WEST YOST ASSOCIATES
Consulting Engineers

MEMORANDUM

DATE:	August 27, 2007	Project No.:	711-04-06-03
TO:	Mr. Richard C. Prima Jr.	CC:	

FROM: Ms. Kathryn Gies, P.E., West Yost Associates
Mr. Kenneth Loy, P.G., West Yost Associates
Ms. Roberta L. Larson, Somach Simmons and Dunn

SUBJECT: Review of the City of Lodi Wastewater Disposal Practices And Groundwater Impacts Report

West Yost Associates (WYA), in association with our subconsultant, Somach Simmons and Dunn, has reviewed the City of Lodi Wastewater Disposal Practices And Groundwater Impacts Report prepared by State Water Resources Control Board (State Board) staff and dated August 1, 2007 (hereinafter, the "State Board Report"). The purpose of this memorandum provides our point by point technical review of the State Board Report based on information that has been documented in various reports developed for the City's Water Pollution Control Facility (WPCF) as well as our preliminary legal analysis.

Before detailing our specific technical and legal comments, we think it important to note that the State Board Report bears little resemblance to other enforcement reports we have reviewed. Rather than evaluate the City's compliance with its lawfully adopted waste discharge (WDRs) requirements, the State Board Report inappropriately second-guesses the Regional Board on permitting decisions and regulatory matters that fall squarely within its purview.

The Porter-Cologne Water Quality Control Act (Wat. Code, § 13000) establishes a comprehensive program for the regulation of water quality in California. (*State Water Resources Control Board Cases* (2006) 136 Cal.App.4th 674, 696.) The Act designates the regional boards with the primary responsibility to issue WDRs that prescribe the terms and conditions as to the nature of any discharge. (See Wat. Code, §§ 13260(a), 13263.) Pursuant to Porter-Cologne, WDRs must be adopted after public hearing and implement any relevant basin plan. (Wat. Code, § 13263(a).) The Regional Board also must exercise its discretion to ensure the WDRs account for various factors, such as the applicable beneficial uses and water quality objectives, other waste discharges, and the need to prevent nuisance. (Wat. Code, § 13263(a).) Any person wishing to challenge WDRs may petition the State Board and courts to review the WDRs. (Wat. Code, §§ 13320(a), 13330.)

The State Board Report attempts to usurp the discretion and best professional judgment the Act affords the Regional Board in managing local water quality and establishing WDRs. Even where a timely petition has been filed, the State Board generally will not interfere with the reasonable exercise of that judgment unless the Regional Board action is inconsistent with law, regulation or established State Board policy. Specifically, the State Board Report critiques the past and potential future WDRs for the White Slough WPCF, which is not an enforcement function. Concerns about appropriate permit conditions are to be addressed through the public process for permit renewal and, in some cases, review by the State Board and courts. Thus, State Board Report's assessment of the City's compliance with applicable regulations laws and policies is of questionable validity and relevance.

Specific comments are provided below. These comments include details that are provided from the following two documents that apparently were not reviewed the State Board in preparation of its report:

- The September 2004 letter from the City of Lodi to the Regional Water Quality Control Board (Regional Board). This letter was written on behalf of the City by its groundwater consultant at the time, Saracino, Kirby and Snow. This letter was developed as a response to the August 20, 2003 Regional Board comment letter regarding the June 2003 Groundwater Monitoring Status Report (which was referenced in the State Board Report). (Hereinafter, the "2004 Letter".)

- The September 2006 *City of Lodi Groundwater Investigation 2006 Report* prepared by WYA. (Hereinafter the "2006 Report.")

Comment No. 1: The information presented in the State Board Report does not accurately represent the City's current practices, nor does it acknowledge the Best Practicable Treatment and Controls (BPTCs) that have been implemented in the last five years or are under construction to reduce the potential for groundwater degradation. In addition, several conclusions presented in the City's previous 2000 and 2003 groundwater reports (both developed by Saracino, Kirby and Snow) that were evaluated under the State Board's investigation have been modified and/or updated based on findings in the 2004 Letter and 2006 Reports. Specific areas of concern are as follows:

Page 1, Paragraph 1, Third sentence states:

> "The surface water discharge is stopped when surface water dissolved oxygen levels drop below 5 mg/l or to provide dilution and augment flow for other wastewater land disposal (reclamation) discharges."

This statement does not accurately characterize the City's practices as detailed in the City's Report of Waste Discharge and the 2006 Report.

As documented in the City's Report of Waste Discharge (WYA 2004, p.p. 13 – 18), the discharge actually increases dissolved oxygen levels in the receiving waters. Therefore, the discharge rarely, if ever, has been moderated because of concerns about dissolved oxygen levels in the receiving water. This issue is addressed in the *Order No. R5-2007-XXX, Waste Discharge Requirements and Master Reclamation Permit for the City of Lodi White Slough Water Pollution Control Facility (Tentative Order)* currently under consideration by the Regional Board. As stated on Page F-49 of this document:

> Order No. 5-00-031 required a minimum daily average effluent limitation for DO of 5.0 mg/L and included a discharge prohibition that prohibited the discharge to Dredger Cut when DO concentrations in Dredger Cut, Bishop Cut, or White Slough were below 5 mg/L. These requirements were included in the previous Order, due to DO concerns from the discharge of secondary treated wastewater, which were based on dissolved oxygen levels measured below 5 mg/L in Dredger Cut when discharges were occurring.
>
> The Discharger has since upgraded the Facility to a tertiary level of treatment, which has reduced the discharge of oxygen demanding substances. Analytical results from 462 monitoring samples obtained from February 2005, through December 2006, indicated that the average effluent DO concentration was 7.4 mg/L, with a minimum of 5 mg/L, and that the minimum dissolved oxygen level in Dredger Cut was 5 mg/L. Thus, the discharge of the higher-level treated effluent does not cause violations of the Basin Plan to occur in Dredger Cut.
>
> Furthermore the Discharger is constructing nitrification facilities that will further reduce oxygen demanding substances by removing ammonia. Based on this new information, this order removes the DO discharge prohibition, but maintains the DO effluent limitation of 5 mg/L as a daily average.

The primary reason wastewater discharges to receiving water are stopped is to provide recycled water for irrigation reuse on City-owned property. A significant amount of detail regarding the current irrigation practices and sources of irrigation flow is provided in Section 2.0 (Facility Description) of the 2006 Report. As detailed, the data collected between 2002 and 2005 shows that the domestic flows make up <u>67.7 percent</u> of the total flow used for irrigation. This flow is augmented by other sources of irrigation water, which include:

- Cannery Wastewater (10.2 percent)
- Other Industrial Wastewater (1.4 percent)
- Captured Storm Water and Tailwater Return (17.7 percent)
- Biosolids Lagoon Supernatant (0.3 percent)
- DAF Subnatant (2.7 percent)

Also note that in 2006, cannery wastewater flows were approximately half of the flows recorded between 2002 and 2005. The domestic effluent flows were used for irrigation instead (making the domestic flow 72.8 percent of the total irrigation flow).

Page 2, October 2000 Groundwater Evaluation, Bullet 5 states:

> *"Groundwater elevations range from 0.5 to 20 feet below ground surface"*

This statement does not reflect the true nature of groundwater elevations beneath the City's property. A graphical representation of all of the elevation data collected by the City since they began groundwater monitoring in 1989 is presented in Appendix E of the 2006 Report. As shown, most of the wells have rarely, if ever, demonstrated groundwater elevations less than two feet below the ground surface. Some wells located on the northeastern portion of the City's properties have, on occasion, had groundwater levels *slightly* less than two feet below the ground surface. However, all of these occurrences were observed during January, a period when irrigation is not practiced.

The only groundwater level measurement that was significantly less than two feet below the ground surface was one measurement taken in WSM 5 in January 1997. However, significant high water levels occurred in the Delta in the winter of 1997, which likely explains this anomalous measurement.

Page 2, June 2003 Groundwater Monitoring Status Report, Bullet 2 states:

> *"The dominant direction of regional groundwater flow is easterly."*

This is not an accurate statement. As detailed in the 2006 Report, Section 3, Pages 3-23, the regional groundwater flow is to the east-southeast towards a cone of depression located approximately five miles east-southeast of the City's facilities. As stated in the 2006 Report, "Review of regional groundwater elevation data from the Department of Water Resources Water Data Library and from the San Joaquin County Flood Control and Water Conservation District semi-annual reports indicates that regional flow directions in the vicinity of the WPCF have been east-southeasterly to southeasterly during both spring and fall measurement periods since at least 1971." This cone of depression is caused by groundwater pumping.

A discussed on Page 3-24 of the 2006 Report, most of the shallow groundwater flow (as measured in the City's shallow monitoring wells) is to the east toward the cone of depression. However, there are localized deflections from the overall regional gradient caused by local groundwater pumping and groundwater recharge.

Page 2, June 2003 Groundwater Monitoring Status Report, Bullet 2 states:

> *"Groundwater mounding around the WWTP, likely caused by the storage of effluent, influences the direction of groundwater flow."*

Groundwater flow near the WPCF is influenced by regional flow patterns and a variety of local recharge sources. As discussed on Page 3-27 of the 2006 Report, the potential sources of recharge (i.e. mounding) around the WPCF include:

- Irrigated delta lands and related waterways located to the west of the WPCF
- Surface water irrigated lands to the north of the WPCF

- Potential recharge sources from the WPCF storage ponds

- Recharge from the WPCF land application areas

The data presented in the 2006 Report does not indicate groundwater "mounding" at the storage ponds (Figures 3-7 thru 3-11), but that the highest groundwater elevations observed year round are offset to the north and west of the WPCF treatment, storage, and land application facilities. This data suggests that the facility is one of several sources of recharge in the area.

Page 2, June 2003 Groundwater Monitoring Status Report, Bullet 3 states:

> *"In 2001 the nitrogen application was greater than plant uptake…No crops were grown on Fields 4A and 4E and reclaimed water was applied thereby overloading the fields."*

This isolated quote is taken out of context from the remainder of the 2003 Report and subsequent follow-up documentation. As stated in the 2003 Report (p. 9):

> A balance in nitrogen loading on a field-by-field basis can be achieved by adjusting management activities to produce a greater spatial distribution of nitrogen application on City Property.

Also, as stated in the 2004 Letter (p. 3):

> It is acknowledged that surplus nitrogen over estimated crop uptake was added to some fields in 2001 and 2002 and that this may have contributed to nitrate percolating into the groundwater. A discussion of how and why that occurred was discussed in the [2003] Status Report on Pages 9 through 13. Potential ways to avoid this in the future were also presented in the [2003] Status Report. The City has been evaluating and implementing various improvements to its reuse facility management practices.
>
> …The City is actively evaluating its nitrogen loading and farming practices and implementing changes to improve results. As an example, the City is modifying its leasing contracts to maintain greater control of when the land is irrigated, when biosolids are applied, and when supplemental fertilizer is applied. The contracts now also require that both summer and winter crops be grown.

As discussed in both the 2003 and 2006 Reports, the City was completing percolation pilot testing in 2001 on Fields 4A and 4E, which is the reason loadings were allowed to occur on fields that were not planted with a crop. As discussed on Page 6-29 of the 2006 Report, eight monitoring wells were sampled as part of this pilot testing (six temporary and two permanent), and the data collected shows that the applications actually resulted in decreased groundwater nitrate levels beneath the pilot percolation basins. Although the results of this testing demonstrated the potential for denitrification in a percolation basin on the City's property, the City elected not to pursue percolation as a means of wastewater disposal.

Moreover, as discussed in the 2006 Report, the City began monitoring the loadings to the individual fields in 2000. Prior to this time, the City was monitoring loadings to the entire land application area as a whole. After a few years of the field-specific monitoring and implementation of the additional controls described in this memorandum, the City has maintained loadings to each individual field at or below agronomic rates. Specific controls the City has implemented include:

- Use of a spreadsheet management tool for the land application area. This tool allows the City to make real-time assessments of nitrogen loading rates such that appropriate decisions regarding biosolids and fertilizer applications can be made.

- In 2001, several fields were overloaded because of un-regulated fertilizer applications by the tenant farmer. In 2003, the City modified the agreement with the tenant farmer to ensure that all applications of fertilizers be first coordinated with City staff.

- Modifying the agreement with the tenant farmer to ensure that adequate area is available each year for biosolids applications to allow for more even distribution of the biosolids.

Details regarding loadings that have occurred through 2005 are provided in Appendices I and K of the 2006 Report. As shown, the City has successfully reduced loadings to within agronomic rates through these measures.

Finally, note that since the 2006 Report was completed, the City has retained Dr. Mitchell Johns, Professor of Plant and Soils Science at Chico State University, to develop appropriate site-specific monthly nitrogen loading rates for each of the field areas. The City is currently using this information to ensure that the land application facilities will be appropriately sized for the disposal of all of the current sources of irrigation water at agronomic rates well into the future.

<u>Page 3, June 2003 Groundwater Monitoring Status Report, Bullet 3 states:</u>

> *"A correlation exists between the application of nitrogen on a particular field and the fluctuations in groundwater concentrations of nitrate underlying that particular field."*

This isolated quote is taken out of context from the remainder of the 2003 Report and subsequent follow-up documentation. Moreover, subsequent information presented in the 2006 Report brings this conclusion into question. Specifically, a graphical comparison of total nitrogen field loadings in each of the four major quadrants of the City's property to the nitrogen concentration measured in the monitoring wells located in these quadrants was provided in Appendix I of the 2006 Report. These graphs, along with a map of the City's properties showing the well locations and the individual 2005 field nitrogen loadings, have been included as Attachment A.

As shown, this data demonstrates that although the total nitrogen and nitrate loadings have decreased since 2001, the nitrate concentrations in groundwater, generally, have not. As stated on page 6-30 of the 2006 Report, "In conclusion, the field nitrogen loadings cannot be readily correlated with nitrate levels observed in the onsite monitoring wells."

Note that if the graphs shown in Attachment A were the only source of information evaluated, one might conclude that a possible connection exists between loadings in the northwestern quadrant and groundwater nitrate levels observed in monitoring well WSM-15. However, based on a review of both the temporal *and* the spatial variations in the groundwater quality, WSM-15 also appears to be affected by offsite nitrogen sources. As stated in the 2006 Report (p. 5-25):

> At times, the gradient is southerly from WSM-16 toward the WPCF land application area. Southerly flow from an as-yet unidentified source towards the WPCF and associated transport of nitrate could explain why the nitrate concentration in WSM-16 peaked in September 2003, then declined, and the concentrations in WSM-15 began to rise thereafter and reached a peak in August 2004.

A detailed discussion of the temporal and spatial variations in nitrogen concentrations in all of the City's monitoring wells is presented in Section 5 of the 2006 Report. A variety of nitrogen fluctuation patterns have been observed and can generally be classified as follows: seasonal, sporadic, uniform increases, and limited variability. Seasonal variability would be an indicator of impacts associated with the City's land application practices. The temporal variations can be observed in the graphs provided in Attachment A.

