CRWQCB

Regional Water Board Workshop
Coachella Valley Salt Nutrient Management Plan

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Topics

- Work Completed to Date
- Technical Concerns
- Summary and Alternatives

Work Completed to Date

- Technical Memorandum No. 1 → 8/18/14

  Preliminary Data Review and Documentation of Technical Methods

- Technical Memorandum No. 2 →10/8/14

  Ambient Water Quality

- RB Staff Comment Letter → 11/5/14
- Comment Letter withdrawn on 12/2/2014

SNMP Components

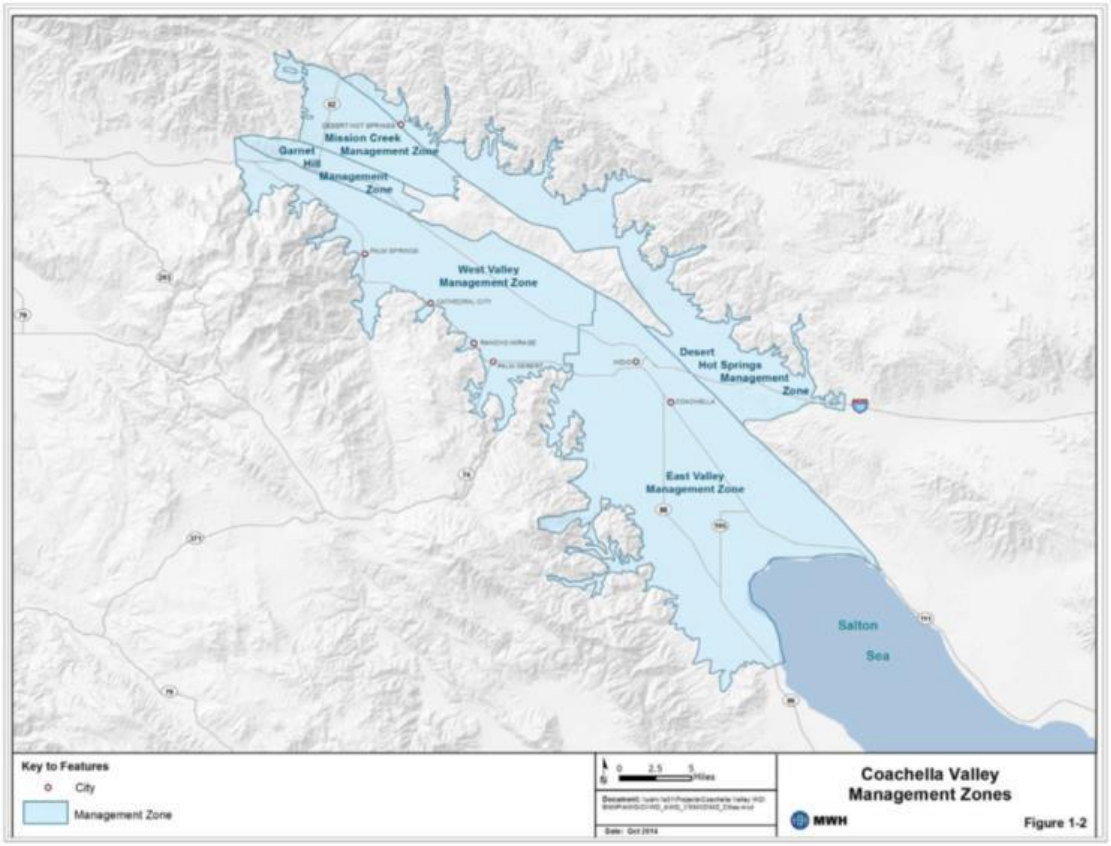
Basic Technical Approach

1. Evaluate existing data → delineate Management Zones (M-Zones), identify constituents of concern (COCs) & data gaps
2. Calculate Ambient Water Quality (AWQ) and Assimilative Capacity (AC)
3. Develop salt loading model to evaluate effectiveness of management strategies
4. Develop monitoring plan to:
   - → ensure compliance with Water Quality Objectives (WQOs)
   - → assess effects & impacts of S/N management strategies

Concerns With Proposed Approach

1. Too few M-Zones
2. Ambient Water Quality Methods
   - Is 20-year baseline period too long?
   - Is median the better measurement of central tendency of available data?
   - Is Volume-Weighted Average (VWA) appropriate given geologic layering? (i.e., significant lateral & vertical variation in geology & water quality)
   - Data quality assurance
3. Blending Chemically Distinct Groundwaters
4. Insufficient Data for Some Areas
   - Is shallow groundwater adequately characterized and protected?

