California Regional Water Quality Control Board
Central Coast Region

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Arnold Schwarzenegger
Governor

May 2, 2006

Mr. J. Edward Tewes
City Manager
City of Morgan Hill
17555 Peak Avenue
Morgan Hill, Ca 95037

Dear Mr. Tewes:

SLIC: 425 TENNANT AVE, MORGAN HILL; RESPONSIBILITY EVALUATION FOR PERCHLORATE DETECTIONS NORTHEAST OF THE OLIN SITE

As you requested, we have completed our evaluation to determine if Olin Corporation (Olin) is responsible for the perchlorate detected in the City of Morgan Hill's Nordstrom Park municipal supply well. Since perchlorate was first detected in the Nordstrom Park Well, the agencies and Olin have spent a lot of time, money, and effort to better understand the geology, hydrogeology, and perchlorate distribution in the area northeast of the Olin Site. Water Board staff sincerely appreciates all the hard work and effort all parties have expended to evaluate such a complex and challenging geologic and hydrogeologic environment. Considering the information currently available, we conclude that it is premature to require Olin to take corrective action for the perchlorate detections in the Nordstrom Park Well. This letter provides our analysis and conclusions.

BACKGROUND INFORMATION

Olin used and discharged potassium perchlorate at its flare manufacturing facility located at 425 Tennant Avenue in Morgan Hill (Olin Site). The flare manufacturing facility was in operation from 1956 until 1995. The use and discharge of wastes resulted in discharge of perchlorate to waters of the state. In August 2000, perchlorate was first detected at 21 and 55 micrograms per liter (µg/L) in groundwater samples collected during a due diligence investigation by a potential buyer. The Department of Health Services (DHS) action level for perchlorate at that time was 18 µg/L. In response, Olin installed three shallow monitoring wells (MW-1, MW-2, and MW-3) to verify the perchlorate detections. These wells were installed to approximately 35 feet below ground surface. Perchlorate was detected at 17 µg/L in MW-1, 37 µg/L in MW-2, and was not detected above 4 µg/L in MW-3. Consequently, the Regional Water Quality Control Board (Water Board) directed Olin to perform on-site and off-site investigations via Water Code Section 13267 and 13304 orders.

In late 2000, perchlorate was first detected northeast of the Olin Site in the Nordstrom Park Well, a municipal supply well that is owned and operated by the City of Morgan Hill. The Nordstrom Park Well was drilled on January 3 and 4, 2000, and the pump station and final permitting for this well were completed in the fall of 2000. The Nordstrom Park Well was first tested for perchlorate on December 4, 2000. The concentration of perchlorate detected in the Nordstrom Park Well on December 4, 2000, was 7 µg/L.

In January 2002, the DHS reduced the action level or notification level from 18 to 4 µg/L. The lowering of the notification level was based on a draft risk assessment on perchlorate released by the U.S. Environmental Protection Agency and the lower detection limit that could generally be achieved by laboratories.

In March 2004, the Office of Environmental Health Hazard Assessment (OEHHA) published a final public health goal (PHG[1]) of 6 µg/L. The DHS subsequently aligned the notification level for perchlorate with the PHG to 6 µg/L. Currently, there is no federal or state maximum contaminant level (MCL) for perchlorate.

In March 2003, the City of Morgan Hill and the Santa Clara Valley Water District (Water District) requested that the Water Board require Olin to sample wells northeast of the Olin Site to assess the extent of perchlorate in groundwater in that area. In a letter dated April 18, 2003, Water Board staff requested all available hydrogeologic data from the City of Morgan Hill and other agencies, organizations and individuals that could aid in the investigation and cleanup of perchlorate in groundwater at and near the Olin Site.

After a thorough review of the available information for the area northeast of the Olin Site, the Water Board issued a Water Code Section 13267 order to Olin on September 30, 2003. The 13267 order required Olin to submit a plan for determining if detections of perchlorate found in wells between Olin's property and the City of Morgan Hill's Nordstrom Park Well are related to perchlorate releases at the Olin Site. Olin and the Water Board later agreed to stay the requirements in the 13267 order directing Olin to complete a forensic study so the Water District could complete its own forensic investigation of these issues. Olin agreed to perform well sampling as part of the stay agreement.

The Nordstrom Park Well was last sampled on October 31, 2005, and the perchlorate concentration was 2 µg/L. A table summarizing the perchlorate concentrations detected in the Nordstrom Park Well is attached as Table 1.

GROUNDWATER FLOW DIRECTIONS

The most detailed information on groundwater flow direction, geology, hydrogeology, and perchlorate distribution in groundwater has been presented in Appendix E of the

[1] The PHG is a drinking water goal only and is intended to provide estimates of the levels of chemical contaminants in drinking water that would pose no significant risk to individuals, including the most sensitive subpopulations, consuming the water day in and day out, over an entire lifetime.

third and fourth quarter 2005 groundwater monitoring reports[2], prepared by Olin's consultant, MACTEC Engineering and Consulting, Inc. (MACTEC).

Figures showing the locations of some of the municipal supply wells and all the domestic and multi-level depth-discrete monitoring wells sampled by Mactec, northeast of the Olin Site, are included as attachments. MACTEC determined that there is a hydraulic and geologic connection between the shallow, intermediate, and deep aquifer in the area northeast of the Olin Site (MACTEC, 2006).

With respect to groundwater flow direction, the fourth quarter 2005 monitoring report indicates that groundwater flow direction within the shallow and intermediate aquifers is predominantly southwest and southeast. Groundwater flow direction in the deep aquifer (particularly the middle and lower portions of the deep aquifer) is strongly influenced by pumping of the City of Morgan Hill's municipal supply wells. A significant response in groundwater elevation is observed in the deep aquifer at the multi-level monitoring wells in response to pumping at the Dunne #1, Nordstrom Park, and Tennant Avenue wells. For example, there is an approximate 25-foot difference in groundwater elevation in PZ-03-325 (middle deep aquifer) during pumping of just the Tennant Avenue well compared to pumping of the Tennant Avenue, Nordstrom Park, and Dunne #1 wells (MACTEC, 2006). During both the third and fourth quarter 2005 sampling events, the groundwater flow direction in the middle deep aquifer, as measured in the multi-level wells, was in a northerly direction.