The following statements are provided in the 2006 Report with respect to the observed seasonal variability (p. 5-24):

> Some of the wells exhibit seasonal variability in nitrate concentrations. As discussed in Section 3.6.2.2, groundwater levels near the WPCF also vary seasonally (under the influence of precipitation between roughly October and March, and groundwater pumping between roughly April and September of each year), suggesting a possible correlation with nitrate concentrations. However, the lack of correlation of nitrate concentrations with groundwater elevations on either shorter (months) or longer (years) term scales in these same wells is an indication that the seasonal variations in nitrate concentrations and groundwater elevations are due to independent causes.
>
> The wells that exhibit apparent seasonal variation include the following (Appendix E and Figure 5-10):
>
> - WSM-03 and WSM-04 near the WPCF influent pipelines
> - WSM-7, northeast and downgradient of the effluent storage ponds on the border of the land application area and adjacent to an unlined irrigation conveyance ditch
>
> The depth to water in these wells is not drastically different from other wells that do not show the same degree of seasonal variability (compare WSM-2 and WSM-3, or WSM-7 and WSM-9 in Appendix E). This is an indication that depth to groundwater is not the primary control on the variation. Instead, proximity to potential sources and soil properties affecting nitrate fate and transport in the

> unsaturated zone are likely the dominant controlling factors on whether seasonal fluctuations are observed in the wells.

Note that the rest of the concluding paragraph from the 2006 Report states (p. 6-30):

> Nevertheless, the available data demonstrates that the City has, on occasion, historically overloaded the field areas with respect to nitrogen. However, revised allowable loading rates based on site-specific nitrogen uptake and losses due to transformations in the soil are needed to better evaluate impacts associated with historic loadings.

Since 2006, the City has continued to make progress on these issues, including beginning a $20.6 million project that will reduce nitrogen loadings from treated domestic wastewater. In addition the City has worked to define the site-specific nitrogen uptake rates and plans to use this information as part of our BPTC land application management program that was described earlier.

<u>Page 3, June 2003 Groundwater Monitoring Status Report, Bullet 4 states:</u>

> *"Nitrate concentrations in the secondary effluent storage ponds are not measured."*

This quote does not reflect the follow-up information presented in the 2004 Letter and the 2006 Report. As stated in the City's 2004 Letter (p. 3):

> Several of the recommendations included in the [2003] Report have been implemented. One such recommendation is the temporary monitoring of the nitrate levels in the City's storage ponds. The nitrate (as N) concentrations of the water in the ponds have been recorded for June 2003 through May 2004. See tabular summary enclosed. The concentrations have ranged from a low of Non-Detect to a high of 7.3 mg/L. However, the City also tested the samples for ammonia concentrations. The ammonia levels have ranged from Non-Detect to 48 mg/L. The City is considering options for evaluating the impact of the ammonia concentrations on the nitrate levels in the groundwater.

In total, the City collected 26 samples from the onsite storage ponds between 2002 and 2005 and analyzed them for ammonia, organic nitrogen, and nitrate. A detailed assessment of this data is provided on pages 6-9 through 6-17 of the 2006 Report. A graph included in the 2006 Report (Figure 6-1) showing a summary of this data is provided in Attachment B. As shown, the nitrogen concentrations in the storage ponds can be significant, particularly during the winter months. For this reason, the 2006 Report also included a detailed evaluation the sources of nitrogen to the ponds. The following findings were presented:

- Most of the nitrogen is either in the form of ammonia or organic nitrogen.
- The primary source of ammonia loading to the storage ponds is from the biosolids supernatant, which is discharged to the ponds during the winter months.

- The primary source of organic nitrogen is runoff from the City-owned properties during the months of June through September (when the cannery wastewater is being discharged to the land application area).

- The majority of nitrate load to the ponds is from treated municipal effluent.

- Nitrogen speciation in the storage ponds is likely affected by the following processes: nitrification, denitrification, mineralization (ammonification) of organic nitrogen, inorganic nitrogen uptake and conversion to organic nitrogen, re-suspension of solids during spring turnover.

These findings indicate that, even though the background groundwater nitrate concentrations have not clearly been defined, the City's storage facilities may have the potential to lead to groundwater degradation with respect to nitrogen. Therefore, the 2006 Report also provided a recommendation that one of the following two BPTC be implemented:

1. Lining the ponds with a geomembrane liner

2. Ensure that the ponds are only used to hold flows low in nitrogen content

At the time the 2006 Report was being completed, the City was already in the process of implementing the WPCF improvement project that is currently under construction. One of the primary purposes of this project is to modify and expand the secondary aeration basins to improve nitrification and allow for denitrification of the municipal effluent prior to discharge. In addition, in response to the recommendations presented in the 2006 Report, the City immediately initiated the design of the facilities needed to direct both the biosolids lagoon supernatant and DAFT subnatant to the aeration basins for treatment in lieu of directing them to the storage ponds. This improvement is now included under the current construction project.

The construction project is currently anticipated to be completed by the beginning of 2009. Once completed, a significant portion of the nitrogen loadings to the ponds will be removed. At this time, the City will be able to evaluate whether additional controls are necessary for the runoff return flows. By this time, the City will have also installed the background monitoring wells, thereby allowing for a more accurate assessment of the potential for impacts.

The proposed source water controls are preferred over the installation of a membrane liner for the following reasons:

- Source control is a more cost-effective means of achieving the necessary goals

- It is a more sustainable practice to completely remove the nitrogen from the system then to store it for later land application, where it could have the potential to (at least on occasion) enter groundwater.

- The City is evaluating the potential for implementing an unrestricted irrigation reuse project on parks and other public open spaces owned by the City. If this project was implemented, the City would likely rely on one or more of the storage ponds to hold the tertiary treated recycled water. Therefore, the uses of and water quality in the storage ponds could change significantly, eliminating almost all potential for groundwater impacts.

Page 3, June 2003 Groundwater Monitoring Status Report, Bullet 5 states:

> *"Annual summaries of fertilizer applications do not provide enough detail to quantify potential impacts to groundwater quality"*

As discussed above, the City modified the lease agreement with the tenant farmer in 2003 to ensure that all applications of fertilizers be first coordinated with City staff. All fertilizer applications are included in the City's spreadsheet management tool for the land application area. This information helps the City staff to make appropriate decisions regarding the timing and appropriateness of biosolids and fertilizer applications on a given field area. This information is also reviewed and considered when evaluating whether applications of nitrogen have exceeded agronomic rates.

Page 3, Paragraph 1, First sentence states:

> *"The measured pollutants in groundwater have been limited to EC [electrical conductivity] and nitrate."*

Not only is this statement incorrect, it demonstrates that a significant portion of the information included in the City's file was not reviewed. The City has been monitoring coliform levels in the groundwater monitoring wells since the first monitoring wells were installed. The City submitted this information as part of its Self Monitoring Reports. A summary of this data was also provided in the City's 2004 Letter.

Page 11, Paragraph 1, Sixth sentence states:

> *"The City's groundwater monitoring assessments discuss background groundwater quality levels of nitrate, but not salts or other pollutants."*

As an initial matter, the City should emphasize that despite its best efforts and the installation of 19 wells to date, the City has been unable to install an appropriate background monitoring well for nitrate or salinity.

As defined in *A Compilation of Water Quality Goals* (Central Valley Regional Water Quality Control Board August 2003, p. 6), the background water quality is the concentrations of substances in "natural waters that are unaffected by waste management practices or contamination incidents." As documented in detail in the 2006 Report, difficulties in siting a background well for nitrate have occurred because:

1. The groundwater flows away from the area of high groundwater levels northwest of the City's properties in both highly variable and divergent directions. This is a unique condition caused by: a) the proximity of the City's facilities to Delta, and b) the fact that the groundwater is the dominant irrigation supply to the east of the City's property but is rarely used to the west.

2. There is a large dairy operation located northeast and adjacent to the WPCF properties. In addition, as documented in the 2006 Report, there are also large dairy operations located to the north of the City's property. These types of facilities have recently begun to be regulated under Waste Discharge Requirements issued by the Regional Board. However, historic practices may not have been in conformance with appropriate BPTCs for these types of facilities. Therefore, any groundwater well within the direct influence of one of these dairies would not be considered "background."

Therefore, even WSM-16 should not be considered "background" for assessing nitrate impacts as suggested by the State Board Report. In the 2006 Report; the City does provide a proposed location for such a background well as follows (p. 5-28):

> Two new wells further to the north and east of the dairy located adjacent to the WPCF [are recommended] to assess background concentrations of nitrate in groundwater. These wells should be sited in land use areas that are similar to the land use in the vicinity of the WPCF. Based on the regional groundwater flow information, wells located in this area will be upgradient of the WPCF and the dairy. Comparison of nitrate data from these background wells will help in determining whether the WPCF and land application areas have contributed to increases in this parameter.

In addition, Section 5 of the 2006 Report does provide extensive detail on the available regional and site-specific groundwater quality data. Nitrate, EC, chloride, sodium, and other salinity components are discussed. With respect to regional EC trends, the 2006 Report states (p.p. 5-5 – 5-7):

> USGS publication entitled *Chemical Quality of Ground Water in San Joaquin and Parts of Contra Costa Counties, California* (Sorenson, 1981)…[shows that the regional] EC is elevated and exceeds 1,000 µmhos/cm…primarily along the margins of the Delta. These elevated EC levels are thought to be the result of the brackish to saline surface waters that intruded into the Delta and San Joaquin River (as far south as Stockton) prior to the advent of water projects during the last century, especially the California State Water Project and the Federal Central Valley Project. This intrusion resulted in elevated EC in groundwater in and near the Delta.
>
> The USGS is currently engaged in a multiyear evaluation of groundwater in the eastern Delta region, including the vicinity of the WPCF. An initial phase of this study, which is scheduled to be completed in 2006, should provide additional information on the origin and distribution of chloride and EC in the vicinity of the WPCF.

With respect to the regional general chemistry trends, the 2006 Report states (p. 5-7):

> …the primary cations contributing to EC are calcium and sodium followed by lower concentrations of magnesium (Sorenson, 1981). West of the WPCF, sodium

> is the dominant cation. Sodium is thought to be attributable to seawater intrusion in the Delta.
>
> …the WPCF overlies the boundary between two regional groundwater types as distinguished by the percentage of major anions. Chloride is the dominant anion on a percentage basis in the northwestern part of the agricultural reuse area and a large area to the west and northwest. The remainder of the WPCF area and the areas to the east and southwest are dominated by the bicarbonate anion on a percentage basis. Chloride is thought to be attributable to seawater intrusion in the Delta. Bicarbonate is a very common major anion in groundwater.
>
> The regional extent of the zone of elevated chloride concentrations over which the WPCF lies coincides approximately with the eastern boundary of the Delta (compare Figures 3-2 and 5-4). Because chloride is a conservative species (not appreciably sorbed on the aquifer matrix), it may have been partially flushed from groundwater under Delta lands irrigated with surface water after the implementation of irrigation projects during the last century. Near the eastern Delta margin, this flushing process appears to have been less complete, leading to the elevated concentrations observed near the WPCF (Figure 5-4). The in-progress USGS study may provide further information on the sources and extent of chloride in groundwater.

The 2006 Report also compares the site-specific data collected by the City to these observed regional trends. Figures 5-7, 5-8 and 5-9 from that report have been included in Attachment C. The following is a summary of the information provided in the 2006 Report (p.p. 5-16 – 5-20):

> Based on this available information, EC distribution patterns at the WPCF are consistent with the regional distribution of EC (compare Figures 5-1 and 5-7). This regional distribution of EC is probably attributable to the predevelopment intrusion of brackish to saline water in the Delta region.
>
> Due to the apparent regional influence on groundwater EC, a monitoring well to the north-northwest of the WPCF land application area (outside of the influence of the WPCF but encompassed by the Delta water quality influence) would be appropriate for defining the background EC in groundwater.
>
> The City collected samples for general chemistry analysis during the fourth quarter of 2005 and first quarter of 2006 groundwater sampling events…Based on this preliminary information, the primary cations contributing to EC beneath the City's property are calcium and sodium followed by lower concentrations of magnesium. This is consistent with the regional trends…
>
> The highest concentrations [of sodium] were detected in the northwestern quadrant of the agricultural reuse area, along the peripheral canal and Delta boundary...
>
> In general, the spatial trends in anion concentrations are consistent with regional trends…Bicarbonate was the dominant anion in all of the wells. However, elevated

> concentrations of chloride were detected in several wells…The highest concentrations were more restricted to the area near the east edge of the peripheral canal and Delta boundary…Note that the maximum chloride concentration shown in Figure 5-9 (510 mg/L in WSM-13) was detected outside of the WPCF land application area. In other WPCF areas, there were no apparent trends in the chloride concentrations.
>
> Comparison of Figures 5-4 and 5-9 shows that the regional distribution of chloride in groundwater is reflected in the site-specific results. On a regional basis, chloride concentrations are elevated along the eastern margin of the Delta, and this seems to explain the high concentrations of chloride observed in the wells near the Delta boundary.
>
> As described in more detail in Section 6.0, *chloride is not a major constituent in waste streams entering the WPCF* [emphasis added], and it appears unlikely that the chloride concentrations detected in the WPCF monitoring wells exceed the range of chloride concentrations observed regionally. Therefore, the regional groundwater conditions are most likely affecting the WPCF monitoring wells more than impacts from the WPCF infrastructure or land application areas.
>
> The consistency between distribution trends for EC, chloride, and sodium confirm that a monitoring well to the north-northwest of the WPCF land application area would be appropriate for defining the background salinity in local groundwater.

This discussion provides a recommended location for the background well to assess EC impacts associated with the City's facility. Note that although the recommended background monitoring location would be further north than WSM-16 (because WSM-16 has been observed to be downgradient of WSM-15 at times), WSM-16 does provide the best indication at this time as to the background levels of EC, chloride and sodium. As shown in the Figures 5-7, 5-8 and 5-9 (Attachment C), the concentrations of all of these parameters are much greater in WSM-16 than they are in the wells located downgradient of the City's land application and storage areas.

Comment No. 2: The State Board Report incorrectly concludes that the City has not adequately evaluated the sources and/or potential impacts associated with the untreated industrial flows. Again, information and details regarding this source of irrigation water included in the City's regulatory file and the 2006 Report were apparently not reviewed. Specific areas of concern are as follows:

Page 3, Paragraph 1, Fourth sentence states:

> *"The industrial discharges have not been adequately characterized."*

This statement ignores the Industrial Source Characterization study completed in June 2000, as required under the current permit.

The following is an updated summary of the industrial discharges. In the last seven years, the following specific industrial discharge modifications have occurred:

- Interlake (a metal finisher) has gone out of business and no longer discharges.

- PCP Can Division no longer is in operation and therefore does not discharge.

- Fruit and vegetable processing wastewaters discharged from the PCP Cannery have been substantially reduced.

- Valley Industries is now Thule Towing Systems.

- R.M. Holz Inc. does metal finishing, but they no longer discharge process wastewater.

- The discharge of treated water from the Chevron groundwater remediation project, which was started up in late 2000, is now complete and no more discharges are expected. This discharge was described in the NPDES permit renewal Form 2A.

- The City has begun accepting batch discharges from three wineries: Van Ruiten, Jesse's Grove, and Michael David.

    - Both Michael David and Jessie's Grove are starting discharge this year (2007) and their wastewater will be trucked to the City's facility.

    - Van Ruiten has a flow limit of 1.1 million gallons (MG) per year and a BOD limit of 11,000 mg/L as a daily maximum and 9,000 mg/L as a daily average.

    - Michael David has a flow limit of 0.7 MG per year and 0.525 MG between 9/1 and 5/31. There is no BOD limit.

    - Jessie's Grove has a flow limit of 0.3 MG per year and 0.240 MG between 9/1 and 5/31. There is no BOD limit.