Proposed Management Zones



MWH: Technical Memorandum 1, Fig. 1-2

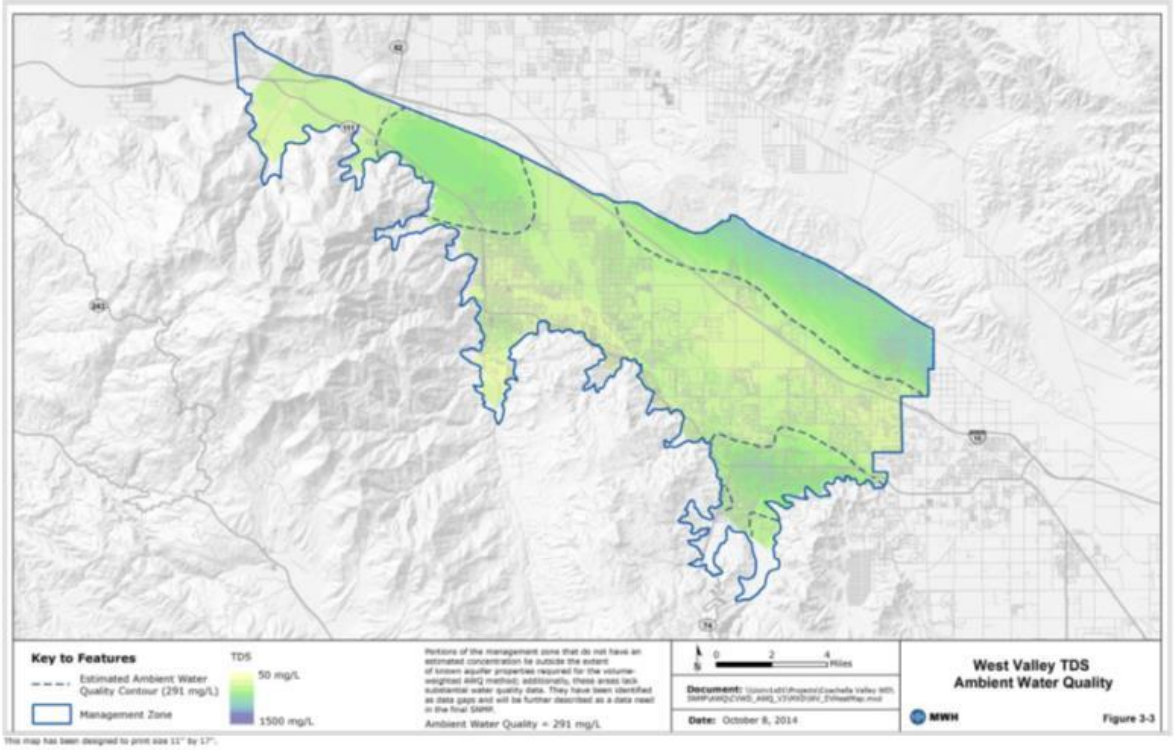
Management Zones

1. Mission Creek
2. Garnet Hill
3. Desert Hot Springs
4. East Valley (Whitewater)
5. West Valley (Whitewater)

Concern → Management Zones too heterogeneous to treat as single entities

Alternative → Further divide into subzones based on similarities in water quality & geology

West Valley TDS and AWQ



MWH: Technical Memorandum 2, Fig. 3-3

- Data clearly shows variable water quality; 100< TDS <1500 mg/l; dark green-blue areas higher in TDS
- High water quality areas discernible and deserve higher protection
- Should manage as distinct subzones, each with discrete AWQ and assimilative capacity for each COC

Proposed Approach for AWQ

Calculating M-Zone AWQ → Multistep process

- Propose to use 20 years (1994 – 2013) of data to derive at single concentrations for TDS and Nitrate (i.e., COCs) to represent well water quality for entire 20-year period

- For M-Zones w/sufficient data -> use Volume Weighted Average method to determine AWQ based on representative well COC concentrations

Concerns With 20-Year Data Interval (1994 – 2013)

Definition of Ambient Water Quality: Current Water Quality in area of interest (M-Zone, subbasin, etc.)

Concerns

1. Historical data does not represent current aquifer water quality (20-year interval is too long)

=> Calculation based on 20 years of data may underestimate AWQ, over-estimate assimilative capacity & place aquifer at risk of degradation & pollution

Alternative

Use recent data, 2010 – Now (default recommendation of State Water Recycle Policy)

Concerns With VWA Approach

Volume Weighted Average

Extrapolates COC concentrations from existing wells in M-Zone to areas within Zone without well data

Concerns

1. Existing well data may not represent WQ throughout M-Zone
   → Wells not uniformly distributed spatially, laterally, or vertically
2. Volume Weighted Average ignores geologic stratification
3. Representative well concentrations used for AWQ & VWA are based on well medians, which in this case are likely to underestimate AWQ

Best Case: Resultant AWQ = gross approx. of actual aquifer WQ

Worst Case: Underestimate AWQ → overestimate Assimilative Capacity (aquifer at risk of degradation or pollution)

There are Medians and…Medians…

Median → numerical value separating the higher half of a data set from the lower half

e.g., the median of {3, 3, 5, 9, 11} is 5

Proposed Approach → derive representative COC concentrations for each well by taking median of yearly medians for entire 20 year interval