It is also worth noting that stable isotope and major ion data indicate that significant recharge via the Madrone Ponds occurs to the shallow and intermediate aquifers. It is unclear whether there is an influence from the Madrone Pond water in the deep aquifer.

Groundwater elevation data from the multi-level monitoring wells also indicate that a vertical downward gradient exists. The difference in groundwater elevation is most significant between the intermediate and deep aquifer zones. The relatively steep vertical gradients between the intermediate and deep aquifer indicate poor vertical communication between these aquifer zones (MACTEC, 2006).

GROUNDWATER CONCENTRATION AND WELL INFORMATION

In addition to the perchlorate concentration data presented in MACTEC's third and fourth quarter 2005 groundwater monitoring reports, the City of Morgan Hill provided perchlorate concentration data for all the City of Morgan Hill's municipal supply wells. The City of Morgan Hill publishes the perchlorate concentration data for all their public supply wells on the City of Morgan Hill website[3]. A copy of the perchlorate test results for all the City of Morgan Hill's municipal supply wells is attached. The City of Morgan Hill provided additional analytical data (not posted on the City of Morgan Hill website) for the Nordstrom Park Well and these data are shown in Table 1 (attached). The

[2] These reports may be downloaded from our website at the following link: ftp://swrcb2a.swrcb.ca.gov/pub/rwqcb3/Olin%20Perchlorate/Olin%20Groundwater%20Monitoring%20Reports/
[3] http://www.morgan-hill.ca.gov/upload/document/d240001353/perchloratetestresultstable.pdf

Water District also provided perchlorate concentration data for several domestic, industrial, and agricultural supply wells in the Llagas Subbasin.

In summary, an evaluation of the available perchlorate concentrations reported for groundwater samples collected from municipal, domestic, and multi-level depth-discrete monitoring wells, northeast of the Olin Site, indicates the following:

1. Perchlorate was first detected in the City of Morgan Hill's Nordstrom Park Well on December 4, 2000, at 7 µg/L. As mentioned above, the attached Table 1 summarizes the perchlorate concentrations detected in the Nordstrom Park Well since December 4, 2000. The highest concentration of perchlorate detected was 7 µg/L (before treatment) at start up. Perchlorate concentrations in the Nordstrom Park Well have been less than the practical quantitation limit (PQL)[4] of 4 µg/L since June 2005.
2. As a precautionary measure, the City of Morgan Hill has treated the Nordstrom Park Well water with a perchlorate removal ion-exchange treatment system since August 2003. If the perchlorate concentrations in water served to consumers exceed the notification level (6 µg/L), the DHS recommends that the water purveyor notify the consumer in accordance with the DHS statutory requirements (DHS, 2006). The DHS recommends removal of the drinking water source from service if perchlorate concentrations are above 60 µg/L. A copy of the DHS notification level requirements and recommendations is attached.
3. The first detection of perchlorate in the City of Morgan Hill's Tennant Avenue Well was on April 30, 2001, at 5.1 µg/L. A permit application for the operation of an ion-exchange treatment system for perchlorate removal was approved by DHS in May 2003. The Tennant Well was not in operation from May 2002 until October 2004. However, since October 2004, the Tennant Avenue Well has been continuously operating with the ion-exchange treatment system in place. The highest concentration of perchlorate detected in the Tennant Avenue Well was 7 µg/L (before treatment) on March 18, 2002, and October 12, 2004. The most recent analytical data for the Tennant Avenue Well (collected on March 27, 2006) indicates a concentration (before treatment) of 6 µg/L.
4. The Nordstrom Park and Tennant Avenue Wells are currently the only City of Morgan Hill municipal supply wells equipped with ion-exchange treatment systems for perchlorate removal.
5. Olin financed the installation of the San Pedro Well, as a replacement well for the Tennant Avenue Well.
6. Perchlorate testing of the City of Morgan Hill's municipal supply wells began as follows:
   a. December 2000 - Nordstrom Park Well
   b. April 2001 - Tennant Avenue Well
   c. January 2003 – Jackson #1, Dunne #1, Dunne #2, Condit, San Pedro, Diana #1, Diana #2, Diana #3, Main #1, Boys Ranch #1, Boys Ranch #2, Boys Ranch #3
   d. January 2005 – Main #2 Well

[4] PQL is the lowest concentration that can be reliably measured within specified limits of precision and accuracy for a specific laboratory analytical method during routine laboratory operating conditions in accordance with "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," EPA Publication No. SW-846.