Based on this information, the list of industries discharging to the industrial line that was provided in Table 1 of the June 26, 2000 report should be modified as follows:

Industries Currently Contributing to the WPCF Industrial Flow

Industry Name	Industry Type	Discharge, MGY[(a)]	Discharge Areas within Plant	Possible Hazardous Waste Limitations
Pacific Coast Producers	Cannery	50 – 130[(b)]	Fruit wash, boiler blow down, caustic peeling of fruit, factory washdown	No
Thule Towing Systems (Formerly Valley Industries)	Categorical metal finisher	5.4	Process wastewater stored in tanks[(c)]	Yes
RM Holz, Inc.	Categorical metal finisher	2.7[(d)]	Compressor cooling water, autoclave blowdown	No
M & R Packing	Fruit packing	2.0	Cooling water, fruit wash	No
Lodi Iron Works	Iron casting plant	0.5	Compressor cooling water	No
Van Ruiten	Winery	1.1[(e)]	Process wastewater, fruit wash, equipment wash	No
Michael David	Winery	0.7[(e)]	Process wastewater, fruit wash, equipment wash	No
Jesse’s Grove	Winery	0.3[(e)]	Process wastewater, fruit wash, equipment wash	No

(a) Million gallons per year.
(b) Maximum permitted discharge for PCP is 130 MGY
(c) Process water sampled prior to discharge and non-compliant water is hauled to the Evergreen Oil Facility.
(d) 2006 flows, does not include process wastewater, which is no longer discharged to the WPCF.
(e) Discharge limit

Thule Towing Systems (formerly Valley Industries) is the only discharger that currently would be subject to Hazardous Waste Limits. Attachment D includes a summary of the data collected from this facility. (Note that data for wastewater that was hauled off to the Evergreen Oil Facility is not included.) Also provided in Attachment D is data provided by RM Holz Rubber, which would be applicable to their discharges prior to the changes discussed above. Note that both of these dischargers have also submitted letters to the City (which have also been forwarded to the Regional Board) certifying that they do not discharge RCRA wastes. Finally, data collected from these dischargers in August and September of 2000, which was also previously provided to the Regional Board, is also included in Attachment D.

The annual discharges to the industrial line are as follows:

Total Annual Industrial Line Flows, MG/Year

Discharger	2006	2005	2004	2003
Pacific Coast Producers	53	83	126	128
Thule Towing Systems (Formerly Valley Industries)	4.7	6.1	5.5	5.5
RM Holz, Inc.	2.7	4.6	5.4	3.3
M & R Packing	1.2	1.2	2.4	3.1
Chevron Remediation Project	-	1.1	3.1	3.3
Lodi Iron Works	0.4	0.5	0.8	0.4
Van Ruiten	0.9	0.1	-	-
Michael David	-	-	-	-
Jesse's Grove	-	-	-	-
Total	63	96	144	144

As shown in the above table, the industrial flows have declined significantly and all the industrial line flows are more or less continuous year-round except PCP and the three wineries. PCP flows are mostly spread out between June and September. The winery flows are typically batch flows that can occur at any time, but discharges are most likely to occur in July/August and March. The typical daily industrial line flows are estimated as follows (note the wineries were not included because they are typically batch discharges and are minor):

Estimated Daily Industrial Line Flows, Gallons per Day[(a)]

Discharger	June – September		October - May	
	Flow	% of Total	Flow	% of Total
Pacific Coast Producers	799,517	95%	-	0%
Thule Towing Systems (Formerly Valley Industries)	14,928	1.8%	14,928	38%
RM Holz, Inc.	10,973	1.3%	10,973	28%
M & R Packing	5,406	0.6%	5,406	14%
Chevron Remediation Project	6,898	0.8%	6,898	17%
Lodi Iron Works	1,440	0.2%	1,440	4%
Total	839,163	-	39,646	-

(a) Average of 2003 thru 2006 data.

Over the 243 days between October 1 and May 31, the total flow that would have historically been discharged from Valley Industries and R. M. Holz Inc. would be approximately 6.75 MG. The total storage capacity in the ponds is 100 MG. Therefore, if all of these flows were directed to the pond, they would be equivalent to less than 7 percent of the total storage capacity in the ponds. However, in April and May, some of these flows are sent to the field areas. Once the cannery starts, typically in June, all these flows are sent to the fields.

Under current conditions, the total flow from Thule Towing Systems discharged to the ponds would be no greater than 3.6 MG, less than 4 percent of the pond storage capacity.

Also note that the annual industrial metals data (submitted with the annual reports) is taken in the first quarter when Thule Towing Systems (formerly Valley Industries) and R.M. Holz Inc. dominate the flows in the industrial line (note that industrial flows are *not* the dominant source to the storage ponds). Therefore, this data should adequately characterize these flows with respect to metals.

<u>Page 11, Paragraph 1, Second and third sentences state:</u>

> *"The cannery and winery wastewater could be released in concentrations exceeding agricultural goals and drinking water MCLs. The City of Lodi blending of domestic wastewater effluent with the higher salinity industrial wastewater has masked the high salinity levels of the industrial flows"*.

This statement suggests that the City's practices are intended to "mask" or hide potential sources of groundwater degradation. On the contrary, the City's practices of blending the industrial flows (which, as documented previously, only make up a small portion of the total irrigation flow) with municipal wastewater is intended to serve as a BPTC.

The *Manual of Good Practice for Land Application of Food Processing/Rinse Water*, recently published by the California League of Food Processors, states that cannery wastewater, as well as other industrial wastewater high in BOD and Total Suspended Solids (TSS), is well-suited for land application because BOD and TSS can readily be converted into soil organic matter (CLFP 2007, p. 2-3)). CLPF worked closely with the Regional Board and its staff in the development of the Manual of Good Practices and is currently holding workshops regarding it use. Furthermore, the State Board has worked closely with stakeholders to address issues regarding the application of cannery and other industrial wastewater to land. Accordingly, the State and Regional Boards are fully aware of the type of land application practice used by the City and other treatment facilities. In fact, it is estimated by CLFP that 70 percent of the process/rinse water generated each year is applied to the land for treatment and reuse (CLFP 2007, p. 2-2) Land application provides several forms of wastewater constituent treatment, including the following:

- Removal of decomposable constituents
- Permanent storage of phosphorous in soil
- Retention of calcium and magnesium minerals in the unsaturated soil profile

The primary concern with both the cannery and winery wastewater is the relatively high levels of salinity. Therefore, to ensure that the land application of these waters do not lead to soil, crop, or groundwater impacts, the City blends the industrial flows with municipal wastewater that has relative low salinity. To allow for this practice without exceeding crop agronomic application rates, the City owns and maintains a much larger irrigation area than would be necessary to dispose of the cannery water alone. The City also monitors EC levels in the irrigation water on a weekly basis, as shown by the limited data presented in the State Board Report. Because the City employs the BPTC practice of blending the canning wastewater flows with lower-salinity municipal effluent, the EC levels can generally be maintained at less than 1,000 µmhos/cm.

In addition, the PCP cannery recently changed their existing process to use potassium hydroxide in lieu of sodium hydroxide. Potassium hydroxide would be considered an environmentally superior source of caustic since the wastewater would add an essential plant nutrient to the cropland.

<u>Comment No. 3:</u> The State Board Report includes several inaccurate, speculative, and otherwise inflammatory statements that, if read by someone not knowledgeable about the City's current practices and/or current state regulatory guidelines, could lead to inappropriate conclusions. Specific areas of concern are as follows:

<u>Page 3, Paragraph 2, First sentence states:</u>

> *"Domestic wastewater sludge and supernatant is directly discharged to the land for disposal by percolation"*

This is not an accurate statement. Applications to the crop areas are made at agronomic nitrogen and hydraulic loadings rates. The City does acknowledge that irrigation of crops on the City's land application area could cause incidental percolation to occur. However, this type of percolation is not dissimilar the percolation that would occur at any agricultural site.

<u>Page 3, Paragraph 2, Third sentence states:</u>

> *"The land disposal of sludge to the wastewater disposal area potentially adds back a large percentage of the pollutants that were removed by the wastewater treatment plant."*

This comment is directly contrary to information included in the State Board General Order (Order No. 2004 - 0012 – DWQ) for the discharge of biosolids to land for use as a soil amendment in agricultural, silvicultural, horticultural, and land reclamation activities (General Order). The following statements are provided in the General Order (Item 7, p. 6):

> Biosolids are a source of organic matter, nitrogen, phosphorus, and micronutrients. These materials are beneficial to agriculture, silviculture, horticulture, and land reclamation activities and they improve agricultural productivity. More specifically, the benefits derived from biosolids used as a soil amendment are as follows:
>
> (a) Nitrogen is a basic nutrient for plant growth. In biosolids, it is present in the forms of ammonia, nitrates, and organic nitrogen at concentrations from two to 10 percent by weight on a dry weight basis. The ammonia and nitrate forms of nitrogen are available for plant usage. Organic nitrogen is released slowly (mineralized) over many months, providing a continuous supply of nitrogen for crops and

minimizing the potential for movement of nitrogen to the ground water. Ammonium and nitrate (and some nitrite) are the available forms of nitrogen that are taken up by the plants, and some form salt reserves and mineralized organic nitrogen in the soil. Total nitrogen available to the plant at any given time is less than the total of these mineral forms due to the dynamic cycling of nitrogen in the soil.

(b) Phosphorus is a basic nutrient for plant growth and is present in all biosolids in varying concentrations.

(c) Micronutrients, including a variety of salts and metals, are necessary for plant growth and are present in biosolids in varying amounts.

(d) The addition of biosolids to soils can also be beneficial by enhancing soil structure, increasing water retention capability, promoting soil aggregation, and reducing the bulk density. Organic matter assists in maintaining soil pores which allow water and air to pass through the soil medium. Such pores can be lost at sites under continuous cultivation and they are critical in maintaining an aerobic environment within the plant root zone.

(e) Organic matter helps soils retain water. Additional water retention can reduce the need for frequent water applications and can facilitate water conservation in the soil column.

Moreover, as documented in the City's Self Monitoring Reports, the City's biosolids application practices are (and have been) in conformance with the requirements outlined in the State Board General Order, which are consistent with the EPA requirements for land application.

On the EPA's website, *Land Application of Biosolids – Frequently Asked Questions*, the following statements with respect to biosolids land application are provided:

> The controlled land application of biosolids completes a natural cycle in the environment. By treating sewage sludge, it becomes biosolids which can be used as valuable fertilizer, instead of taking up space in a landfill or other disposal facility. (Question 5)
>
> The National Academy of Sciences has reviewed current practices, public health concerns and regulator standards, and has concluded that "the use of these materials in the production of crops for human consumption when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production and to the environment. (Question 9)
>
> Biosolids are used to fertilize fields for raising crops. Agricultural use of biosolids, that meet strict quality criteria and application rates, have been shown to produce significant improvements in crop growth and yield. Nutrients found in biosolids, such as nitrogen, phosphorus and potassium and trace elements such as calcium,

> copper, iron, magnesium, manganese, sulfur and zinc, are necessary for crop production and growth. The use of biosolids reduces the farmer's production costs and replenishes the organic matter that has been depleted over time. The organic matter improves soil structure by increasing the soil's ability to absorb and store moisture. (Question 13)
>
> The organic nitrogen and phosphorous found in biosolids are used very efficiently by crops because these plant nutrients are released slowly throughout the growing season. This enables the crop to absorb these nutrients as the crop grows. *This efficiency lessens the likelihood of groundwater pollution of nitrogen and phosphorous* [emphasis added]. (Question 13)

<u>Page 4, Paragraph 1, First sentence states:</u>

> *"Because the copper and mercury concentrations in sludge exceed ten times the STLC in the total analysis, it is recommended that acid soluble sludge extractions be analyzed for these constituents..."*

Soluble Threshold Limit Concentrations (STLC) are prescribed in Section 66261.24, Title 22, of the California Code of Regulations (CCR). STLC concentrations are measured in solid samples by using a metals extraction method (such as the acid soluble testing recommended in the State Board Report). This measurement defines the amount of a given leachable compounds present in a solid material and represents what could happen to a given material as it is exposed to normal climatic conditions in a landfill over time (North Coast Laboratories Ltd, 2002). When this extraction is used on solid matrices, the results will be reported in liquid units (mg/L). If the STLC concentrations are exceeded in a sample collected using an extraction method, the solid material must be dealt with as hazardous waste per State regulations, thereby requiring specific disposal methods be practices. If the concentration of a given metal measured on a wet weight basis in a solid material using typical testing procedures (i.e. the Total Threshold Limit Concentration, which is not an extraction method) is greater than ten times the STLC, extraction testing is required to see if the extractable metals exceed the STLC values (North Coast Laboratories Ltd, 2002).

Total Threshold Limit Concentration (TTLC) are also prescribed in Section 66261.24, Title 22, CCR. These values are similar to the STLC values except that they are expressed as mg/kg on a wet weight basis. Solids which contain metals at or above the TTLC values on a wet weight basis could also be defined as "hazardous."

The March 2007 biosolids data that is presented in the State Board Report is reported on a dry-weight basis. A "dry-weight" measurement is the weight of measured metal expressed per unit of total weight of the dry solids. To determine this value, the lab analyzes a given volume of biosolids to determine the total milligrams of the compound of concern. The lab then dries the sample and weighs the dry material. In contrast, the "wet weight" represents the weight of the measured metal per unit of the total weight of the sample (before it is dried, or "as is"). Therefore, it is not valid to compare the dry-weight concentrations to the TTLC or the STLC.

The following equation can be used to calculate the wet weight concentration from a given dry-weight value:

mg/kg dry weight x percent total solids ÷ 100 =
milligrams per kilogram wet weight

The percent of total solids was not measured in the sample discussed in the March 2007 State Board Report. However, the sample was collected from solids discharged from the anaerobic digesters, which typically has a solids content between one and two percent. Therefore, even under a worst-case scenario, the percent solids of this sample would be no greater than 5 percent. Even under this worst-case scenario, the calculated wet-weight concentration for copper would be 15.8 mg/kg, and for mercury would be 0.1 mg/kg. Both of these values are significantly less than the TTLC and one tenth the STLC for copper and mercury. Therefore, additional assessment of whether the biosolids should be classified as “hazardous” or “designated” is not warranted or appropriate.

Page 4, Paragraph 1, Second sentence states:

> *“…the groundwater elevation is shallow and underlying soils provide little potential for adsorption.”*

and

Page 11, Paragraph 1, Seventh sentence states:

> *“…the groundwater elevations underlying the waste disposal area is shallow and the underlying solids provide little if any treatment of the waste as it passes through.”*

Both of these statements are highly speculative and inaccurate. The EPA provides guidelines for appropriate soil depths in Slow Rate systems (which is another term for describing the type of agronomic application practiced by the City) to ensure adequate treatment is achieved. The following information is provided by the EPA:

> Adequate soil depth is needed for retention of wastewater constituents on soil particles, for plant root development, and for microbial action. Adequate depth is also required in SR [Slow Rate] and SAT [Soil Aquifer Treatment] systems to separate the zone of wastewater treatment from the saturated soil layers. Retention of wastewater constituents is a function of residence time of wastewater in the soil. Residence time depends on the application rate and the soil permeability (EPA 2006, p. 3-2).
>
> The type of land treatment process being considered will determine the minimum acceptable soil depth. For SR, the soil depth can be 0.6 to 1.5 m (2 to 5 ft), depending on the soil texture and crop type. For example, soil depths of 0.3 to 0.6 m (1 to 2 ft) can support grass or turf, whereas deep rooted crops do better on soil depths of 1.2 to 1.5 m (4 to 5 ft) (EPA 2006, p. 3-2).

