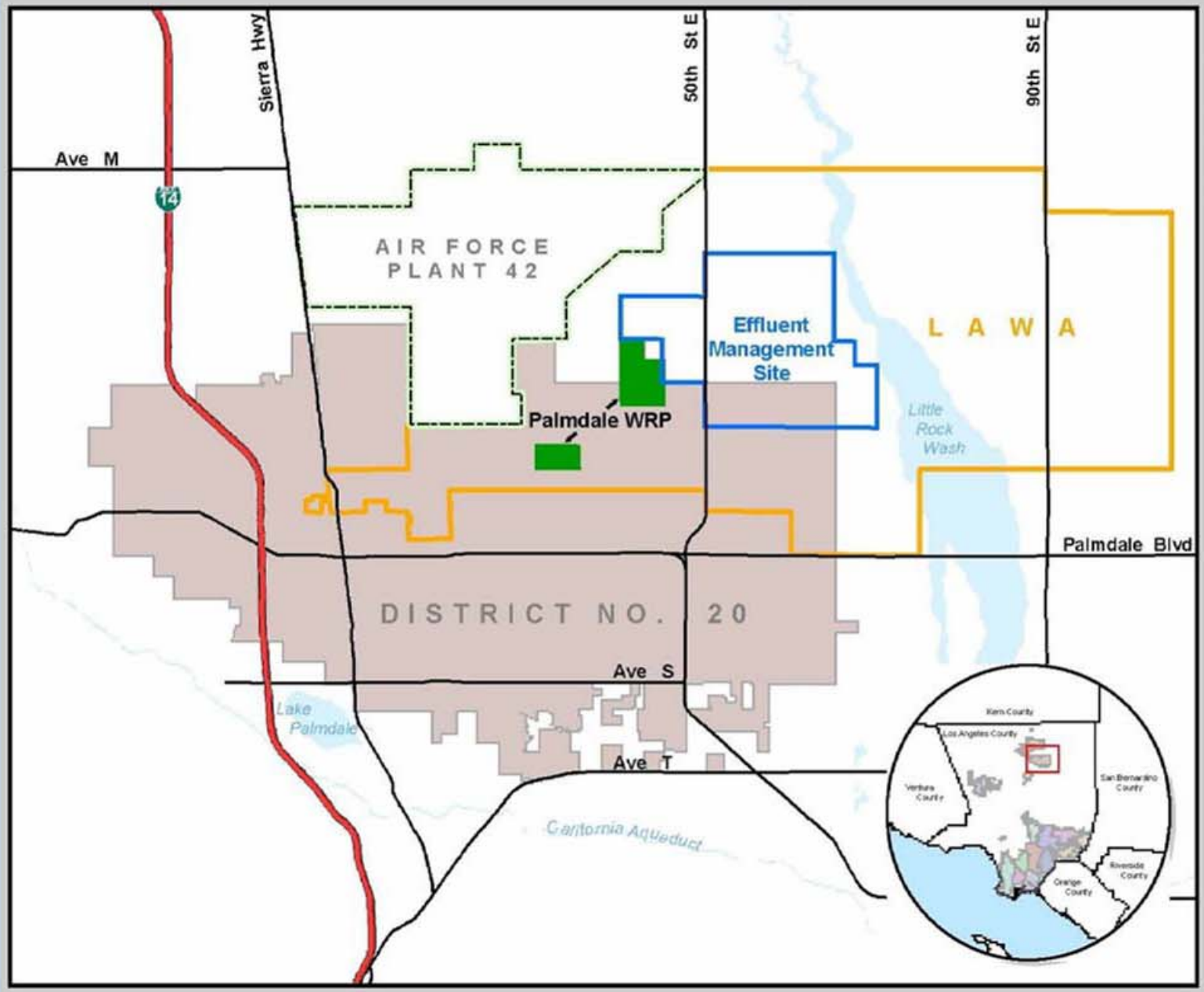
## Table 1 – Containment and Remediation Plan Alternatives