e. June 2005 - Butterfield Well

7. With the exception of the Nordstrom Park, Tennant Avenue, Dunne #2, and Condit wells, no detectable concentrations of perchlorate have been identified in the City of Morgan Hill municipal supply wells above the PQL (4 µg/L).
8. With the exception of the Nordstrom Park and Tennant Avenue wells, there is no available information on trace perchlorate concentrations (detections below the PQL and above the method detection limit (MDL)[5]) for the City of Morgan Hill municipal supply wells. In March 2006, Water Board staff requested all available analytical data that show trace concentrations of perchlorate (below the PQL) from the City of Morgan Hill's municipal supply wells. Due to the difficulty in obtaining previous laboratory records, Water Board staff agreed to allow the City of Morgan Hill to provide data for only the Dunne #2 well at this time. Trace analytical data for the Dunne #2 well have not been received to date.
9. During the third quarter of 2005, MACTEC collected groundwater samples from four multi-level depth-discrete monitoring wells (36 screen intervals) and 27 existing supply wells northeast of the Olin Site. During the fourth quarter of 2005, MACTEC collected groundwater samples from the multi-level monitoring wells (36 screen intervals), three other off-site monitoring wells, and 19 existing supply wells (see attached figures). Trace perchlorate concentrations (<u>below</u> the PQL) were detected in the intermediate and deep aquifers for several domestic, agricultural and industrial supply and multi-level monitoring wells. Perchlorate concentrations were detected <u>above</u> the PQL in the intermediate and deep aquifers at three multi-level monitoring well locations:
   a. MP-04-88 (multi-level depth-discrete monitoring well Number 4 with a screen interval at a depth of 88 feet below ground surface) at 6.8 and 14 µg/L in August and November 2005, respectively,
   b. MP-03-195 at 5.7 µg/L in November 2005, and
   c. MP-01-245 at 4.1 µg/L in November 2005.
10. Miscellaneous trace detections of perchlorate have been detected by Olin and the Water District in the intermediate aquifer and in areas anticipated to be outside of the area influenced by the Olin Site (e.g., northeast of the Nordstrom Park Well). Some of these miscellaneous detections were detected on one occasion and it is unclear what the source of the perchlorate may have been.
11. Nitrate concentrations in the Tennant Avenue well average approximately 34 milligram per liter (mg/L) as NO_3. Elevated nitrate concentrations beneath the Site are anticipated because the flares that Olin formerly produced at the Olin Site, contained approximately 70 percent strontium nitrate and 10 percent potassium perchlorate. Nitrate concentrations in the Nordstrom Park well average approximately 19 mg/L. The multi-level wells that are located between the Olin Site and the Nordstrom Park Well have nitrate concentrations less than 1 mg/L in the deep aquifer. Based on the similar physiochemical properties of nitrate and perchlorate, a typical nitrate concentrations profile between the Olin Site and the Nordstrom Park Well are not observed.

[5] MDL is the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

12. No private domestic supply wells sampled northeast of the Olin Site have had perchlorate concentrations greater than the PQL (4 µg/L).

POTENTIAL PERCHLORATE SOURCES

Water Board staff has reviewed the extensive Water Board file (including Olin's March 29, 2006 Llagas Subbasin Characterization Report), numerous technical reports, comment letters, and other publications pertaining to perchlorate and the geology and hydrogeology northeast of the Olin Site. After careful review of all available data, Water Board staff has determined that while it is plausible that the perchlorate concentrations detected at the Nordstrom Park Well originated from the Olin Site, other potential sources of perchlorate that have recently been identified may also have contributed to the existing groundwater impacts. Therefore, Water Board staff considers the Olin Site and all of the potential perchlorate sources identified below, collectively, as potential sources for the perchlorate detections identified in the Nordstrom Park Well. A detailed review and analytical testing of the recently identified potential perchlorate sources is required to determine if they are viable perchlorate sources to groundwater. The following potential sources of perchlorate must be investigated in further detail to determine if they are impacting or threatening to impact underlying groundwater:

1. Disinfection procedures, usage, and contact of hypochlorite solution with wastewater at food processing facilities (e.g., mushroom farms, wineries, vegetable packaging facilities, etc.) and the impacts of perchlorate-containing wastewater to groundwater.
2. The use of hypochlorite solutions for disinfection of supply wells.
3. Past contributions of ammonium perchlorate to Lake Anderson. An investigation to determine if impacts to the Llagas Subbasin occurred during the time when the Madrone Ponds and San Pedro Ponds were recharged with water from Lake Anderson.
4. Agricultural fertilizers' impact to groundwater.
5. Highway flares runoff impact to groundwater.

It will be very difficult to determine whether the above-mentioned potential perchlorate sources have contributed to groundwater impacts in the past. The challenge lies in the fact that the groundwater flow system is very dynamic (particularly northeast of the Olin Site) due to pumping of municipal, agricultural, industrial, and domestic supply wells during various times of the year. Additionally, significant mixing of groundwater and recharge water has occurred over time, and there is a lack of historical and depth-discrete groundwater elevation and analytical data available.

Water Board staff believe that a forensic chemistry analysis is likely the most viable method for evaluating background perchlorate concentrations for the Llagas Subbasin and possibly identify the original source(s) of perchlorate that are detected in the area northeast of the Olin Site. Fortunately, the Water District has received funding to conduct a detailed quantitative background investigation of perchlorate in the Llagas Subbasin. The primary objective of the Water District study is to use advanced geochemical techniques to develop multiple types of forensic data, which will improve

the understanding of the sources of perchlorate presently detected in groundwater samples from the City of Morgan Hill's municipal water supply wells and residential domestic wells in the vicinity of Morgan Hill. Additionally, we anticipate the Water District's forensic study will provide information on whether there is a background concentration of perchlorate in groundwater in the Llagas Subbasin. The results from the Water District study are anticipated to become available in the summer of 2007. If the forensic study or other evidence rules out other potential sources, we will consider that as additional evidence that Olin is a source of perchlorate in the Nordstrom Park Well.

FURTHER ASSESSMENT

Water Board staff will not require Olin to conduct further assessment of perchlorate concentrations detected in the City of Morgan Hill's Nordstrom Park Well at this time. We will reevaluate this decision once the Water District publishes the results of its detailed forensics study, a cleanup level for perchlorate has been established, and after the other potential sources of perchlorate have been fully evaluated. Water Board staff continues to encourage the City of Morgan Hill and others to submit new information related to perchlorate northeast of the Olin Site for our review.

On June 30, 2006, Olin is required to submit a Cleanup Feasibility Study for the Llagas Subbasin in accordance with Cleanup or Abatement Order No. R3-2005-0014 that addresses viable cleanup alternatives for perchlorate in groundwater. The Feasibility Study will evaluate the feasibility, effectiveness, and relative cost of groundwater cleanup in accordance with Resolution No. 92-49. The Feasibility Study will provide the basis for the establishment of an acceptable groundwater cleanup level for perchlorate. The proposed cleanup level must be based on the State's anti-degradation policy and may not be higher than the maximum concentration that would be allowed by other applicable statutes and regulations. Information and conclusions in the Cleanup Feasibility Study may ultimately assist in planning cleanup, including areas northeast of the Olin Site, by whoever ultimately conducts that cleanup.