In addition, the CLFP provides guidance for appropriate depths to groundwater for land application of cannery process/rinse water flows:

> Retention of process/rinse waster components is a function of their residence time in the soil and the degree of contact with soil particles. Except for *very* [emphasis added] high permeability soils, a soil depth of two feet is generally adequate for process/rinse water treatment (Pettygrove and Asano, 1985; USEPA, 2006, as sited in CLFP 2007, p. 5-7)

As discussed previously, the depth to groundwater measured in the City's monitoring wells are almost always greater than two feet, with much greater soil depths observed on the eastern portion of the City's properties. Based on this information and the guidelines presented above, the depth to groundwater beneath the irrigation site should be adequate.

Page 6, Paragraph 3, Third sentence states:

> *"Well logs show the underlying soil structure to be highly permeable sand and silt."*

This is not an accurate statement. As stated in the 2006 Report (p.p. 3-6 – 3-10):

> The predominant, mapped soil types in the vicinity of the WPCF and the agricultural reuse areas are the Guard and Devries soils….The Guard soil is fine-textured (clay loam), while the Devries is coarse textured (sandy loam)… The Guard soil has a calcareous-silica subsoil, while the Devries series has a duripan (a hard, subsurface horizon, cemented by silica or other materials, such as iron oxides or calcium carbonate that are always brittle, even after prolonged wetting) that is also calcareous.

Therefore, both soils have low hydraulic conductivity, either because of fine-grained texture or the presence of a duripan, which significantly impedes the vertical flow of water.

The 2006 Report also provides information on the geologic materials encountered during monitoring well installation and test boring drilling (p. 3-13).

> The sediments encountered during drilling are predominately fine-grained, ranging from silts and clays to silty fine sands. Actual hydraulic conductivity values have not been assessed at the WPCF. Typical hydraulic conductivity values for these materials range from roughly 0.001 to 10 feet per day (Freeze and Cherry, 1976).
>
> Several of the wells penetrate coarser grained layers without appreciable fine grained material intermixed. These clean sand layers were composed of fine to coarse grained sands with occasional fine gravel. Typical hydraulic conductivity values for these materials range from roughly 10 to 1,000 feet per day (Freeze and Cherry, 1976).
>
> Although not recorded in the drilling logs, observations made by WYA and facilities staff indicate that *cemented and hard pan zones are present within the sediments at depths of six to ten feet*. *These zones would tend to lower the*

> *hydraulic conductivity of the sediments and impede the vertical flow of groundwater* [emphasis added].

It should be noted that the 2006 Report contains geologic cross sections that show that the coarser grained sediments are typically isolated lenses enclosed within fine-grained sediments, as is typical of alluvial plain environments. As detailed in the 2006 Report, average groundwater flow velocities in the fine grained sediments, which are present at most shallow groundwater locations, are estimated to range from approximately 10^{-6} to 0.1 feet per day. These flow velocities are quite low, allowing time for chemical transformations and plant uptake. These processes can reduce contaminant concentrations in the soil column over time. Also, fine grained soils tend to strongly adsorb metals and organic compounds, leading to decreased potential for groundwater impacts.

Page 4, Paragraph 1, Second sentence states:

> *"…the sludge sampling indicates the potential for constituents such as dioxins, phosphorus, and fecal coliform organisms to degrade groundwater."*

and

Page 4, Paragraph 1, Fourth sentence states:

> "*Although there is currently not a water quality standard for phosphorus, it could be determined if the City's discharges have degraded groundwater quality."*

and

Page 4, Paragraph 1, Sixth sentence states:

> "*It is difficult to conceive that the application of sludge with fecal coliform concentrations at over a million and a half organisms will not exceed 2.2 MPN in shallow groundwater."*

These statements are speculative and inflammatory. The concentrations of these parameters in the City's biosolids are typical of any biosolids generated at a municipal wastewater treatment facility, and the City has always met or exceeded the EPA biosolids quality requirements established for land application. Moreover, several studies have been done by the EPA demonstrating that these constituents do not pose a threat to groundwater when biosolids are land applied within the guidelines provided by the EPA.

Regarding phosphorus, the EPA states:

> Phosphorus is part of the plant genetic material ribonucleic (RNA) and energy transfer with adenosine triphosphate (ATP). Phosphorus is available for absorption by plants from the soil as the orthophosphate ions (H2PO4-2 and HPO4-3). Aluminum, iron, calcium, and organic matter quickly bind phosphorus into highly insoluble compounds. The concentration of orthophosphate ion in soil solution is commonly less than 0.05 mg/L, so and equilibrium is established between the soluble ion and the adsorbed form in soil (EPA 2006, p. 4-9).

.

> The amount of phosphorus in municipal effluent is usually higher than plant requirements. Fortunately, the relative immobility of phosphorus in soil profile allows for application of phosphorus in excess of crop requirements (EPA 2006, p. 4-9).

With respect to fecal coliform, the EPA states:

> The known pathogens of concern in land treatment systems are parasites, bacteria, and viruses. The potential pathways of concern are to groundwater, contamination of crops, translocation or ingestion by grazing animals, and human contact through off site transmission via aerosols or runoff. The removal of pathogens in land treatment systems is accomplished by adsorption, desiccation, radiation, filtration, predation, and decay due to exposure to sunlight (UV) and other adverse conditions. Fecal coliform are used as an indicator of fecal contamination... (EPA 2006, p. 2-3)
>
> The SR process is the most effective, removing about five logs (10^5) of fecal coliforms within a depth of a 0.6 m (2 ft) [emphasis added]. (Reed et al., 1995 as cited in EPA 2006, p. 2-3).

Moreover, as discussed previously, the City has monitored fecal coliform in the onsite wells. As presented in the Self Monitoring Report, the City has very rarely measured detectable concentrations of the organisms in the groundwater. The following information related to this subject was also included in the City's 2004 Letter (p. 7):

> The City has evaluated Total Coliform Organisms and they are not an issue. In 2003, of the 187 coliform samples collected from the monitoring wells and analyzed, only three indicated coliform levels above 2.2 MPN/100 ml. The highest level was 8 MPN/100 ml. Thus far in 2004, 95 coliform samples have been collected and analyzed and only five indicated coliform levels above 2.2 MPN/100 ml. The highest level was 5.1 MPN/100 ml. See the enclosed Tabular Presentation of Groundwater Quality Data by Well.

Finally, with respect to dioxin, in 1999 the EPA began the studies necessary to define appropriate limitations for these compounds in land applied biosolids. The following findings were made based on the results of these studies:

> EPA has determined that no further regulation of land-applied sewage sludge [for dioxins] is needed to protect public health and the environment from reasonably anticipated adverse effects from exposure to dioxins in land-applied sewage sludge. Therefore, no numeric limitations, monitoring, operational standards, or management practices are being established in 40 CFR part 503 for dioxins in land-applied sewage sludge. (United States Federal Register, 2003)

Page 6, Paragraph 1, Seventh sentence states:

> *"The above soil sampling confirms that the wastewater discharges are contributing large quantities of nitrate to groundwater."*

and

Page 6, Paragraph 1, Ninth and tenth sentences state:

> *"If one assumes that the soluble salts [measured in the soil samples] are dissolved the value is directly comparable to TDS in mg/L. One must also recognize that the soluble salts may pass through the soil column quickly."*

These statements are not based on fact and reflect the apparent lack of thorough review by staff in preparing the State Board Report. Specifically, the author fails to recognize that one of the soil samples (Soil Sample Location No. 6E) is collected in a field that is irrigated solely with groundwater and has never received application biosolids or cannery discharges. As shown, the concentrations of nitrate and total soluble salts measured in this soil sample is very similar to those measured in the soils collected from the City's land application areas, particularly in the last few years. Based on this data, it can readily be concluded that the City's practices have not caused the soils onsite to be very different from that of indigenous soils in the area. Additional details regarding soil sampling data is provided in the 2006 Report (Page 6-30 through 6-32).

Moreover, with respect to the nitrogen, the TKN concentrations measured in the soil samples show decreasing concentrations with depth. This would be expected in an agricultural soil because organic content decreases with depth. As such, the TKN profiles are not supportive of the statements regarding downward movement of nitrogen due to field loadings.

Finally, soluble salts refer to the total soluble minerals plus some soluble organic substances in soils and are not necessarily correlated to TDS. Henley (1975) states: "Soluble salts are composed predominantly of ammonium, calcium, magnesium, potassium, sodium, bicarbonate, chloride, nitrate, and sulfate ions . Growers of plants use soluble salts measurements to get an indication of the fertility of their soils." Therefore, the author's suggestion that these soluble salts are somehow an indication of the potential for the City's discharge to degrade groundwater with respect to salinity is troubling and erroneous.

Page 6, Paragraph 2, Third sentence states:

> *"The discussion of groundwater degradation has principally and inappropriately been limited to nitrate and EC."*

This statement is not accurate and unnecessarily inflammatory. First, as discussed above, the City has also evaluated coliform levels in groundwater. Secondly, the City's current permit specifically requires monitoring for specific conductivity, nitrate and total coliform. Moreover, the groundwater studies completed by the City (and associated monitoring) conform to the original workplan approved by the Regional Board in 2000. Finally, since nitrate and salinity are the most likely contaminants associated with a land application project, it would be reasonable for the City to initiate monitoring based on these "first tier" parameters.

<u>Page 6, Paragraph 3, Fourth and fifth sentences state:</u>

> *"Based on the shallow groundwater elevations and the use of unlined ponds, groundwater likely enters the ponds directly commingling with the waste. There are no barriers to stop pollutants from migrating to groundwater."*

These statements are not based on any factual evidence and do not appear to consider the 2006 Report. The City's monitoring shows that the groundwater elevations in several wells located near the ponds are several feet below the bottom of the ponds (elevation 1.6 to 1.9 feet above mean sea level). This data is shown in the geologic cross-sections provided in the 2006 Report (Figures 3-6 through 3-11). In addition, as stated in the 2006 Report (p. 3-28):

> The water levels in wells WSM-2, WSM-3 and WSM-4 provide information regarding the depth to groundwater beneath the WPCF treatment and storage facilities. A summary of the depth to groundwater in these three wells measured between September 2001 and November 2005 is shown in Table 3-5.

Table 3-5. Depth to Groundwater in Wells Located Near the WPCF Treatment and Storage Facilities[(a)]

Well	Median Feet Below Ground Surface	Maximum Feet Below Ground Surface	Minimum Feet Below Ground Surface
WSM-2	6.7	8.4	4.2
WSM-3	8.5	10.5	5.3
WSM-4	8.4	13.2	4.4

In addition, the City typically empties the storage ponds. During these events there has not been any observed occurrence of groundwater infiltration into the ponds..

<u>Comment No. 4:</u> The State Board Report suggests that the potential for groundwater impacts associated with the City's practices can be determined solely from a small sample of available concentration data presented in the City's Self Monitoring Reports. Not only do the author's statements and conclusions fail to take into account background groundwater concentrations (which have not been clearly defined), they also do not reflect an understanding of the current BPTCs that the City employs to keep excessive amounts of pollutants from entering groundwater. Nevertheless, the author uses the limited data reviewed for this report to support not only his conclusions regarding impacts, but also how these impacts should be addressed based on an interpretation of State Policy that is unfounded in law or fact. Specific areas of concern are as follows:

Page 7, Paragraph 2, Last sentence states:

> "*In either case the total nitrogen identified in the wastewater by sampling is higher than the underlying groundwater levels identified…and would therefore reasonably degrade groundwater quality.*"

This statement is speculative, misleading and ignores established science and the data. For example, fate and transport factors such as adsorption and dispersion; biological and chemical transformations; soil types; and hydrogeology are relevant to evaluating groundwater impacts, yet were ignored in the State Board Report. This is particularly the case with respect to nitrogen compounds, as the nitrogen cycle is complex and changes in nitrogen speciation are affected by site-specific conditions. For the City's site, the following factors must be considered:

1. As discussed in the 2006 Report, nitrogen losses (volatilization and denitrification) occur in the storage ponds.

2. Regarding the City's land application practices, flows are applied at agronomic rates. Therefore, most, if not all, of the nitrogen applied in irrigation water will be taken up by crops.

3. Because surface irrigation is used and the carbon content in the applied irrigation water can be significant, nitrogen losses will occur due to denitrification of nitrate and volatilization of ammonia when the irrigation water is being applied.

4. Nitrogen transformations and denitrification losses will occur in the unsaturated soil environment.

5. Nitrogen transformations and denitrification losses will also occur in the shallow aquifer.

Moreover, with respect to the land application practices, total nitrogen loadings are a much better indicator of the potential for nitrogen to move past the root zone of the crops to which it is applied. As discussed previously, the City currently employs the practices necessary to ensure that nitrogen loadings are less than the uptake rates of crops. In fact, the City is currently evaluating not only annual allowable loading rates, but has recently developed monthly loading rates to determine what the allowable loadings would be each month. This information has also been compared to the anticipated worst-case nitrogen loadings from the applied irrigation water (including cannery water). Based on this analysis, it has been determined that the land application area is appropriately sized to allow for crop uptake of the anticipated applied nitrogen even under worst-case monthly conditions. Note that by basing applications on monthly rates, the City is implementing a BPTC measure that is beyond what is typical for these types of facilities.

Page 10, Paragraph 3, First sentence states:

> *"Unless there are underlying features which are capable of containing waste and leachate equivalent to providing a doubly lined containment unit, high salinity wastewater is designated waste…and must be regulated in accordance with the requirements of Title 27."*

and

Page 10, Paragraph 4, Item (b) states:

> *"[Designated waste means] Nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or that could reasonably be expected to affect beneficial uses of the water of the state as contained in the appropriate stat water quality control plan."*

and

Page 11, Paragraph 1, Fourth Sentence states:

> *"The beneficial uses of the groundwater underlying the City of Lodi facility include agriculture and drinking water both of which have been adversely affected by the saline wastewater discharge."*

and

Page 11, Paragraph 2, Fourth Sentence states:

> *"The City of Lodi's wastewater disposal at a minimum contributes to groundwater degradation above water quality standards which adversely affects beneficial uses of groundwater."*

First, although it is not clearly defined in the State Board Report, these statements, combined with the limited irrigation water data presented, suggest that the Lodi irrigation wastewater is a "high salinity wastewater" and should therefore be regulated as a "designated waste" under Title 27. It is not clear, however, whether the author's suggestion that Title 27 is appropriate is based on either:

a) The author's own interpretation of whether beneficial uses have been impacted by the salinity in the discharge, or

b) That because it has EC levels of the irrigation water are in the range of 600 to 1,000 µmhos/cm, salinity could be released in concentrations greater than applicable objectives.

With respect to item a), the Regional Board defines the term "beneficial use water quality objective" as follows:

> …this term refers to the most stringent of a set of applicable water quality criteria and objectives and relevant water quality limits used to interpret narrative criteria and objectives for a constituent or parameter of concern in a specific body of water. This limit is chosen to comply with all applicable water quality objectives and Section 303(c) criteria so as to protect all beneficial uses designated for the body of water in question. *In no case is this limit more stringent than the natural*

> *background concentration of the constituent* [emphasis added]. (Central Valley Regional Water Quality Control Board August 2003, p. 2)

However, as documented previously and explained in extensive detail in the 2006 Report, the City has not been able to define the background concentrations. Therefore, the conclusions presented in the State Board Report that the beneficial uses have been impacted solely based on the water quality of the City's irrigation water are not appropriate.