| Alternative | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Description** | **Base Case - No Action[1] - 2025 Plan** | **Hot Spot Remediation[1]** | **Limited Containment[1]** | **Aggressive Remediation[1]** | **Focused Hot Spot Remediation[2]** |
| **Groundwater quality by the year 2025** | • 2-4 mg/L at most of the site<br>• 5-7 mg/L in the western half of section 10<br>• 9 mg/L at the 40th St ponds. | • 2-4 mg/L at most of the site<br>• 5-7 mg/L in the western half of section 10<br>• 9 mg/L at the 40th St ponds. | • 2-4 mg/L at most of the site<br>• 5-7 mg/L in the western half of section 10<br>• 9 mg/L at the 40th St ponds. | • 1-3 mg/L at most of the site<br>• 4-5 mg/L in a localized area in the western half of section 10<br>• 7 mg/L at the 40th St ponds. | • 2-4 mg/L at most of the site<br>• 5-6 mg/L in a localized area in the western half of section 10<br>• 8-9 mg/L at the 40th St ponds. |
| **Time to Implement** | None | 1 year | > 1 year | 3-5 years | 1 Year + 6 mo after 2009 |
| **Groundwater decline due to project[3]** | 0 feet | 3 feet | 10 feet | 5 feet ( with an increase near Little Rock Wash) | 5 feet |
| **Tons nitrate removed** | NA | 119 | 181 | 351 | 130 |
| **Nitrate removal efficiency (lbs/acre-ft)** | NA | 11.7 | 7.0 | 6.9 | 13.4 |
| **New groundwater extraction wells** | 0 | 5 | 15 | 25 | 6 wells now<br>2 wells after 2009 |
| **Combined Flow** | 0 | 1,500 gpm (2.2 mgd) | 3,900 gpm (5.6 mgd) | 5,000 gpm (7.2 mgd) | 1,500 gpm (2.2 mgd)<br>1,950 gpm after 2010 |
| **Pumping Period** | 0 | Six months/yr | Six months/yr | Year round | Six months/yr |
| **Linear Feet of Piping** | 0 | 16,000 | 64,470 | 183,660 | 32,370 |
| **Other Features** | None | None | Additional storage pond | Additional storage pond<br>Reverse osmosis system<br>Brine evaporation ponds<br>Percolation basins | Additional storage ponds after 2009 |
| **Capital Cost** | $ 0 | $ 6,456,000 | $ 16,691,000 | $ 108,587,000 | $8,735,000 |
| **20-yr O&M Cost** | $ 0 | $ 6,769,000 | $ 15,476,000 | $ 68,634,000 | $13,661,000 |
| **Net Present Value Cost** | Not Reported | $10,674,000 | $26,305,000 | $158,544,000 | $13,661,000 |
| **Cost effectiveness (lbs/$1000)** | Not Reported | 22.3 | 13.8 | 4.4 | 19.0 |
| **Sewer Rate Cost – per connection per year** | $ 71 (Current) | $ 161 | $ 255 | $ 446 | $180 |

[1] Containment and Remediation Plan dated September 15, 2004 prepared by Geomatrix for LACSD – 20 Palmdale Water Reclamation Plant.
[2] Containment and Remediation Plan Supplement dated March 1, 2005 prepared by Geomatrix for LACSD – 20 Palmdale Water Reclamation Plant.
[3] For all scenarios there is an estimated 75 foot decline beneath Section 9 as the groundwater mound dissipates due to 1) regional groundwater pumping in municipal and agricultural wells and 2) elimination of land spreading in 2009 as the District's 2025 Plan is implemented. The changes described are in addition to these effects following active remediation. For alternative 4, an estimated 80% of the extracted water is returned to the aquifer, but at a location other than Section 9.