Concerns

1. In some cases median may not be best indicator of AWQ for changing, non-static systems (e.g., heterogeneous groundwater aquifers)
   a. Masks COC variability through time and space
   b. Masks recent changes in water quality
   c. Underestimates current impacts to water quality
2. Median likely to underestimate AWQ, Overestimate Assimilative Capacity

Determining Representative Well Concns. for TDS→ Hypothetical Impacted Well

Year	TDS (mg/L)	Order (low-high)
1994	250	1
1995	195	2
1997	225	3
2002	275	4
2005	550	5
2008	880	6
2012	1250	7

Median AWQ = WQ in 2002

Current AWQ

In this example, use of median does not provide best estimate of current TDS concentration in well or aquifer

Data Provided Has Spatial Filter

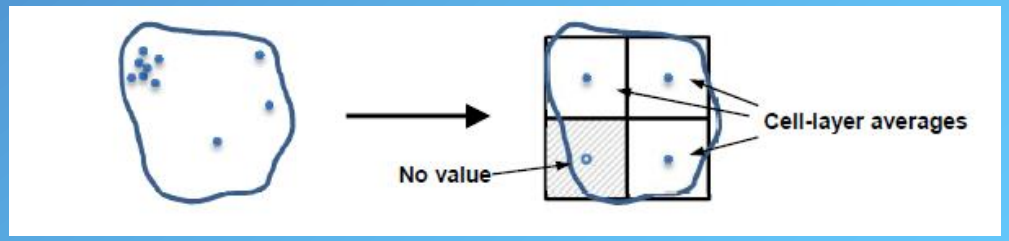
Each M-Zone Divided into 1000 foot Grids

- Some M-Zones have grids with high density of data points
- Values from high density data grid cells used to project water quality for remaining grids in a M-zone

Concerns

1. More than 90% of grids have no data
2. Grids with high density data are spatially isolated from rest of zone
3. M-Zones are too large & heterogeneous to use this approach

From MWH →



Quality Assurance Concerns

Table 3-5: Descriptive Statistics of Filtered Data for TDS in East Valley (1994-2013); Tech Memo 2		
	Upper Aquifer TDS (mg/L	Lower Aquifer TDS (mg/L)
Count	53	222
Mean	643	350
Median	523	215
Mode	665	160
STD Dev	484	391
Range	1 to 2,210	19 to 4,582

→ Low TDS levels in upper & lower aquifer → 1 mg/l and 19 mg/l
Typical of distilled water or rainwater, not groundwater

→ Lower Aquifer Very High Quality → 4,582 mg/l upper limit ?

Concerns

1. Data review suggests some data used to determine AWQ not properly QA
2. 4,582 mg/l datum is anomalous & should group in subzone with similar WQ wells that are spatially co-located

Scientific Interpretations → Only as good as your data

Blending Chemically Distinct Aquifers

Table 3-5 (cont'd)		
	Upper Aquifer TDS (mg/L	Lower Aquifer TDS (mg/L)
Count	53	222
Mean	643	350
Median	523	215
Mode	665	160
STD Dev	484	391
Range	1 to 2,210	19 to 4,582

Concerns

1. Blending WQ of chemically discrete Upper & Lower Aquifers does not accurately reflect current day AWQ
2. Compliance with and consistency in implementing Anti-degradation Policy
   Likely surface waste discharges already degrading Upper Aquifer

Alternative: Treat chemically unique aquifers separately, with different AWQs and Assimilative Capacities

Other Data Concerns

Data Gaps → Insufficient WQ data within upper, shallow aquifer to adequately assess AWQ conditions needed to quantify Assimilative Capacity

Why Important ?

1. Need to protect all aquifers, shallow & deep
2. Shallow aquifer vulnerable to degradation from surface waste discharges
3. Confining beds separating upper and lower aquifers (e.g., East Valley) frequently "leak", eventually impacting lower aquifers

Data Density → More data available for lower aquifer, but limited usefulness

Why ?

1. Long well-screens typical of supply wells
2. Positioning in areas of highest WQ &
3. Positioning in populated areas rather than throughout groundwater basin

Concern Data gaps occur in Upper & Lower Aquifers throughout Valley. Collecting additional relevant & appropriate data is paramount to developing an effective SNMP

Summary

1. M-Zones complex and heterogeneous
   - → divide into “subzones” based on similarities in WQ & Geology
   - → assign AWQ and AC to each “subzone”
2. Well medians for 20 year, 1994-2013 data set likely to underestimate AWQ
   - → Underestimate AWQ → Overestimate AC → Aquifer at risk to degradation & pollution
3. Most WQ data from pristine, lower aquifer
   - → applying WQ data for lower aquifer to shallow (impacted) aquifer, gives appearance of higher WQ throughout vertical & lateral extent of Zone
   - → places aquifers at risk to degradation
4. Applying Volume Weighted Average to heterogeneous basin (e.g., CV)
   - → blends chemically distinct waters, blurring effects of recent recharge/waste discharge activities &
   - → assumes zones behave like bathtubs with instantaneous mixing
5. If developed as proposed, Coachella Valley SNMP may not adequately characterize current aquifer conditions, nor protect groundwater resources