Nevertheless, by just looking at the regional and site specific groundwater data that is available (as presented in this document and in the 2006 Report), it is apparent that the background concentrations for salinity in the area of the WPCF are likely greater than 1,000 µmhos/cm. As shown on the Figure 5-7 from the 2006 Report (Attachment C), median EC levels in WSM-16, located north of the City's facility, are 1,400 µmhos/cm, while every single well that is located downgradient of the City's facilities have median EC levels that are less than this value.

Moreover, Title 27 specifies statistical methods for evaluating the potential for groundwater impacts with respect to background levels. These methods include the evaluation of long-term concentrations. In the case of the Lodi irrigation water, the EC levels are highly variable from week to week during the canning season. However, historic monthly average concentrations (as shown in the following table that was included in the 2006 Report, p. 6-22) are consistently less than 900 µmhos/cm, despite the elevated concentrations measured in the industrial influent wastewater.

Table 6-6. Average Irrigation Water EC (2002-2005)

Month	Irrigation Water	Municipal Effluent	Industrial Wastewater
April	840	630	850
May	700	620	900
June	690	610	940
July	800	620	1200
August	860	620	1070
September	820	660	1210
October	780	660	860

Finally, the City evaluated EC levels in the storage ponds during 2005 in association with development of the 2006 Report. This data (as shown in the following table taken from the 2006 Report, p. 6-7) also demonstrates EC levels less than 900 µmhos/cm. Note that the City does not discharge high salinity canning flows to the storage ponds.

Table 6-3. Storage Pond Salinity

Constituents	September through December 2005	January through March 2006
EC, µhos/cm	813	593
TDS, mg/L	530	377
Hardness, mg/L as $CaCO_3$	163	117

With respect to item b), the State Board Report fails to explain why it uses only the *minimum value in the range* of the MCL for EC to assert that the groundwater exceeds the water quality standard for EC. (see CCR, Title. 22, Section 64449-B.) In fact, the suggested 900 umhos/cm criterion is based on a non-regulatory paper published in 1985 by the United Nations as the standard to regulate salinity (Food and Agriculture Organization, 1985). This approach is wholly at odds with the State Board precedent and the Regional Board's *Management Guidance for Salinity in Waste Discharge Requirements* (April 26, 2007). The United Nations paper, on its face, indicates its purpose as *guidance for non-regulators* and emphasizes the importance of site-specific considerations in assessing water quality suitability (Food and Agriculture Organization, 1985). Indeed, the State Board has held that a regional board cannot treat a salinity value in the United Nations report as an "absolute value, rather the Regional Board must determine whether site-specific conditions applicable to [the] discharge allow some relaxation in this value." (Order WQO 2004-0010, p. 7.) Finally, the Regional Board is currently implementing a comprehensive basin-wide approach to salinity reduction, which confirms that "each case is unique", and WDR conditions must be developed on a site-specific, case-by-case basis—by permit writers and the Regional Board as part of the public process, not by an individual in the State Board's enforcement unit.

Under the secondary MCL established by the Department of Public Health, drinking water may be served directly to customers with EC levels of up to 1,600 umhos/com, and up to 2,200 umhos/com in drought conditions. Neither the irrigation water nor the water stored in the ponds has ever exceeded these water quality criteria based on the available data.

Secondly, the author then discusses the Title 27 containment requirements for "designated waste" and suggests that because of the elevated salinity levels in the discharge *both the storage ponds and the land application area* must have either full containment in a Class II containment unit (i.e. double liner) or natural features capable of containing waste and leachate equivalent to providing a double lined containment unit. However, the EC levels in the irrigation water are on par with (or in the case of many Southern California dischargers are less than) most recycled water and cannery wastewater discharges currently occurring in the state. Therefore, by following the logic presented in the State Board Report, all of these projects would need the level of containment required under Title 27. Not only would it be difficult to demonstrate that this type of containment is present, but it is very unlikely that most irrigation reuse site would have natural features that fit this description. Therefore, the proposed approach to regulation would be not only unreasonable but also in direct contradiction to adopted State policies that encourage the use of recycled water.

<u>Page 15, Paragraph 1, Fifth and sixth sentences state:</u>

> *"Regional Board staff found…that there is 'inconclusive' information regarding over 57 individual constituents and whether there is reasonable potential for these constituents to exceed water quality standards. While recent data indicate that the reclaimed water is of fairly good quality for pathogens, salts and nitrogen, the prior pollutant data indicate the reclaimed water does pose a threat to groundwater quality"*

and

<u>Page 15, Paragraph 2, First sentence states:</u>

> *"Based on the available information, there is a reasonable potential that the discharge of reclaimed water to unlined storage ponds and to land for disposal by reclamation has degraded the drinking water beneficial use of groundwater for dichlorobromomethane, dibromochloromethane, nitrite and manganese."*

First, although the statement that there is "*'inconclusive' information regarding over 57 individual constituents and whether there is reasonable potential for these constituents to exceed water quality standards"* is true, other facts that support the Regional Board's decision to not regulate these compounds are not even mentioned in the State Board Report. Specifically, the State Board Report wholly ignores the fact that <u>*every single one*</u> of these constituents was reported as "not detected" in the City's water quality monitoring data. Moreover, the author fails to account for currently available commercial laboratory technologies, which constrain the reporting limits the City may use to assess these constituents are limited by the currently available commercial laboratory technologies. Finally, the State Board Report does not mention the current State policy, which recognizes that many constituents cannot be reliably measured at the concentrations needed to accurately assess reasonable potential. The fact that the State Board Report did not address all of this information is quite curious and inflammatory.

Secondly, the fact that the State Board Report suggests that the four parameters that have been assigned effluent limitations for surface water discharge have degraded the drinking water beneficial use of groundwater is also inflammatory and does not take into account well-established science.

With respect to dichlorobromomethane and dibromochloromethane, these constituents are trihalomethanes and are a by product of chlorine disinfection. These constituents are both volatile and readily adsorbed onto soil particles. Therefore, the potential for these constituents to enter groundwater is likely very low. Moreover, the City modified the treatment process in 2005 to eliminate the use of chlorine for disinfection. Since this time, the City has had one instance of an exceedance of the water quality criteria and is currently working to eliminate all potential for any additional exceedances in the future.

With respect to manganese, one can see by a simple review of the Table F-5 in the Tentative Order (which is cited by the author) that the concentrations in the discharge of manganese have NOT exceeded the applicable secondary MCL. The reasonable potential identified in the

Tentative Permit is based on the fact that the receiving water has exceeded this value. This would not be applicable to groundwater.

Finally, just like the other forms of nitrogen discussed above, nitrite is a very reactive in the environment and the presence of this compound in the City's municipal effluent is not adequate reasoning to conclude that it has caused groundwater degradation.

<u>Comment No. 5:</u> The State Board Report suggests that the City's treated biosolids should be classified as "undewatered sludge" in accordance with Title 27. Not only is this inaccurate, this claim directly contradicts State Policy. Specific areas of concern are as follows:

<u>Page 17, Paragraph 2 in full states:</u>

> "*California Code of Regulations division 2, Title 27 specifically cites undewatered sludge as requiring full containment in a class II landfill where natural features are not capable of providing equivalent containment of a double liner to protect groundwater quality. Sludge at less than 2% solids is undewatered. The natural features in the area include shallow groundwater and permeable soils. Based on these conditions the requirements of Title 27 are applicable.*"

First, the author elected to apply his own definition of "undewatered sludge." Title 27 defines "sludge and "dewatered sludge" as follows:

> **Sludge**" (SWRCB) means residual solids and semi solids from the treatment of water, wastewater, and other liquids. It does not include liquid effluent discharged from such treatment processes (CCR, Title 27, Section 20164).

> "**Dewatered sludge**" (SWRCB) means "residual semi-solid waste from which free liquid has been evaporated or otherwise removed (CCR, Title 27, Section 20164).

While these regulations do not define "biosolids," the State Board has defined the term in the Statewide General Order governing biosolids land application:

> <u>Biosolids</u> are defined as "[s]ewage sludge that has been treated and tested and shown to be capable of being beneficially and legally used as a soil amendment for agriculture, silviculture, horticulture, and land reclamation activities as specified under 40 CFR Part 503." (Order WQ 2004-12 at 3.)

<u>In accordance with this definition, the City land applies biosolids - not sludge - to the agricultural area at issue.</u>

Moreover, the State Board has recognized the benefits of reusing biosolids, and in Finding No. 22 of the General Order notes that "biosolids applied to land under this General Order are non-hazardous decomposable wastes applied as a soil amendment pursuant to best management practices and, as such, are exempt from the requirements" of Title 27 and Title 23 Chapter 15.

Secondly, the State Board Report erroneously argues that the City's land application of "sludge" is subject to Title 27 requirements for designated waste. This contention is advanced by selectively citing from the regulations. Title 27 exempts certain activities from its disposal requirements, including “nonhazardous decomposable waste as a soil amendment pursuant to applicable best management practices” subject to WDRs issued by the Regional Board. (CCR. Title 27, Section 2009; and Title 23 Section 2511.) In fact, Regional Board staff guidance clarifies that “designated wastes” may be reused and that sewage treatment sludges may be beneficially reused where certain conditions are met:

a) the waste is not ‘hazardous’;

b) loading rates of the waste to the soil are such that constituent concentrations in soils remain below Designated Levels for the site (i.e., the resulting concentrations in soil will not pose a threat to ground or surface water quality) and below levels which would be injurious to plants or crops or, through plant uptake, to consumers of crops from the site;

c) waste application is controlled to prevent direct constituent release to surface waters via tail water from the field; and

d) the waste is shown to provide a benefit for the soil on which it is applied, such that the re-use does not simply constitute disposal. (Central Valley Regional Water Quality Control Board 1989, p. 44)

As detailed throughout this document and other information developed by the City, the City’s land application of biosolids falls within this exemption from Title 27’s requirements.

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Order No. R5-2007-XXXX. NPDES No. CA0079243, *Waste Discharge Requirements and Master Reclamation Permit for the City of Lodi White Slough Water Pollution Control Facility, San Joaquin County, (Tentative Order)*, issued by the Central Valley Regional Water Quality Control Board on 13 July 2007.

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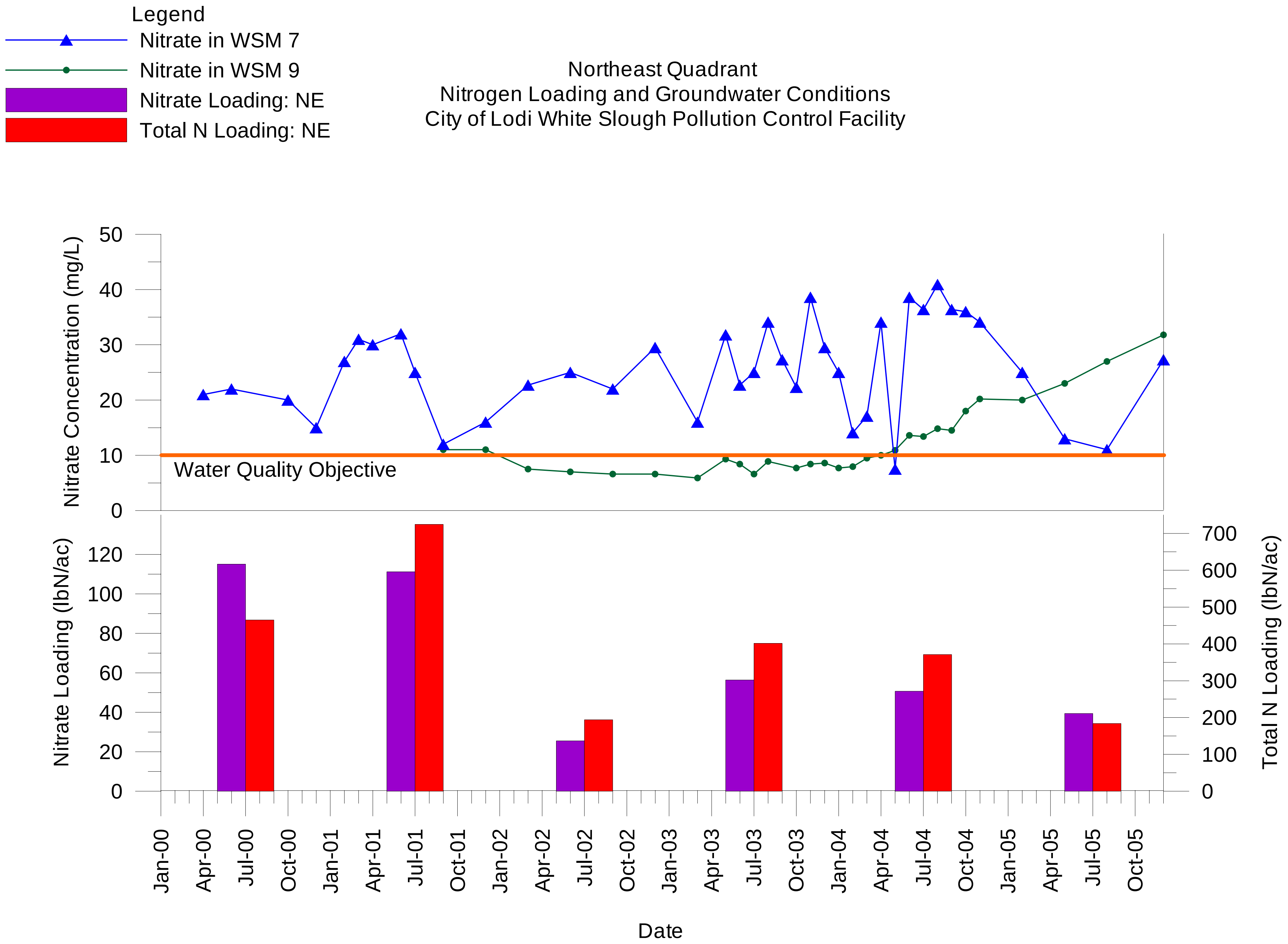
West Yost Associates, 2006, *City of Lodi Water Pollution Control Facility Groundwater Investigation – Existing Conditions Report*