# Figure No. 1
## Palmdale WRP and Effluent Management Site




**LEGEND**

- LAWA Property
- Palmdale WRP Property
- Air Force Plant 42
- Effluent Management Site
- LACSD District No. 20

LACSD GIS

N W E S

0 1 2 Miles

COUNTY SANITATION DISTRICTS
OF LOS ANGELES COUNTY

GENERAL MAP OF

PWRP and Effluent Management Site

JAMES F. STAHL - CHIEF ENGINEER & GENERAL MANAGER
WHITTIER, CA AUGUST 2004

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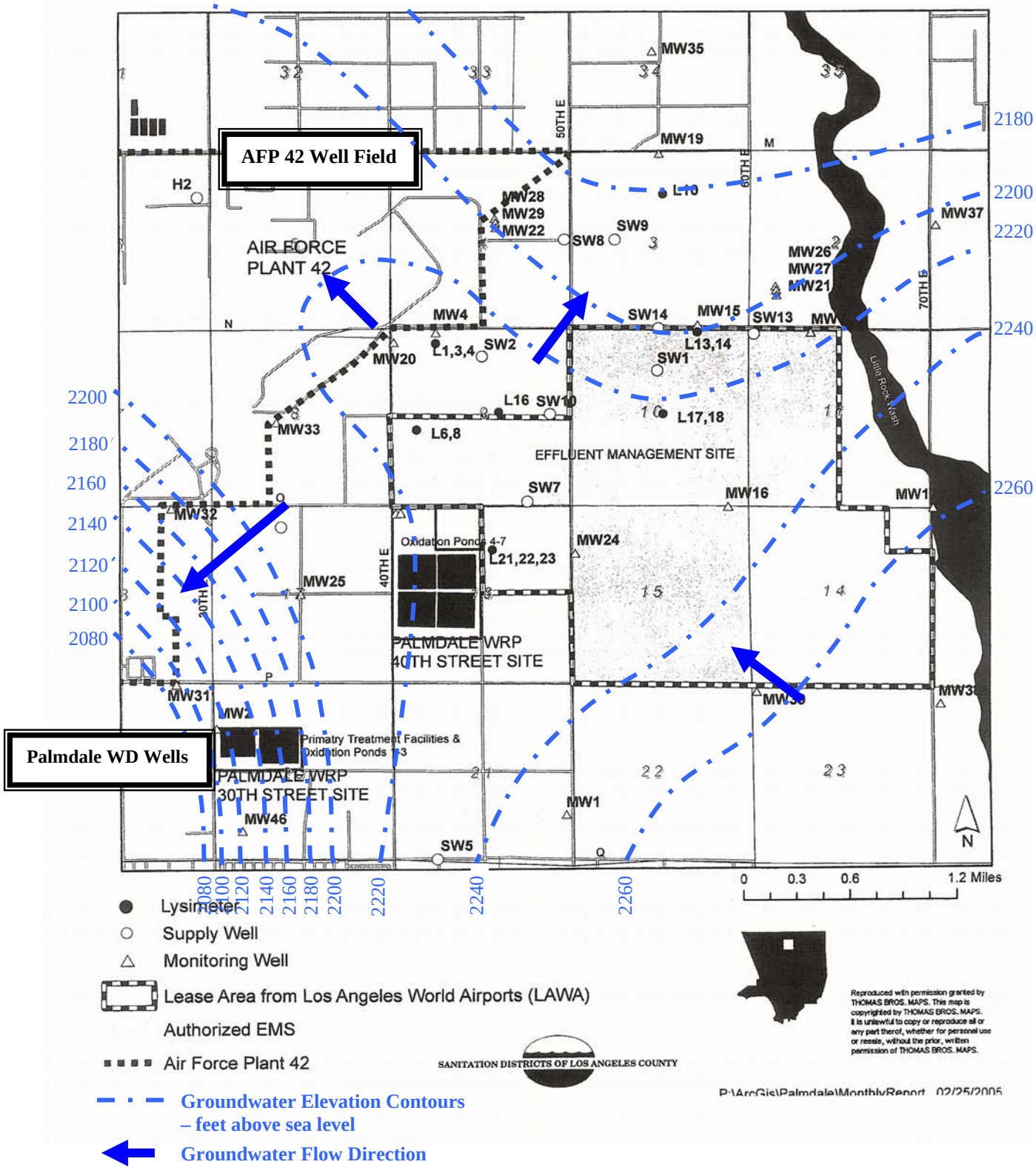
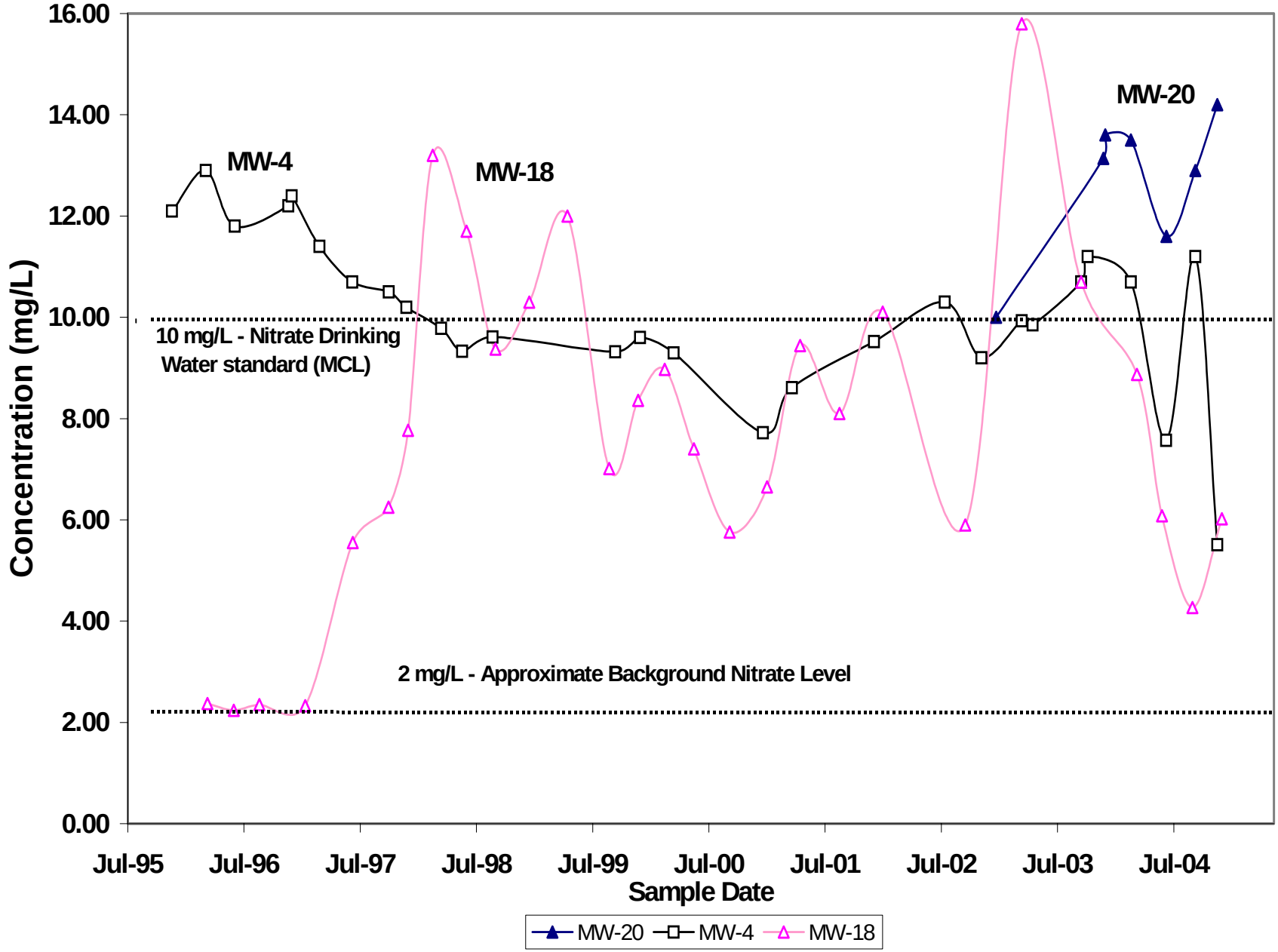
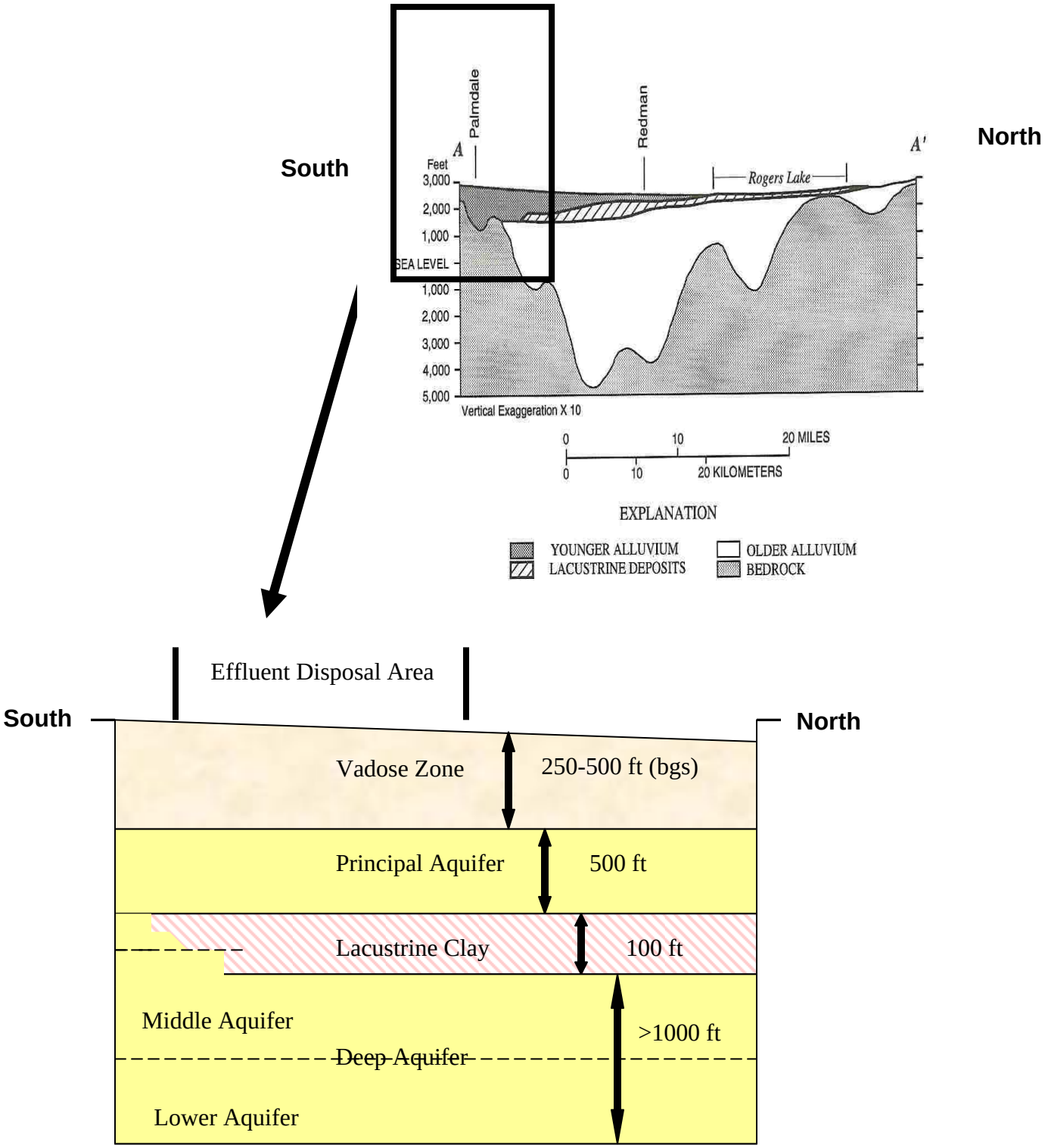
# FIGURE 2
# PALMDALE WATER RECLAMATION PLANT
## Effluent Management Site, Wells and Lysimeters