CONCLUSION

There is some evidence that Olin could be a source of perchlorate northeast of the Olin Site. We know a large mass of perchlorate discharged from the Olin Site and groundwater flow in the deep aquifer zone has been demonstrated to flow in a northerly direction under certain conditions. However, there are anomalies in the pattern of perchlorate detections in wells northeast of the Olin Site and other potential sources have been identified. The other potential perchlorate sources have not been investigated to determine if these potential sources of perchlorate are contributing to the groundwater impacts detected in the area northeast of the Olin Site. It should also be noted that the perchlorate concentrations detected in the Nordstrom Park Well have been below the PHG of 6 µg/L since 2003. Therefore, Water Board staff concludes that it is not necessary to require Olin to conduct investigation of perchlorate detections in the Nordstrom Park Well, in addition to what has already been required.

We plan to investigate disinfection procedures of municipal and domestic supply wells, and at various food processing facilities. We believe that the information from the Water District forensic study will provide valuable data to aid in a detailed interpretation of the sources of perchlorate in the Llagas Subbasin.

The Porter-Cologne Water Quality Control Act does not establish a procedure for the Water Board to make determinations of liability (or absence of liability). Rather, the Water Board makes liability determinations by issuing orders that either name or exclude various entities. Since we have decided not to issue additional investigation and cleanup requirements to Olin at this time, we decline to make any findings that Olin or any other potential source is or is not a "discharger" subject to future cleanup requirements for the perchlorate detections in the Nordstrom Park Well.

We appreciate your patience during our evaluation of the data in regard to this very complex issue. We will provide a brief overview of the information detailed in this letter to the Water Board at its regularly scheduled meeting in San Luis Obispo on May 12, 2006. If you wish to make a presentation at the Water Board meeting please submit this request in writing as soon as possible. If you have any questions, please contact Thea Tryon at **(805) 542-4776**, Hector Hernandez at (805) 542-4641, or Eric Gobler at (805) 549-3467.

Sincerely,

Roger W. Briggs
Executive Officer

References:

MACTEC, 2006. *Fourth Quarter 2005 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California.* January.

California Department of Health Services, 2006. *Perchlorate in Drinking Water: Notification Level.* April 10.

Attachments:

1. Table 1: Perchlorate results for the City of Morgan Hill's Nordstrom Park Well.
2. DHS Notification Level Requirements and Recommendations.
3. Figures E18, E19, E20 from MACTEC's Fourth Quarter 2005 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California.
4. Perchlorate Test Results by Well Name downloaded from the City of Morgan Hill website.

cc via E-mail:

Ms. Lori Okun
Office of the Chief Counsel
State Water Resources Control Board

cc via U.S. Mail:

Mr. Richard W. McClure
Olin Corporation

Olin Correspondence IPL

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Table 1: Perchlorate Concentrations for the Nordstrom Park Well

Date	Perchlorate[a]	Perchlorate SV99[b]	Perchlorate SV100[b]
12/4/2000	7	-	-
1/18/2001	6.2	-	-
1/22/2001	6	-	-
12/10/2001	<4	-	-
9/9/2002	<4	-	-
12/3/2002	<4	-	-
2/19/2003	6	-	-
2/28/2003	<4	-	-
8/2/2003		-	<4[c]
8/3/2003		-	<4[c]
8/4/2003		-	<4[c]
8/5/2003		-	<4[c]
8/6/2003		-	<4[c]
8/7/2003		<4	2.3
8/8/2003		<4	2.3
8/9/2003		<4	2.7
8/14/2003		<4	2.4
8/18/2003		<4	4
8/25/2003		<4	4
9/2/2003		<4	3
9/8/2003		<4	3
9/15/2003		<4	5
9/22/2003		<4	4
9/29/2003		4	3
10/6/2003		<4	3
10/13/2003		<4	4
10/20/2003		<4	4
10/27/2003		4	4
10/31/2003		<4	4
5/4/2004		<4	3
5/10/2004		<4	5
5/17/2004		4	4
5/24/2004		5	4
6/1/2004		4	4
6/7/2004		4	4
6/14/2004		4	4
6/21/2004		4	4
6/28/2004		4	4
7/6/2004		4	4
7/12/2004		<4	3
7/19/2004		<4	4
7/26/2004		4	4
8/2/2004		<4	4
8/9/2004		4	4
8/16/2004		<4	<2
8/23/2004		4	-
8/30/2004		4	4
9/7/2004		4	4

Table 1: Perchlorate Concentrations for the Nordstrom Park Well

Date	Perchlorate[a]	Perchlorate SV99[b]	Perchlorate SV100[b]
9/13/2004		<4	4
9/20/2004		<4	4
9/27/2004		4	4
10/7/2004		<4	2
10/11/2004		<4	4
10/18/2004		<4	4
10/25/2004		4	4
5/19/2005		<4	<2
5/20/2005		<4	<2
5/21/2005		<4	<2
5/22/2005		<4	<4[c]
5/23/2005		<4	<4[c]
5/24/2005		<4	<4[c]
5/31/2005		<4	2
6/6/2005		<4	3
6/13/2005		5	3
6/20/2005		<4	4
6/27/2005		<4	2
8/1/2005		<4	3
8/8/2005		<4	3
8/15/2005		<4	2
8/22/2005		<4	3
9/2/2005		-	3
9/5/2005		<4	-
9/12/2005		<4	3
9/19/2005		<4	3
9/26/2005		<4	<2
10/3/2005		<4	2
10/10/2005		<4	2
10/17/2005		<4	2
10/24/2005		<4	3
10/31/2005		<4	2

Notes:
Compilation of data obtained from the City of Morgan Hill.
Perchlorate concentrations in micrograms per Liter (ug/L)
- not available/ no sample collected

[a] Raw water sample collected prior to installation of ion exchange treatment system and SV ports.

[b] Raw water samples collected after ion exchange treatment system and SV ports were installed. SV99 and SV100 are both raw water ports. SV99 is tested to a detection limit of 4 ug/L, and SV100 is tested to a detection limit of 2 ug/L.

