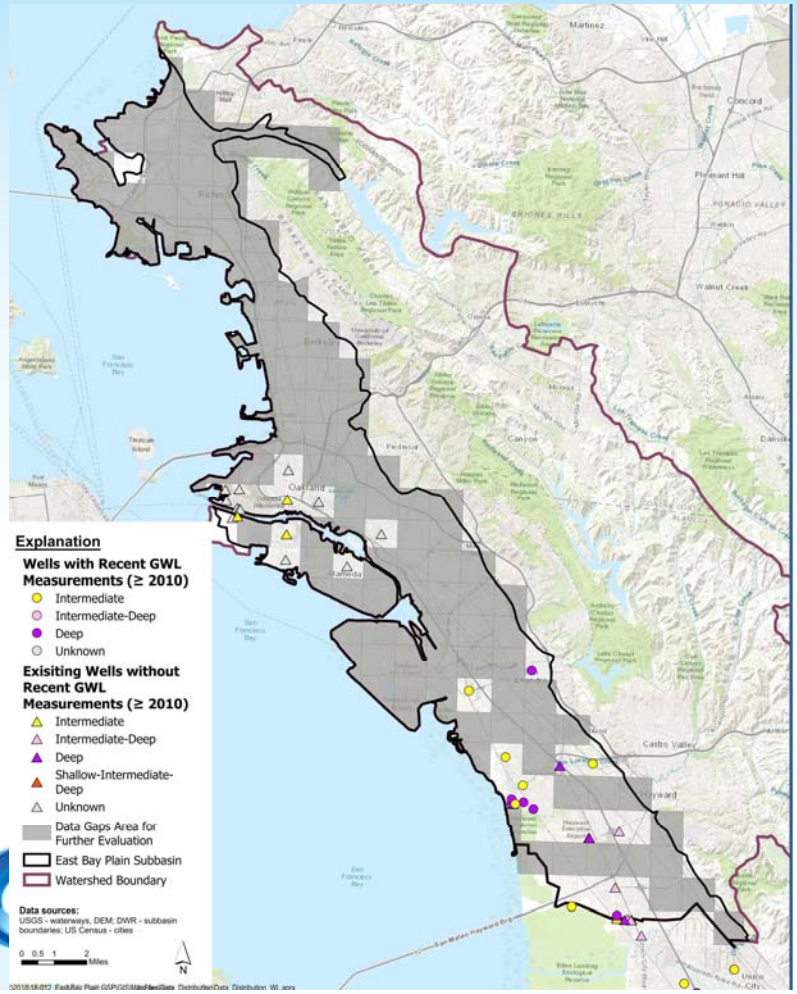
Subtask 4.1 Data Compilation/Data Gaps

- Compilation of Groundwater Level Data (Wells > 50 feet)
- Majority of wells with water level data represent shallow zone (<200 feet)



Subtask 4.1 Data Compilation/Data Gaps

- Compilation of Groundwater Level Data (Wells > 200 feet)
- Intermediate and deep well water level data mostly limited to southern portion of subbasin
- Some intermediate well data in west central portion of subbasin



Subtask 4.1 Data Compilation/Data Gaps

- Compilation of Water Quality Data (TDS) for Wells > 50 feet
- Generally similar data distribution as for water level data