ATTACHMENT A

Excerpt from 2006 Report Appendix I: Historic WPCF Nitrogen Field Loadings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Nitrate in WSM 7
Nitrate in WSM 9
Nitrate Loading: NE
Total N Loading: NE
Northeast Quadrant
Nitrogen Loading and Groundwater Conditions
City of Lodi White Slough Pollution Control Facility
Nitrate Concentration (mg/L)
Water Quality Objective
Nitrate Loading (lbN/ac)
Total N Loading (lbN/ac)
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
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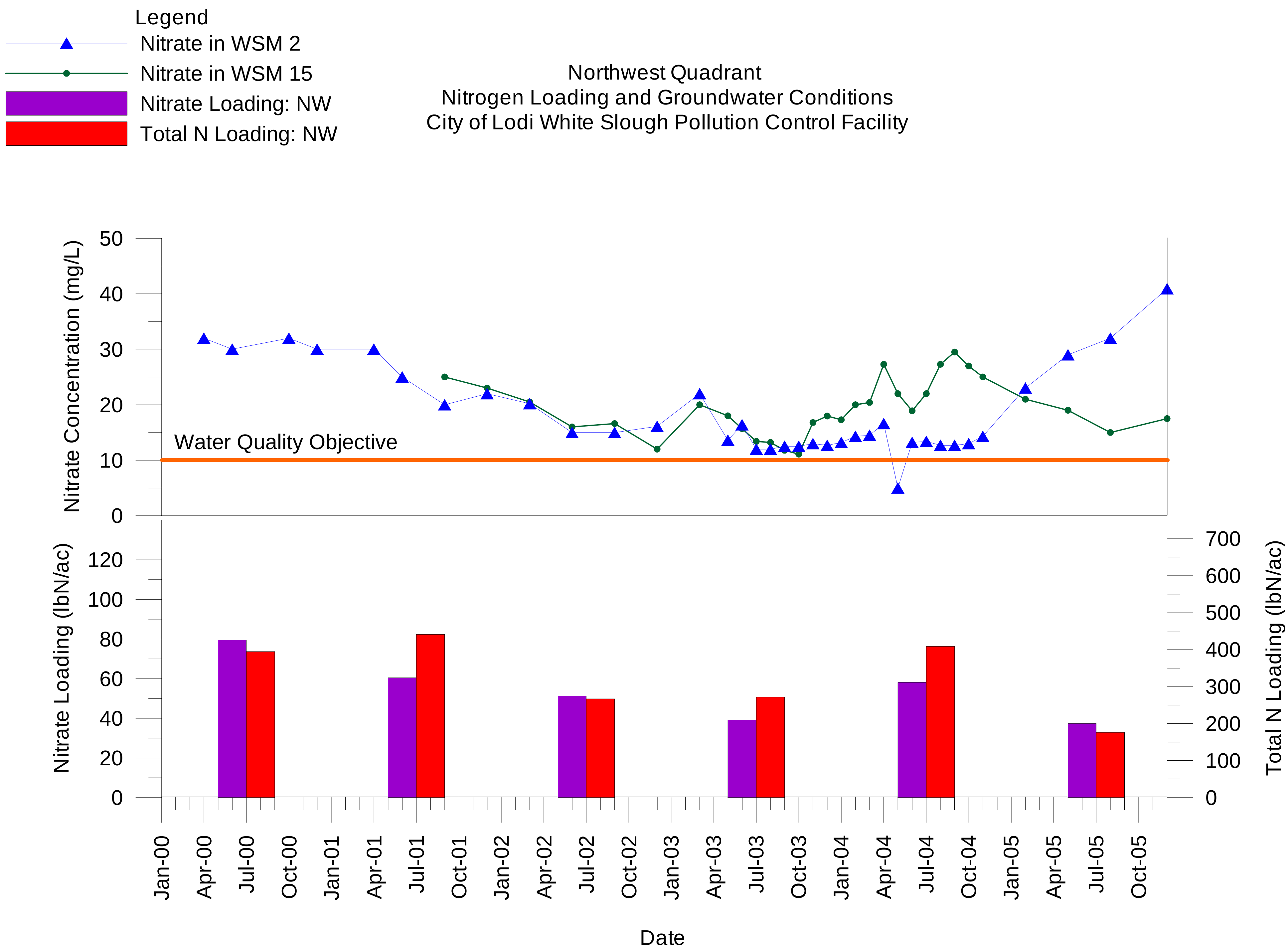
Jul-05
Oct-05
Date



Legend
Nitrate in WSM 2
Nitrate in WSM 15
Nitrate Loading: NW
Total N Loading: NW
Northwest Quadrant
Nitrogen Loading and Groundwater Conditions
City of Lodi White Slough Pollution Control Facility
Nitrate Concentration (mg/L)
Water Quality Objective
Nitrate Loading (lbN/ac)
Total N Loading (lbN/ac)
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
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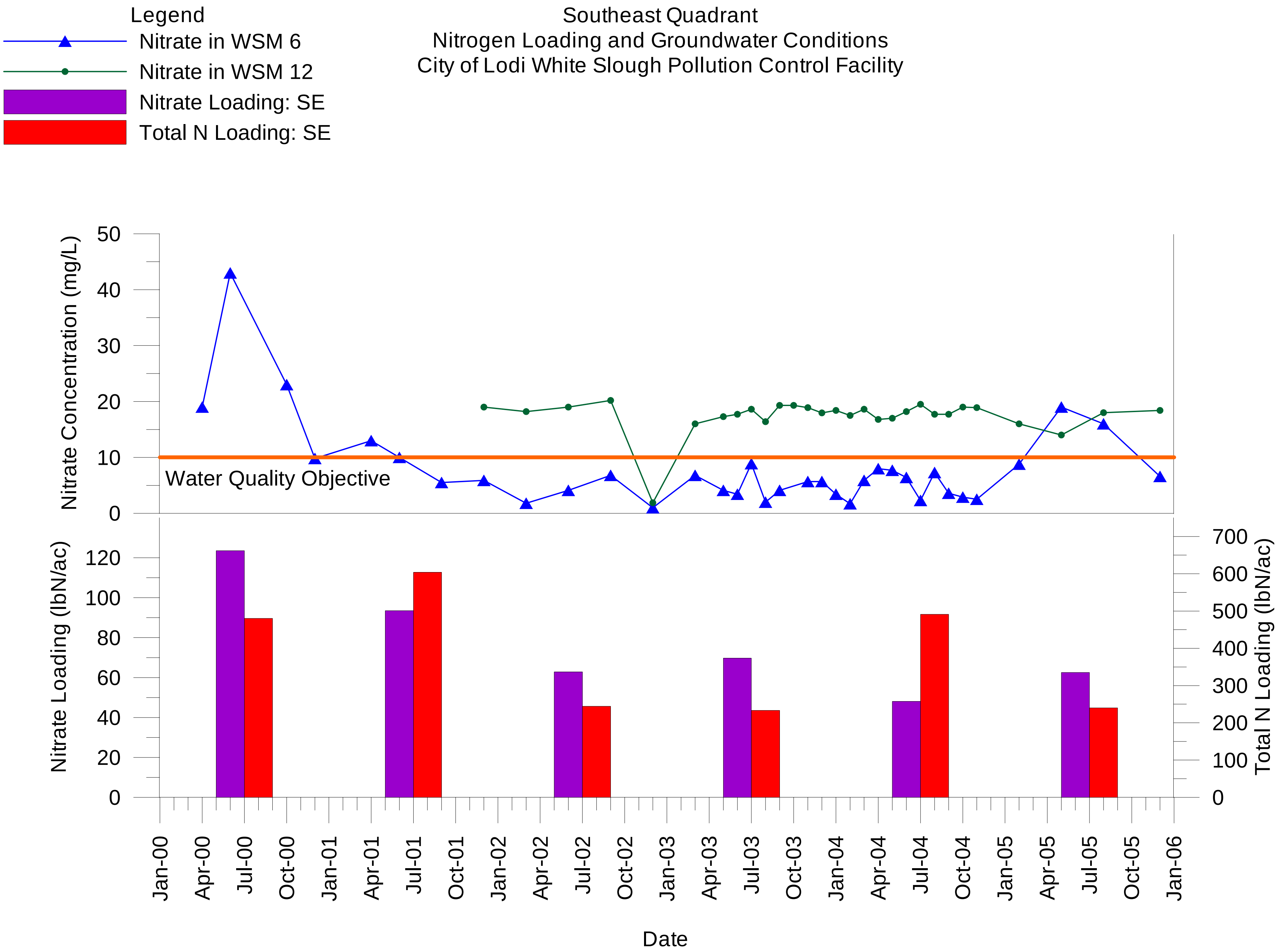
Jul-05
Oct-05
Date


Legend
Nitrate in WSM 6
Nitrate in WSM 12
Nitrate Loading: SE
Total N Loading: SE
Southeast Quadrant
Nitrogen Loading and Groundwater Conditions
City of Lodi White Slough Pollution Control Facility
Nitrate Concentration (mg/L)
Water Quality Objective
Nitrate Loading (lbN/ac)
Total N Loading (lbN/ac)
Date
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
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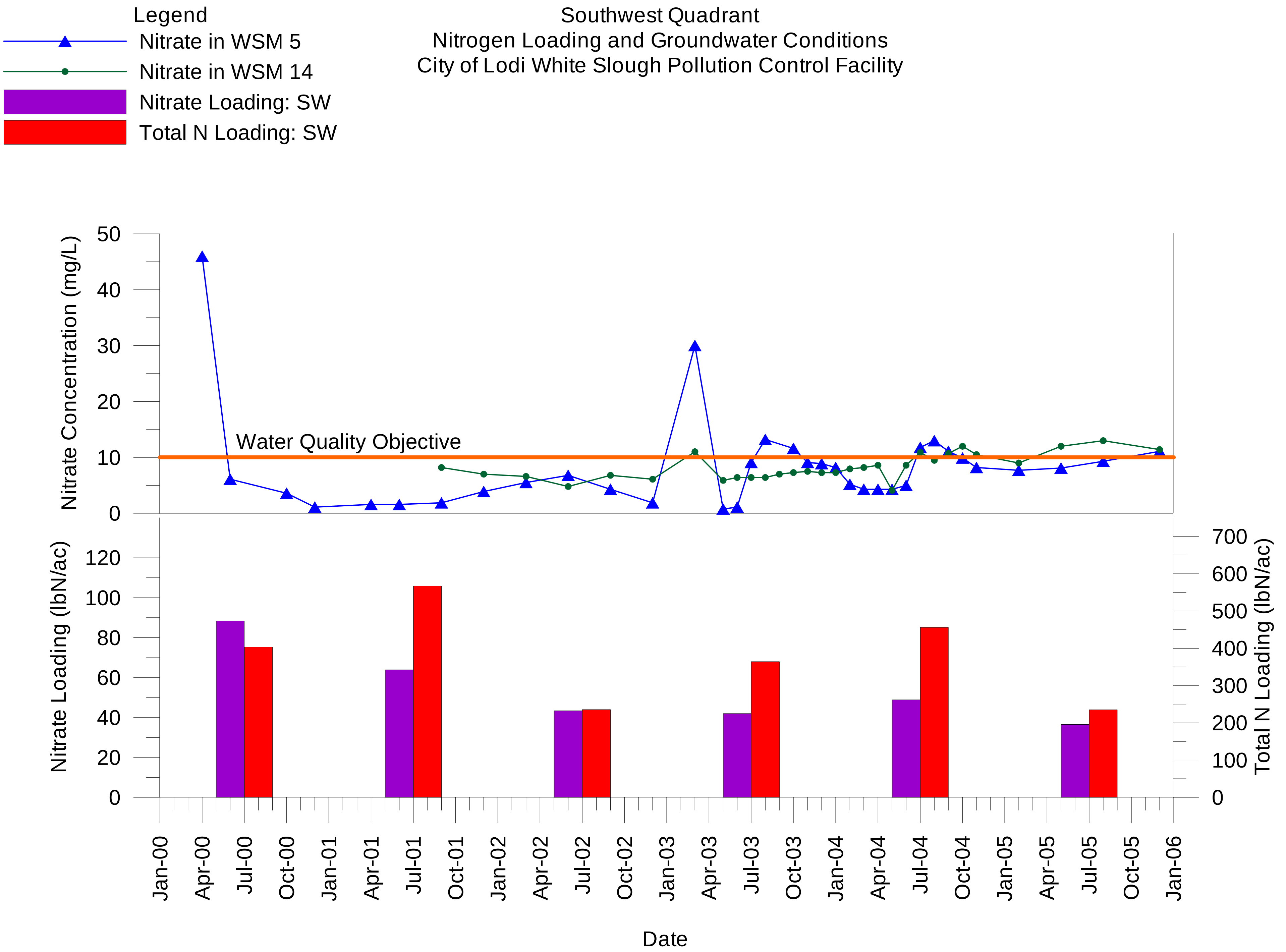
Jul-05
Oct-05
Jan-06


Legend
Nitrate in WSM 5
Nitrate in WSM 14
Nitrate Loading: SW
Total N Loading: SW
Southwest Quadrant
Nitrogen Loading and Groundwater Conditions
City of Lodi White Slough Pollution Control Facility
Nitrate Concentration (mg/L)
50
40
30
20
10
0
Water Quality Objective
Nitrate Loading (lbN/ac)
120
100
80
60
40
20
0
Total N Loading (lbN/ac)
700
600
500
400
300
200
100
0
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
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Date

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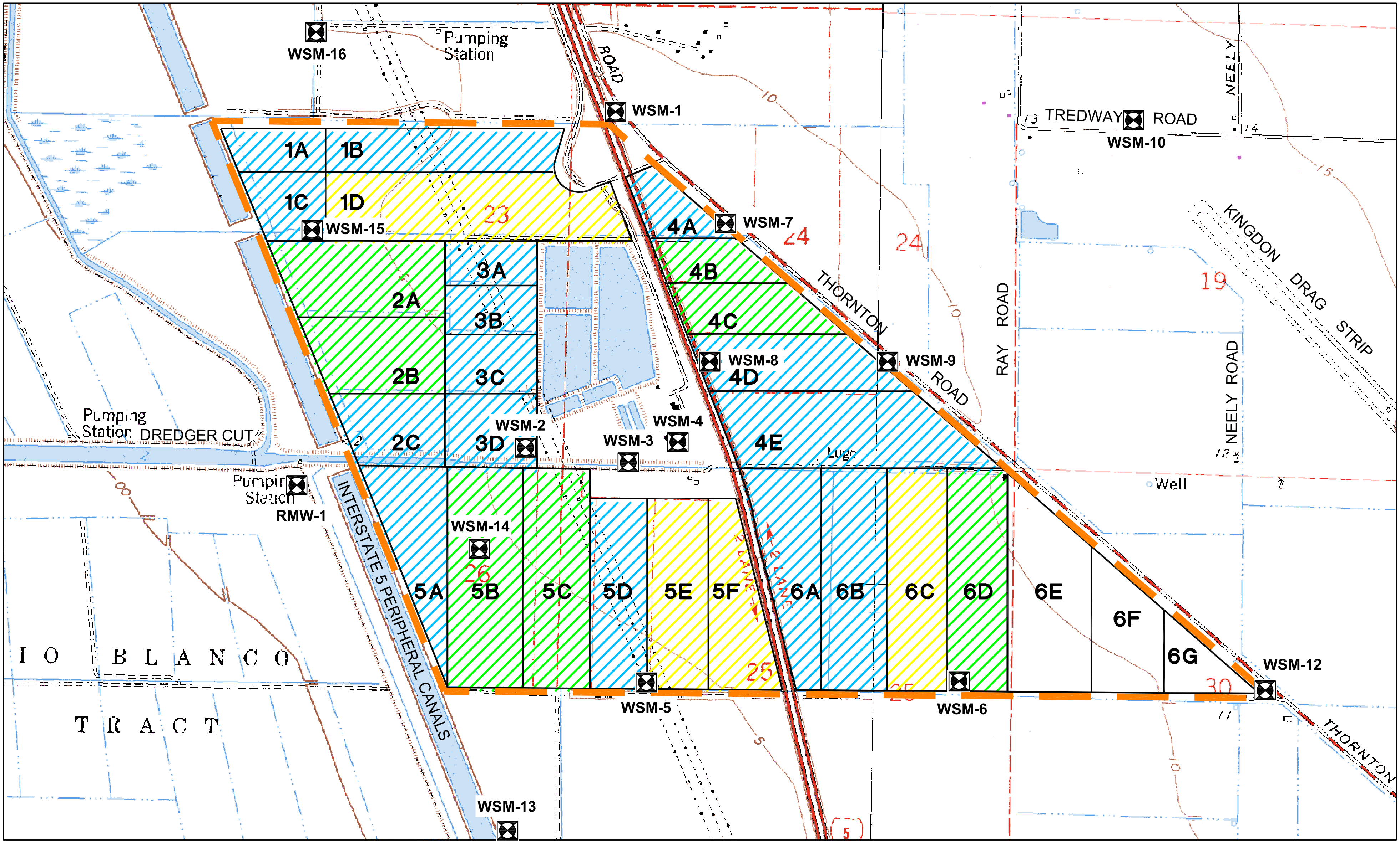