[c] Detection limit was 4 ug/L for these samples, all other samples in this column were 2 ug/L.

California Department of Health Services

Perchlorate in Drinking Water: Notification Level

Last Update: April 10, 2006

In the absence of a maximum contaminant level (MCL) for perchlorate in drinking water, CDHS uses a 6-µg/L notification level to advise water systems, their consumers, and others. [Click here for an update on the MCL.]

Notification Level: Requirements and Recommendations

Findings of a contaminant in drinking water sources at concentrations greater than its notification level prompt certain statutory requirements. In addition, CDHS recommends:

- consumer notification when water served exceeds the notification level
- removal of the drinking water source from service at more than 10 times perchlorate's notification level (*i.e.*, > 60 µg/L for perchlorate). This is called the response level.

History of the Perchlorate Notification Level

1997 — With its early perchlorate findings, CDHS established an 18-µg/L notification level, based on the upper value of the 4- to 18-µg/L range resulting from US EPA's "provisional" reference dose (RfD) (US EPA, 1992; 1995)

2002 — US EPA released a revised draft perchlorate RfD that corresponded to 1 µg/L in drinking water (US EPA, 2002). Concluding that its notification level needed to be revised downward, in January 2002 CDHS reduced it to 4 µg/L, the lower of US EPA's 1992-95 range of values. Perchlorate's detection limit for purposes of reporting is also 4 µg/L.

2004 — OEHHA (2004) established the perchlorate public health goal at 6 µg/L. CDHS revised its notification level to 6 µg/L.

References

OEHHA, 2004, *Public Health Goal for Perchlorate in Drinking Water*, Office of Environmental Health Hazard Assessment, March.

US EPA, 1992, Provisional Non-cancer and Cancer Toxicity Values for Potassium Perchlorate (CASRN 7778-74-7) (Aerojet General Corp./CA), Memorandum from Joan S. Dollarhide, Superfund Health Risk Technical Support Center, Environmental Criteria and Assessment Office, Office of Research and Development, to Dan Stralka, US EPA Region IX.

US EPA, 1995, Correspondence from Joan S. Dollarhide, National Center for Environmental Assessment, Office of Research and Development, to Mike Girrard, Chairman, Perchlorate Study Group.

US EPA, 2002, *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization*, External Review Draft, National Center for Environmental Assessment, NCEA-1-0503, January 16, 2002 [revised the December 1998 external review draft].

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Health and Safety Code Section 116455
(Chapter 679, Statutes of 2004, AB 2528, Lowenthal)

(a) A public water system shall comply with the requirements of this section within 30 days after it is first informed of a confirmed detection of a contaminant found in drinking water delivered by the public water system for human consumption that is in excess of a maximum contaminant level, a notification level, or a response level established by the department.

(1) If the public water system is a wholesale water system, then the person operating the wholesale water system shall notify the wholesale water system's governing body and the water systems that are directly supplied with that drinking water. If the wholesale water system is a water company regulated by the California Public Utilities Commission, then the wholesale water system shall also notify the commission. The commission in the exercise of its general and specific powers to ensure the health, safety, and availability of drinking water served by the utilities subject to its jurisdiction, may order further action that is not inconsistent with the standards and regulations of the department to ensure a potable water supply.

(2) If the public water system is a retail water system, then the person operating the retail water system shall notify the retail water system's governing body and the governing body of any local agency whose jurisdiction includes areas supplied with drinking water by the retail water system. If the retail water system is a water company regulated by the California Public Utilities Commission, then the retail water system shall also notify the commission. The commission, in the exercise of its general and specific powers to ensure the health, safety, and availability of drinking water served by the utilities subject to its jurisdiction, may order further action that is not inconsistent with the standards and regulations of the department to ensure a potable water supply.

(b) The notification required by subdivision (a) shall identify the drinking water source, the origin of the contaminant, if known, the maximum contaminant level, response level, or notification level, as appropriate, the concentration of the detected contaminant, and the operational status of the drinking water source, and shall provide a brief and plainly worded statement of health concerns.

(c) For purposes of this section, the following terms have the following meanings:

(1) "Drinking water source" means an individual groundwater well, an individual surface water intake, or in the case of water purchased from another water system, the water at the service connection.

(2) "Local agency" means a city or county, or a city and county.