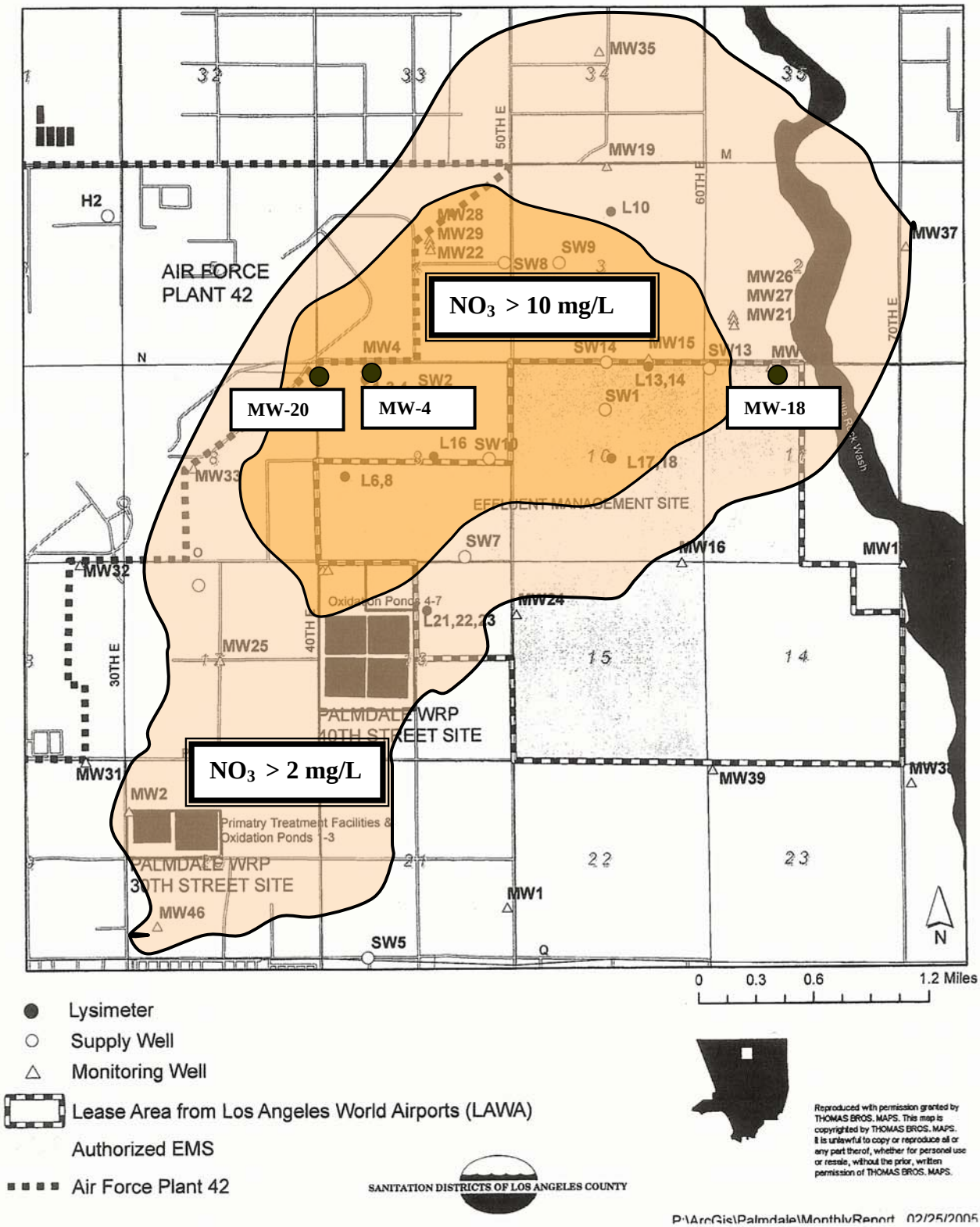
# FIGURE 3- Groundwater Nitrate Concentrations in MW-1, MW-18 and MW-20