LEGEND

BOUNDARY OF CITY-OWNED LAND

WSM-4 WELLS

<200 LB/ACRE TOTAL N PER YEAR

200-300 LB/ACRE TOTAL N PER YEAR

300-400 LB/ACRE TOTAL N PER YEAR

400-500 LB/ACRE TOTAL N PER YEAR

>500 LB/ACRE TOTAL N PER YEAR

N

0 800 1600
SCALE IN FEET

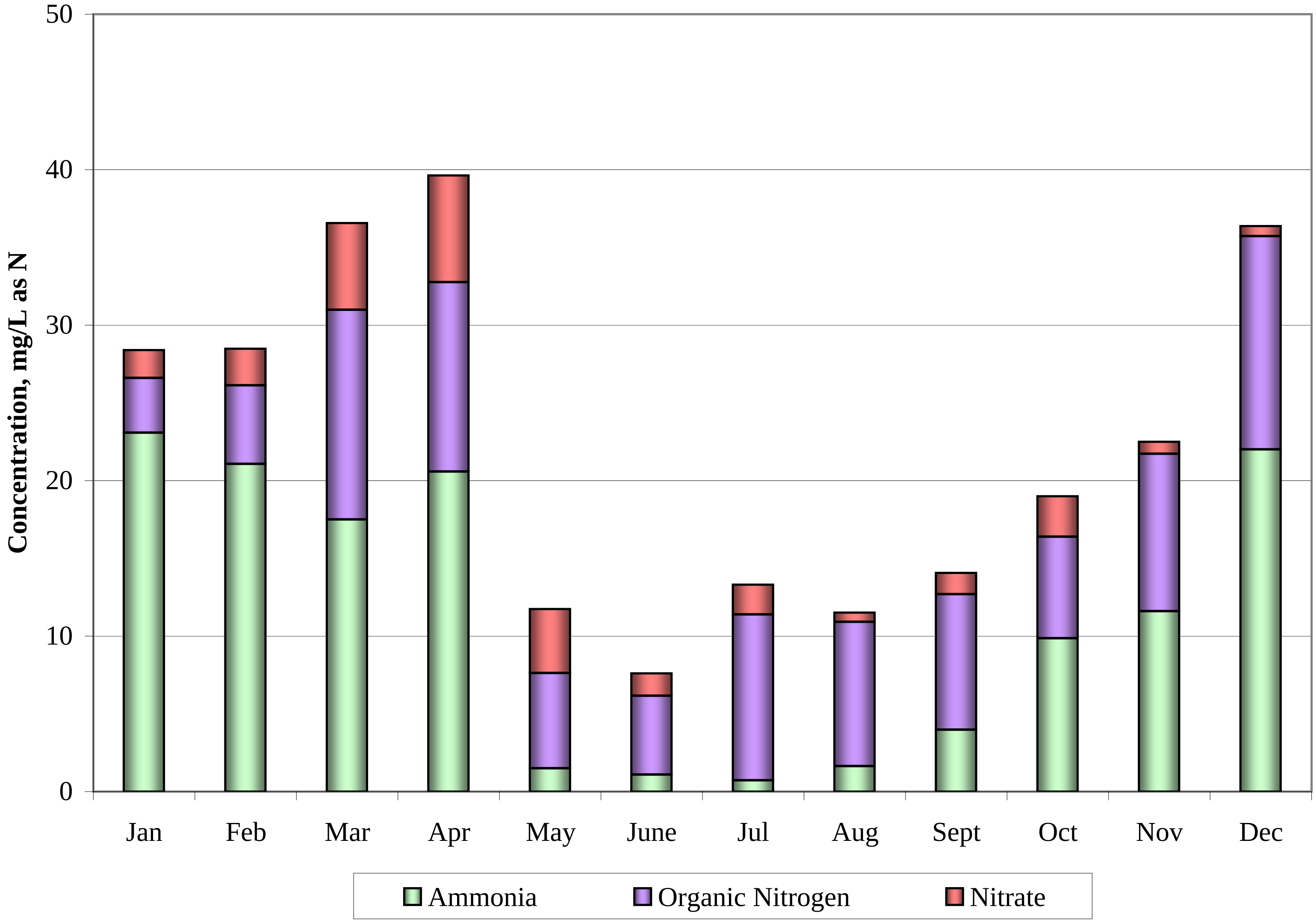
City of Lodi
Water Pollution Control Facility
Groundwater Assessment
Total Nitrogen Loading for All Sources 2005

WEST YOST ASSOCIATES
Consulting Engineers

APPENDIX B

2006 Report Figure 6-1: Average Storage Pond Nitrogen Concentrations (2002 – 2004)

Figure 6-1. Average Storage Pond Nitrogen Concentrations (June 2003 - March 2006)



APPENDIX C

2006 Report Figures 5-7, 5-8 and 5-9: WPCF EC, Sodium and Chloride in Groundwater

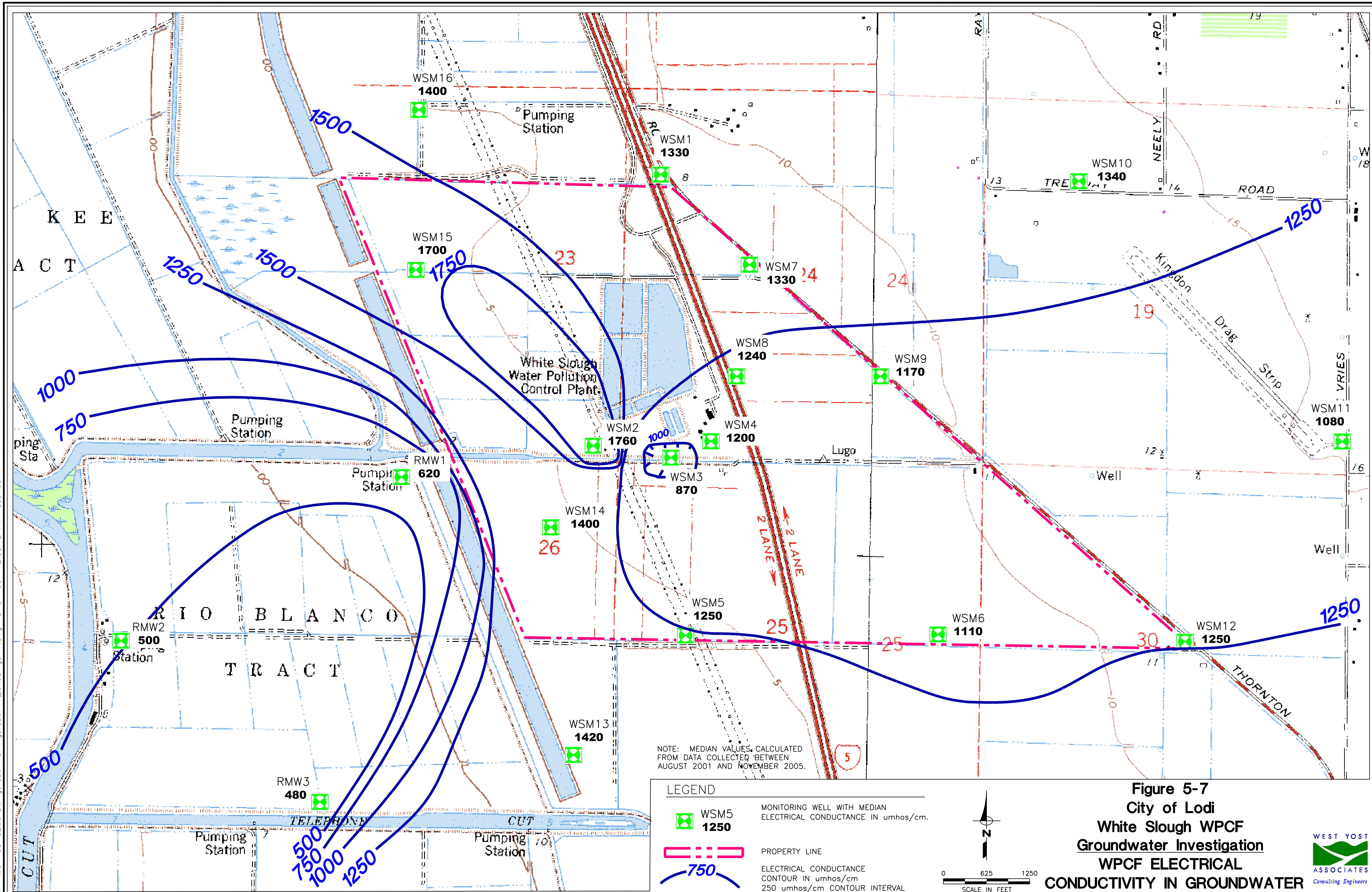


Figure 5-7
City of Lodi
White Slough WPCF
Groundwater Investigation
WPCF ELECTRICAL
CONDUCTIVITY IN GROUNDWATER

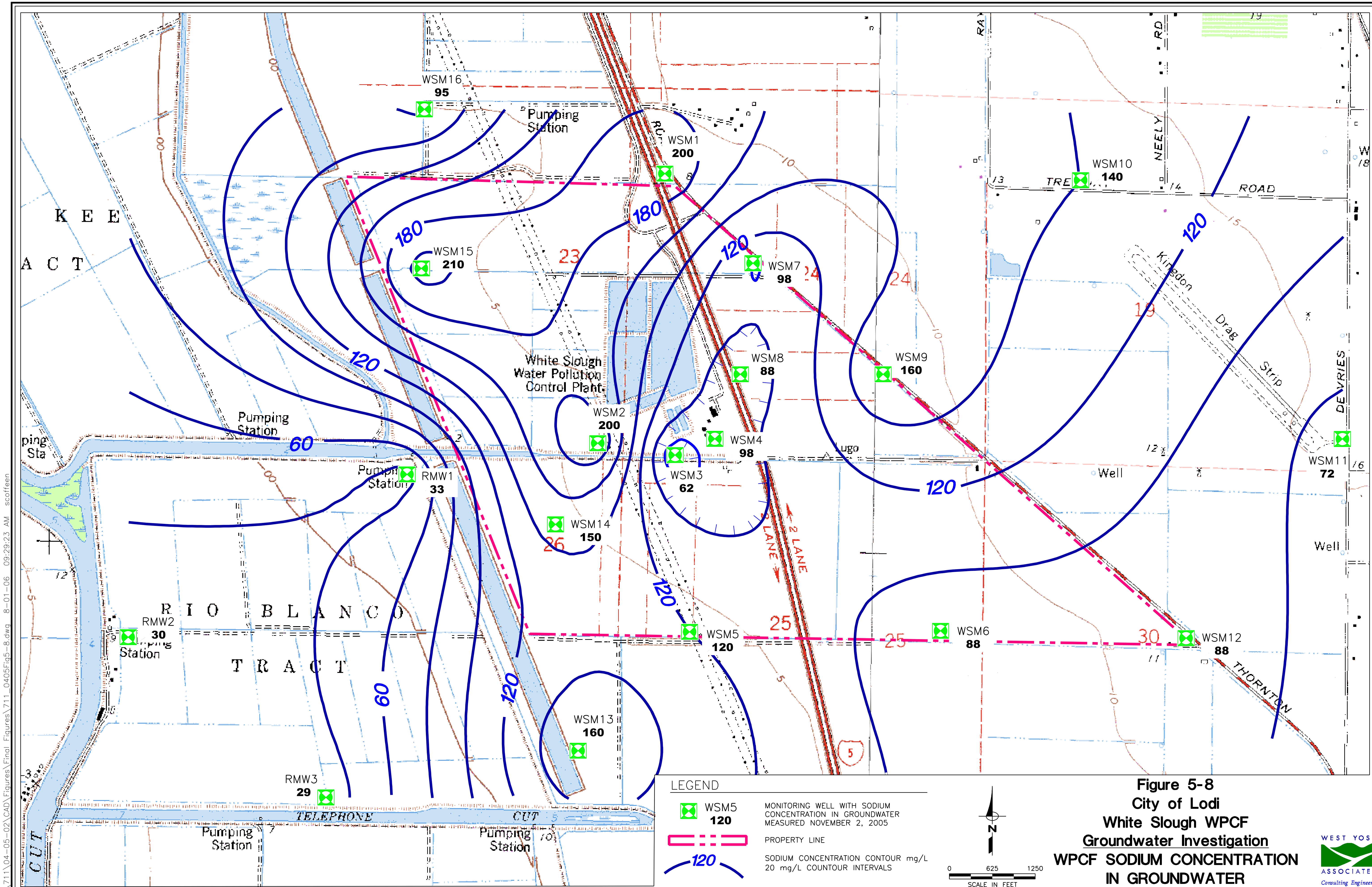


Figure 5-8
City of Lodi
White Slough WPCF
Groundwater Investigation
WPCF SODIUM CONCENTRATION IN GROUNDWATER