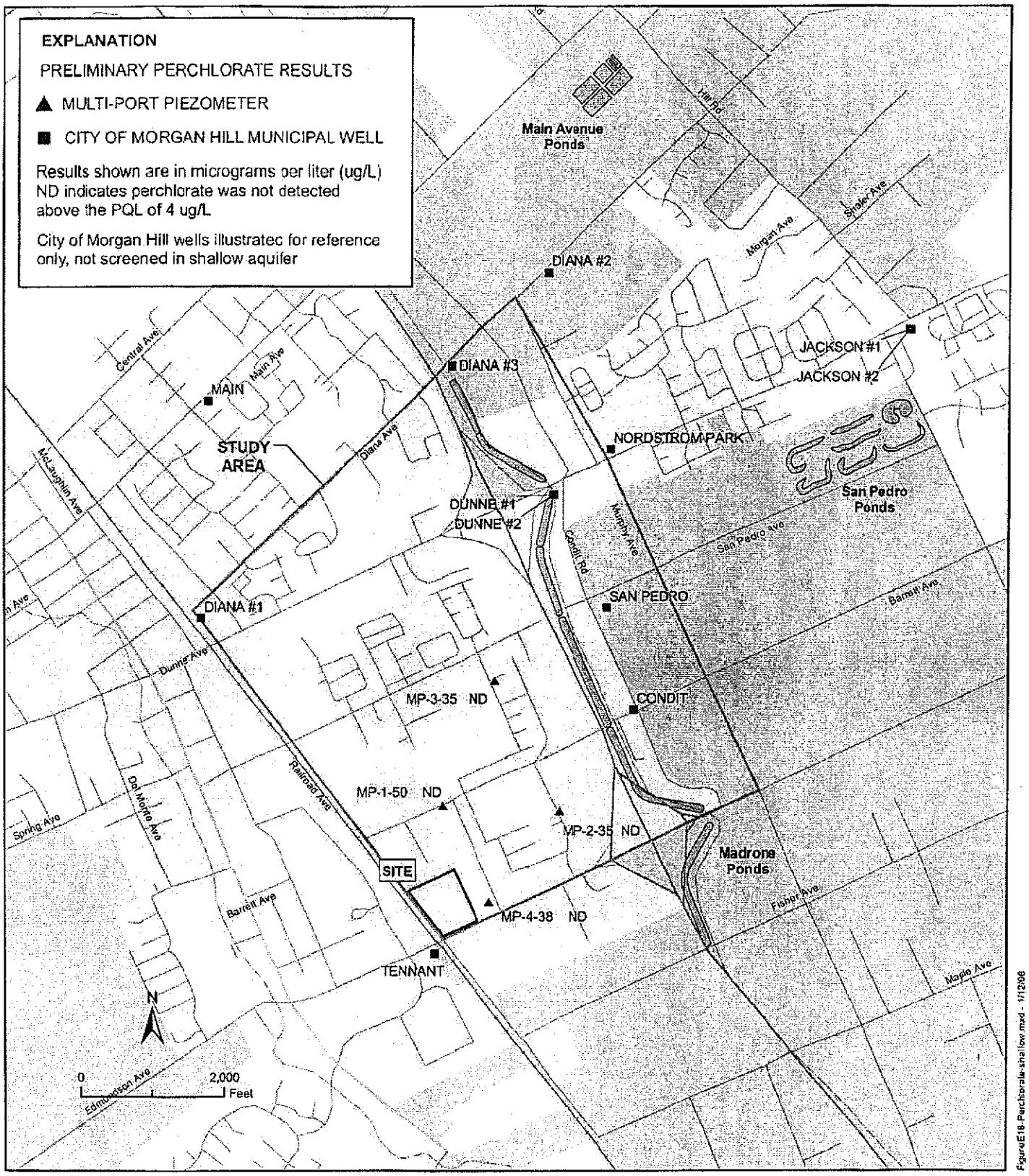
(3) "Notification level" means the concentration level of a contaminant in drinking water delivered for human consumption that the department has determined, based on available scientific information, does not pose a significant health risk but warrants notification pursuant to this section. Notification levels are nonregulatory, health-based advisory levels established by the department for contaminants in drinking water for which maximum contaminant levels have not been established. Notification levels are established as precautionary measures for contaminants that may be considered candidates for establishment of maximum contaminant levels, but have not yet undergone or completed the

regulatory standard setting process prescribed for the development of maximum contaminant levels and are not drinking water standards.

(4) "Response level" means the concentration of a contaminant in drinking water delivered for human consumption at which the department recommends that additional steps, beyond notification pursuant to this section, be taken to reduce public exposure to the contaminant. Response levels are established in conjunction with notification levels for contaminants that may be considered candidates for establishment of maximum contaminant levels, but have not yet undergone or completed the regulatory standard setting process prescribed for the development of maximum contaminant levels and are not drinking water standards.

(5) "Retail water system" means a public water system that supplies water directly to the end user.

(6) "Wholesale water system" means a public water system that supplies water to other public water systems for resale.



FigureE18-Perchlorate-shallow.mxd - 1/12/06

MACTEC

Perchlorate Results - Shallow Aquifer

Fourth Quarter 2005 Groundwater Monitoring Report
Olin/Standard Fusee Site
Morgan Hill, California

FIGURE
E18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	6300060006 01	5/07 MDT	12/2005	