# FIGURE 4- Cross Section of Antelope Valley



# FIGURE 5
# PALMDALE WATER RECLAMATION PLANT
## Nitrate ($NO_3$) Plume Boundary- >2 mg/L, >10 mg/L



# Attachment 1

## Estimate of Nitrate Mass in Plume

1. Assume entire nitrate plume greater than background (2 mg/L as nitrogen) contains 190,000 acre-feet (AF) and polluted groundwater plume greater than drinking waster standard (10 mg/L as nitrogen) contains 21,000 AF.

2. Assume Plume A = Nitrate plume between 2 mg/L and 10 mg/L with an average nitrate concentration of 6 mg/L. Then:

   190,000 Acre-Feet (AF) – 21,000 AF = 169,000 AF
   169,000 AF * 325,000 gal/AF = 54,925 million gallons (MG)
   = 55 billion gallons (BG)

3. Assume Plume B = Nitrate plume greater than 10 mg/L with an average nitrate concentration of 12 mg/L. Then:

   21,000 AF * 325,000 gal/AF = 6,825 MG
   = 6.8 BG

4. Consider the following equation to determine mass:

   Volume (MG) * Concentration (mg/L) * 8.34 (lb/MG/mg/L) = Load (lb)
   Divide by 2000 lb/ton = tons

5. Plume A: (54,925 * 6 * 8.34)/2000 = 1,400 tons

6. Plume B: (6,825 * 12 * 8.34)/2000 = 300 tons

7. Total Nitrate Mass in Plume = Mass in Plume A + Mass in Plume B = **<u>1,700 tons</u>**

8. Mass of nitrate less than background (2 mg/L): [(54,925 + 6,825) * 2 * 8.34]/2000 = 500 tons

9. Mass of nitrate that is above background (2/mg/L): 1,700 – 500 = **<u>1,200 tons</u>**

The above calculations are rounded for simplicity.

# Attachment 2

## Information Requested from the District to Evaluate Alternatives

**Improved Analysis Comparing Alternatives with Respect to SWRCB Resolution 92-49**

The District agreed to complete further evaluation of the cleanup alternatives proposed with respect to Resolution 92-49 to provide the Regional Board with a comparable alternative analysis. This analysis should provide a narrative, graphical and tabular evaluation in the following areas.

1. Describe the current nitrate plume volume, mass, and aerial and lateral extent.

2. Describe the estimated volume and mass of nitrate removed for each alternative.

3. Describe the volume, mass and aerial and lateral extent of nitrate remaining following cleanup for each alternative. This should include an estimate of the nitrate mass added to the vadose zone and groundwater disposal, mass removed by proposed abatement actions, mass removed by denitrification, and mass remaining in the vadose zone for potential transport to groundwater.

4. Evaluate the remediation time to reach the 10, 5 and 1.5 mg/L (assumed background is 1 – 2 mg/L) nitrate concentrations for different portions of the affected plume (e.g. beneath disposal areas, ponds and throughout the remainder of the plume).

5. Clarify where and how natural attenuation is a component of each alternative.

6. Clarify the role agricultural pumping wells have in each alternative and options to reduce or eliminate localized agricultural groundwater pumping that draws the plume deeper and may require additional, deeper, monitoring wells over time to assess vertical plume movement.

7. Provide an accurate comparison of the costs for each alternative. For example, alternative No. 2 costs should be reduced by the cost to provide summer supplemental water to Sections 14, 15 and 16 because the District has indicated that the volume of water to be pumped in alternative 2 is necessary even if cleanup was not required. Operation and maintenance costs should not be included after wells are predicted for shut down.

8. Include a “No-Action” alternative showing the effect of continuing the current disposal practices (as described in the District’s Abatement Report) to compare the effect of each alternative.

9. Include an analysis of the resulting TDS concentrations and salt loading that remains for each alternative. As we discussed during the meeting, it would be appropriate to update the TDS assessment from the 2003 Degradation Analysis for each of the proposed alternatives.

10. Describe the long-term monitoring aspects for each alternative necessary to determine if the alternative is achieving its theorized effectiveness.

11. Describe the computer model uncertainties that may be over or under conservative.

12. Include an improved description of the computer model layers related to groundwater elevations with annotated cross-sections.