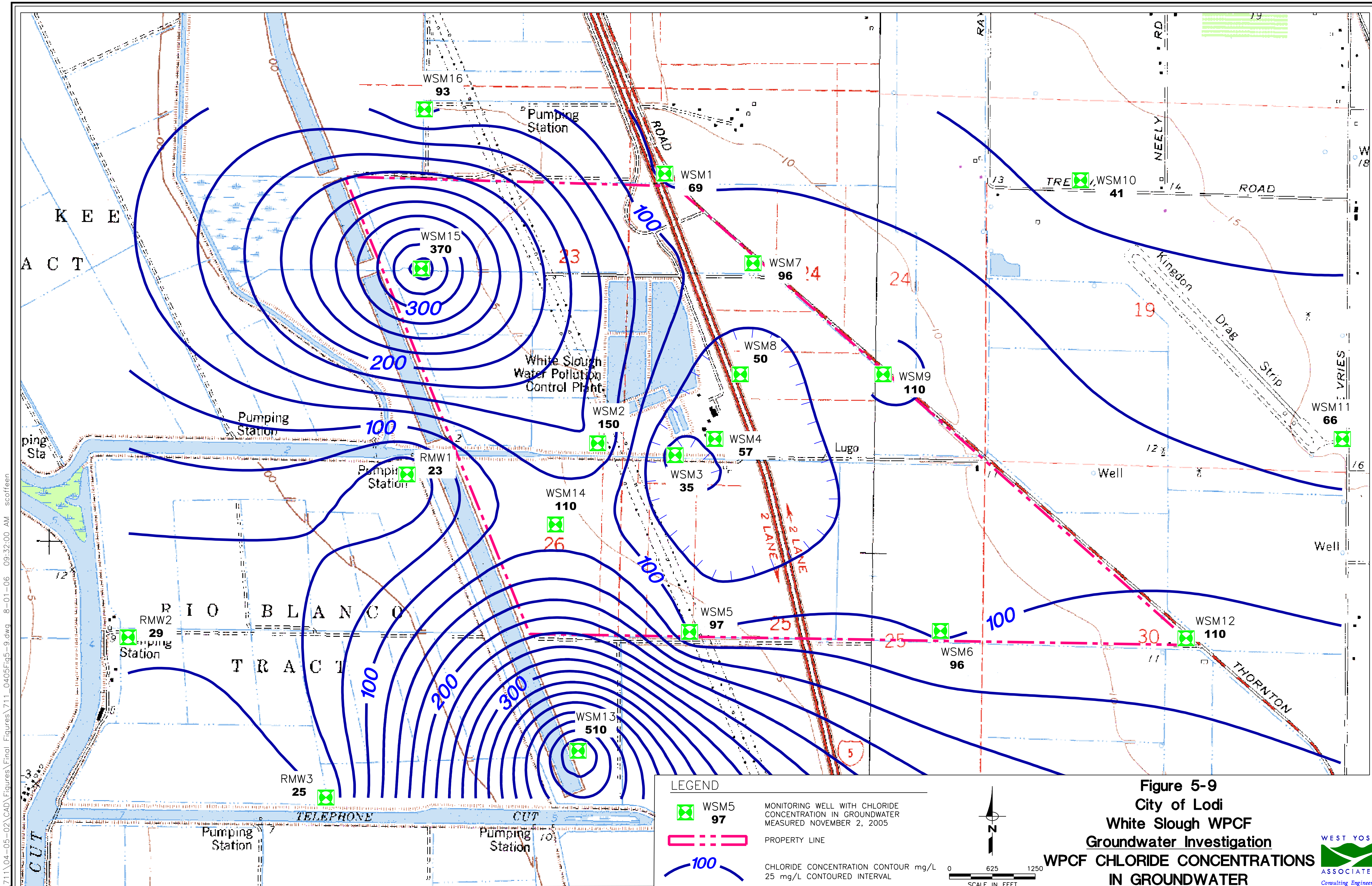


Figure 5-9
City of Lodi
White Slough WPCF
Groundwater Investigation
WPCF CHLORIDE CONCENTRATIONS IN GROUNDWATER

APPENDIX D

Industrial Discharger Metals Data

Valley Industries Water Quality Monitoring Data 2001 - 2006

Applicable Standard	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-
Drinking Water MCL, mg/L	0.005	None	1.3	0.15	0.1	0.1	5	0.15
Restricted Hazardous Waste Limit, mg/L	100	500	None	500	134	None	None	1000
Hazardous Waste Limit, mg/L	1	5	25	5	20	5	250	None
Maximum Detected Concentration	**0.005**	**0.4**	**4.9**	**0.03**	**2.15**	**ND**	**0.69**	**0.1**

Sample Date	Time	Sample Description *(mg/L)*	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-	TTO	G pH
3/6/2001	1120	First Stage TTO									**2.5**	
3/6/2001	1120	First Stage Metal	ND	0.14	1.62	ND	0.17	ND	0.43			9.6
3/6/2001	1120	First Stage Cyanide								0.01		
5/31/2001	900	Third Stage TTO									0.01	
5/31/2001	900	Third Stage Metal	ND	0.4	0.64	0.03	2.15	ND	0.13			7.2
5/31/2001	900	Third Stage Cyanide								0.01		
6/29/2001	1140	2nd,4th,5th Stg TTO									0.1	
6/29/2001	1140	2nd,4th,5th Stg Metal	ND	ND	0.02	ND	0.02	ND	0.04			7.2
6/29/2001	1140	2nd,4th,5th Cyanide								ND		
8/2/2001	715	First Stage Metal	0.005	0.36	**4.9**	0.02	0.47	ND	0.69			9.8
8/2/2001	715	First Stage Cyanide								0.02		
10/29/2001	915	Third Stage Metal	ND	0.03	0.31	ND	0.09	ND	0.03			8.2
10/29/2001	915	Third Stage Cyanide								ND		
12/3/2001	1330	Effluent	ND	0.014	0.095	ND	0.02	ND	0.078			
12/12/2001	1300	2nd,4th,5th Stg Metal	ND	ND	0.03	ND	0.02	ND	0.03			7.8
12/12/2001	1300	2nd,4th,5th Cyanide								ND		
4/25/2002	815	Third Stage TTO									ND	
4/25/2002	815	Third Stage Metal	ND	0.06	0.38	ND	0.21	ND	0.04			7.3
4/25/2002	815	Third Stage Cyanide								ND		
6/6/2002	800	2nd,4th,5th Stg TTO									0.1	
6/6/2002	800	2nd,4th,5th Stg Metal	ND	ND	0.02	ND	ND	ND	0.03			7.6
6/6/2002	800	2nd,4th,5th Cyanide								ND		
9/13/2002	850	2nd Stg TTO									**0.25**	
9/13/2002	850	2nd Stg Metal	ND	ND	0.01	ND	ND	ND	0.02			7.8
9/13/2002	850	2nd Stg Cyanide								ND		
11/5/2002	930	Effluent	ND	0.013	0.057	0.0025	0.000	ND	0.078			
12/27/2003	1035	4th,5th Stg Metal	ND	ND	0.01	ND	0.01	ND	0.09			6.4
12/27/2003	1035	4th,5th Cyanide								ND		

Valley Industries Water Quality Monitoring Data 2001 - 2006

Applicable Standard	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-
Drinking Water MCL, mg/L	0.005	None	1.3	0.15	0.1	0.1	5	0.15
Restricted Hazardous Waste Limit, mg/L	100	500	None	500	134	None	None	1000
Hazardous Waste Limit, mg/L	1	5	25	5	20	5	250	None
Maximum Detected Concentration	**0.005**	**0.4**	**4.9**	**0.03**	**2.15**	**ND**	**0.69**	**0.1**

Sample Date	Time	Sample Description *(mg/L)*	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-	TTO	G pH
3/10/2003	745	Third Stage TTO									2.1	
3/10/2003	745	Third Stage Metal	ND	0.09	0.73	ND	0.61	ND	0.2			7.7
3/10/2003	745	Third Stage Cyanide								ND		
4/28/2003	715	2nd,4th,5th Stg TTO									0.03	
4/28/2003	715	2nd,4th,5th Stg Metal	ND	0.02	0.11	ND	ND	ND	0.6			8.2
4/28/2003	715	2nd,4th,5th Cyanide								0.1		
7/22/2003	945	Effluent	ND	0.005	0.06	ND	0.01	ND	0.07			
8/6/2003	805	Third Stage TTO									0.03	
8/6/2003	805	Third Stage Metal	ND	0.05	0.66	ND	0.43	ND	0.15			7.5
8/6/2003	805	Third Stage Cyanide								0.01		
12/11/2003	1315	2nd,4th,5th Stg TTO									ND	
12/11/2003	1315	2nd,4th,5th Stg Metal	ND	ND	0.02	ND	0.01	ND	0.02			7.8
12/11/2003	1315	2nd,4th,5th Cyanide								ND		
1/30/2004	945	Third Stage TTO									0.02	
1/30/2004	945	Third Stage Metal	ND	0.05	0.28	ND	0.34	ND	0.08			7.4
1/30/2004	945	Third Stage Cyanide								ND		
6/11/2004	1400	2nd,4th,5th Stg TTO									0.06	
6/11/2004	1400	2nd,4th,5th Stg Metal	ND	0.002	0.022	0.0004	0.017	ND	0.03			7.3
6/11/2004	1400	2nd,4th,5th Cyanide								ND		
7/21/2004	945	Effluent	ND	0.006	0.029	ND	0.009	ND	0.027	ND		
8/31/2004	845	Third Stage TTO									0.01	
8/31/2004	845	Third Stage Metal	ND	0.06	0.11	ND	0.15	ND	0.14			7.5
8/31/2004	845	Third Stage Cyanide								0.009		
11/17/2004	945	2nd,4th,5th Stg TTO										
11/17/2004	945	2nd,4th,5th Stg TTO										
11/17/2004	945	2nd,4th,5th Stg TTO										
3/8/2005	1115	2nd,4th,5th Stg TTO									0.01	
3/8/2005	1115	2nd,4th,5th Stg Metal	ND	ND	0.020	ND	0.02	ND	0.06			7.6
3/8/2005	1115	2nd,4th,5th Cyanide								ND		

Valley Industries Water Quality Monitoring Data 2001 - 2006

Applicable Standard	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-
Drinking Water MCL, mg/L	0.005	None	1.3	0.15	0.1	0.1	5	0.15
Restricted Hazardous Waste Limit, mg/L	100	500	None	500	134	None	None	1000
Hazardous Waste Limit, mg/L	1	5	25	5	20	5	250	None
Maximum Detected Concentration	**0.005**	**0.4**	**4.9**	**0.03**	**2.15**	**ND**	**0.69**	**0.1**

Sample Date	Time	Sample Description *(mg/L)*	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-	TTO	G pH
7/13/2005	730	Effluent	ND	ND	0.051	ND	0.009	ND	0.037	ND		
7/13/2005	900	Effluent									0.05	
8/22/2005	1030	Third Stage TTO									ND	
8/22/2005	1030	Third Stage Metal	ND	0.05	0.74	ND	0.24	ND	0.06			7.4
8/22/2005	1030	Third Stage Cyanide								ND		
11/8/2005	1050	2nd,4th,5th Stg TTO									ND	
11/8/2005	1050	2nd,4th,5th Stg Metal	ND	ND	ND	ND	ND	ND	ND			7.8
11/8/2005	1050	2nd,4th,5th Cyanide								ND		
4/21/2006	1025	Third Stage TTO									**2.3**	
4/21/2006	1025	Third Stage Metal	ND	0.017	0.951	0.004	0.392	ND	0.06			8.5
4/21/2006	1025	Third Stage Cyanide								ND		
5/26/2006	955	Third Stage TTO									1.29	
6/20/2006	830	Effluent	ND	0.008	0.06	ND	0.009	ND	0.04	ND		
6/20/2006	830	Effluent									0.022	
7/18/2006	840	2nd,4th,5th Stg TTO									0.02	
7/18/2006	840	2nd,4th,5th Stg Metal	ND	ND	ND	ND	0.05	ND	ND			7.7
7/18/2006	840	2nd,4th,5th Cyanide								ND		
11/8/2006	845	2nd,4th,5th Stg TTO									0.002	
11/8/2006	845	2nd,4th,5th Stg Metal	ND	ND	0.01	ND	0.04	ND	0.02			7.9
11/8/2006	845	2nd,4th,5th Cyanide								ND		

TTO = Total Toxic Organics, Sum of Results from EPA 624 and 625 tests.

RM Holz Water Quality Monitoring Data 2001-2004

Applicable Standard	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-
Drinking Water MCL, mg/L	0.005	None	1.3	0.15	0.1	0.1	5	0.15
Restricted Hazardous Waste Limit, mg/L	100	500	None	500	134	None	None	1000
Hazardous Waste Limit, mg/L	1	5	25	5	20	5	250	None
Maximum Detected Concentration	**ND**	**0.01**	**0.08**	**0.0003**	**0.005**	**ND**	**0.1**	**ND**

Sample Date	Time	Sample Description *(mg/L)*	Cd	Cr	Cu	Pb	Ni	Ag	Zn	Total CN-	TTO
5/8/2001		Metals	ND	ND	ND	ND	ND	ND	0.04		
5/8/2001		Cyanide								ND	
5/8/2001		TTO									ND
11/13/2001		Metals	ND	ND	0.02	ND	ND	ND	0.05		
11/13/2001		Cyanide								ND	
11/13/2001		TTO									ND
5/6/2002		Metals	ND	ND	ND	ND	ND	ND	0.03		
5/6/2002		Cyanide								ND	
12/19/2002		Metals	ND	ND	ND	ND	ND	ND	0.03		
12/19/2002		Cyanide								ND	
12/19/2002		TTO									0.02
4/15/2003		Metals	ND	ND	0.02	ND	ND	ND	0.05		
4/15/2003		Cyanide								ND	
11/11/2003		Metals	ND	0.006	0.017	0.0003	0.001	ND	0.03		
11/11/2003		Cyanide								ND	
11/11/2003		TTO									ND
5/6/2004		Metals	ND	ND	ND	ND	ND	ND	ND		
5/6/2004		Cyanide								ND	
5/6/2004		TTO									ND
11/1/2004	1000	Metals	ND	ND	0.02	ND	0.005	ND	0.03		
11/1/2004	1000	Cyanide								ND	
11/1/2004	1000	TTO									ND
11/11/2004	1030	Metals	ND	ND	0.04	ND	ND	ND	0.1		
11/11/2004	1030	Cyanide								ND	
11/11/2004	1030	TTO									ND
5/19/2005	1306	Metals	ND	0.01	0.03	ND	ND	ND	0.04		
5/19/2005	1306	Cyanide								ND	
5/19/2005	1306	TTO									0.02
6/21/2005	1400	Metals	ND	ND	0.08	ND	ND	ND	0.04		
6/21/2005	1400	Cyanide								ND	
6/21/2005	1400	TTO									0.02

TTO = Total Toxic Organics, Sum of Results from EPA 624 and 625 tests.

CITY OF LODI

White Slough Water Pollution Control Facility

Supplemental Industrial Discharge Water Quality Data (Originally Submitted to Regional Board February 8, 2001)

Substance	Restricted Hazardous Waste Limit, mg/L	Hazardous Hazardous Waste Limit, mg/L	Drinking Water MCL mg/L	Interlake 8/7/2000 mg/L	Interlake 9/8/2000 mg/L	RM Holz 8/18/2000 mg/L	RM Holz 10/18/2000 mg/L	Valley Industries 7/27/2000 mg/L	Valley Industries 9/11/2000 mg/L
Antimony	None	15	0.006	<0.025	<0.025	<0.005	<0.005	<0.005	<0.025
Arsenic	500	2	0.01	0.046	0.027	<0.01	0.012	<0.01	0.022
Barium	None	100	1.0	0.059	0.11	0.046	0.036	0.069	2.1
Beryllium	None	0.75	0.004	0.005	0.018	<0.001	<0.001	<0.001	<0.005
Cadmium	100	1.0	0.005		<0.01	<0.001	<0.001	<0.001	<0.01
Chromium	500	5.0	0.05		<0.01	0.0094	<0.005	0.0065	0.17
Cobalt	None	80	None	<0.010	<0.05	<0.002	<0.002	<0.002	<0.05
Copper	None	25.0	1.3		0.32	0.012	0.0064	0.047	0.51
Fluoride	None	180	2.0	18	11	0.17	3.8	0.54	2.6
Lead	500	5.0	0.015		<0.05	<0.005	<0.005	<0.005	<0.05
Mercury	20	0.2	0.00005	<0.002	<0.0002	<0.002	<0.0002		<0.002
Molybdenum	None	350	None	0.34	<0.2	0.0072	0.44	<0.005	<0.2
Nickel	134	20.0	0.1		0.064	0.0057	<0.005	0.008	0.096
Selenium	100	1.0	0.05	<0.05	<0.003	<0.02	<0.02	<0.02	<0.003
Silver	None	5.0	0.1		<0.01	<0.005	<0.005	<0.005	<0.01
Thallium	130	7.0	1.7	<0.1	<0.050	<0.02	<0.02	<0.02	<0.050
Vanadium	None	24	None	<0.001	<0.05	0.056	0.073	0.029	<0.05
Zinc	None	250.0	5.0		0.18	0.038	0.028	0.048	0.87