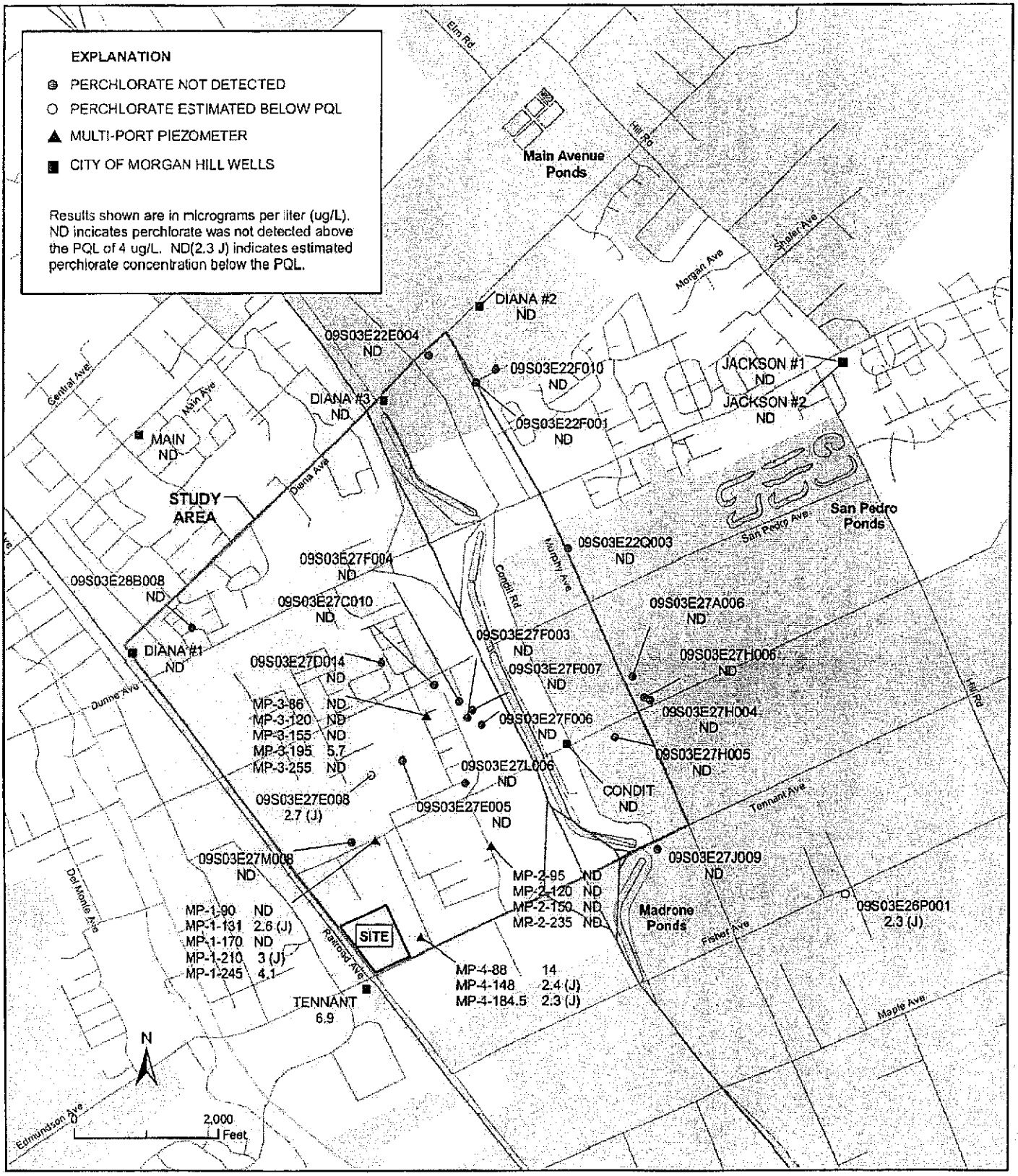


Figure8-Perchlorate-INTERMEDIATE.mxd - 12/14/05

MACTEC

Perchlorate Results Intermediate Aquifer

Fourth Quarter 2005 Groundwater Monitoring Report
Olin/Standard Fusee Site
Morgan Hill, California

FIGURE
E19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	6300060006 01	MDT	12/2005	

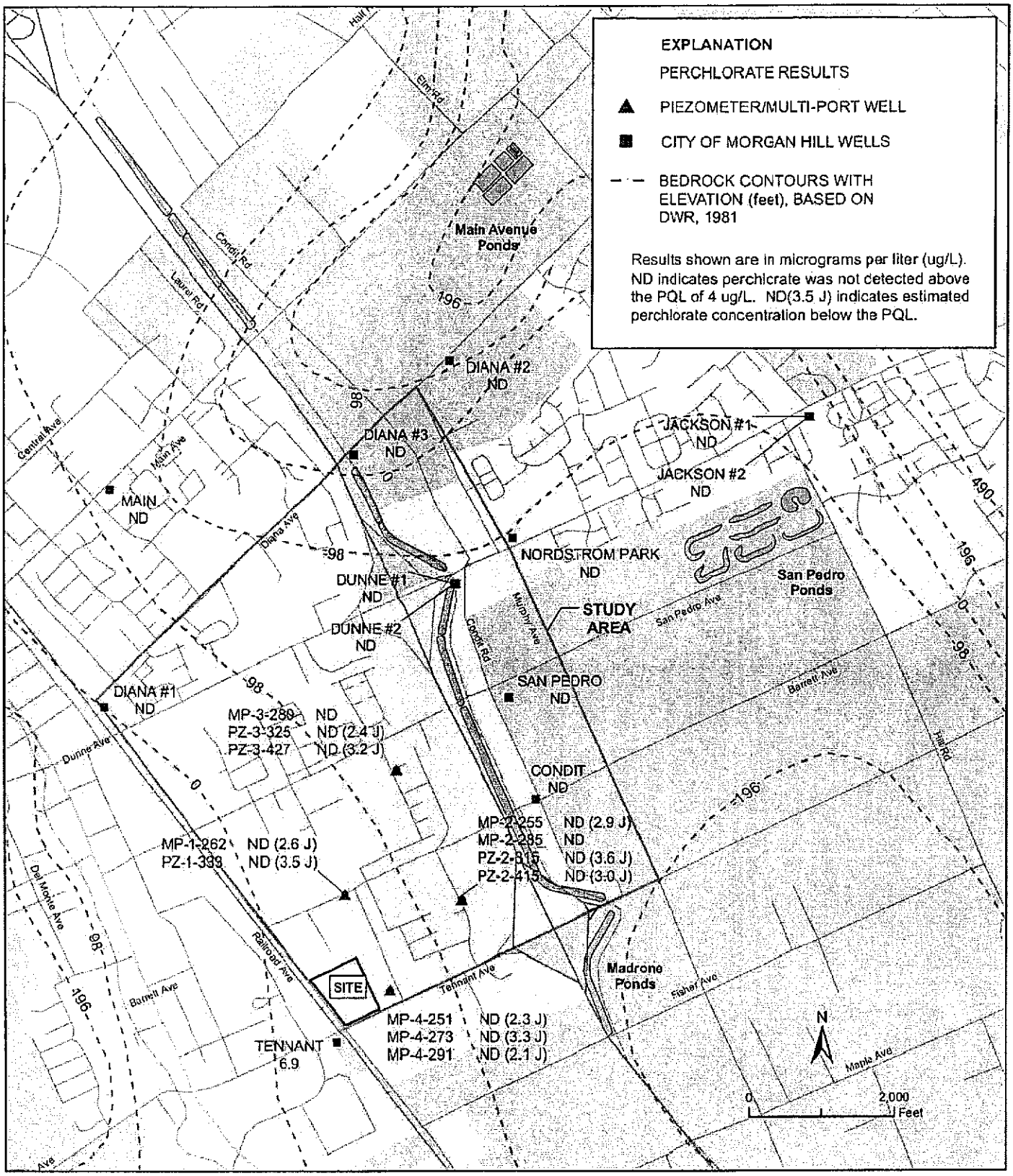


Figure 18-Perchlorate-deep.mxd - 12/15/05

Perchlorate Results - Deep Aquifer

MACTEC

Fourth Quarter 2005 Groundwater Monitoring Report
Olin/Standard Fusee Site
Morgan Hill, California

FIGURE
E20

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	6300060006 01	KCF MDT	12/2005	

PERCHLORATE TEST RESULTS by WELL NAME

(ppb or parts per billion)

DATE	Action Level	Lab	Detection Limit	Tennant) *note 3	Jackson 1 *note 1	Nordstrom *note 2	Dunne 1	Dunne 2	Condit (off since 2/03)	San Pedro	Diana 1	Diana 2	Diana 3	Boys Ranch 1	Boys Ranch 2	Boys Ranch 3	Main 1	Main 2	Butterfield
Production (GPM)				425	590	1,000	500	550	200	600	950	1,300	450	1,200	550	400	1,000	1,100	450
4/18/06	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/10/06	6	1	4	ND															
4/4/06	6	1	4	ND															
3/20/06	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	OFFLINE	ND	ND	ND
3/13/06	6	1	4	ND															
3/8/06	6	1	4	ND															
2/28/06	6	1	4	ND															
2/22/06	6	1	4	ND															
2/21/06	6	1	4		OFFLINE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	OFFLINE	ND	ND	ND
2/10/06	6	1	4	ND															
2/8/06	6	1	4	ND															
2/3/06	6	1	4	ND															
1/26/06	6	1	4	ND															
1/23/06	6	1	4		OFFLINE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1/18/06	6	1	4	ND															
1/12/06	6	1	4	ND															
1/9/06	6	1	4	ND															
1/4/06	6	1	4	ND															
12/22/05	6	1	4	ND															
12/21/05	6	1	4	ND															
12/19/05	6	1	4		OFFLINE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12/9/05	6	1	4	ND															
11/28/05	6	1	4	ND															
11/21/05	6	1	4	ND															
11/18/05	6	1	4		OFFLINE		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11/15/05	6	1	4	ND		ND													
11/10/05	6	1	4	ND		ND													
11/8/05	6	1	4	ND		ND													
11/3/05	6	1	4	ND		ND													
10/24/05	6	1	4	ND		ND													
10/17/05	6	1	4	ND			ND												
10/13/05	6	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/7/05	6	1	4	ND		ND													
9/26/05	6	1	4	ND		ND													
9/19/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/16/05	6	1	4	ND		ND													
9/13/05	6	1	4	ND		ND													
9/8/05	6	1	4	ND		ND													
8/31/05	6	1	4	ND		ND													
8/26/05	6	1	4	ND		ND													
8/22/05	6	1	4	ND		ND													
8/19/05	6	1	4	ND		ND													
8/15/05	6	1	4	ND		ND													
8/11/05	6	1	4	ND					ND	ND	ND								ND
8/10/05	6	1	4	ND	ND	ND	ND	ND				ND	ND	ND	ND	ND	ND	ND	
8/3/05	6	1	4	ND		ND													
7/27/05	6	1	4	ND		ND													
7/20/05	6	1	4	ND		ND													
7/14/05	6	1	4	ND		ND													
7/12/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/16/05	6	1	4	ND															
6/14/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
6/9/05	6	1	4	ND		ND													
6/6/05	6	1	4	ND															
6/3/05	6	1	4	ND															
6/2/05	6	1	4	ND															
5/25/05	6	1	4	ND															
5/24/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
5/23/05	6	1	4	ND															

PERCHLORATE TEST RESULTS by WELL NAME
(ppb or parts per billion)

DATE	Action Level	Lab	Detection Limit	Tennant) *note 3	Jackson 1 *note 1	Nordstrom *note 2	Dunne 1	Dunne 2	Condit (off since 2/03)	San Pedro	Diana 1	Diana 2	Diana 3	Boys Ranch 1	Boys Ranch 2	Boys Ranch 3	Main 1	Main 2	Butterfield
Production (GPM)				425	590	1,000	500	550	200	600	950	1,300	450	1,200	550	400	1,000	1,100	450
5/18/05	6	1	4	ND															
5/11/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
5/10/05	6	1	4	ND															
5/3/05	6	1	4	ND															
4/27/05	6	1	4	ND															
4/20/05	6	1	4	ND															
4/13/05	6	1	4	ND															
4/12/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
4/7/05	6	1	4	ND															
4/6/05	6	1	4	ND															
3/28/05	6	1	4	ND															
3/15/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
3/9/05	6	1	4	ND															
3/2/05	6	1	4	ND															
2/22/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*note 1	ND	ND		ND	
2/14/05	6	1	4	ND															
2/7/05	6	1	4	ND															
1/24/05	6	1	4	ND															
1/20/05	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
1/18/05	6	1	4	ND															
1/10/05	6	1	4	ND															
1/3/05	6	1	4	ND															
12/27/04	6	1	4	ND		ND													
12/20/04	6	1	4	ND		ND													
12/14/04	6	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
12/13/04	6	1	4	ND		ND													
12/6/04	6	1	4	ND		ND													
11/22/04	6	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
11/15/04	6	1	4	ND		ND													
11/10/04	6	1	4	ND															
11/8/04	6	1	4			ND													
11/1/04	6	1	4			ND													
10/26/04	6	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
10/25/04	6	1	4			ND													
10/18/04	6	1	4			ND													
10/11/04	6	1	4	ND															
10/11/04	6	1	4			ND													
10/10/04	6	1	4	ND															
10/9/04	6	1	4	ND															
10/8/04	6	1	4	ND															
10/7/04	6	1	4			ND													
10/7/04	6	1	4	ND															
9/28/04	6	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
9/20/04	6	1	4			ND													
9/13/04	6	1	4			ND													
9/7/04	6	1	4			ND													
8/30/04	6	1	4			ND													
8/30/04	6	1	4					ND											
8/25/04	6	1	4		ND		ND	ND	5	ND	ND	ND	ND	ND	ND	ND		ND	
8/24/04	6	1	4	ND															
8/23/04	6	1	4			ND													
8/20/04	6	1	4	ND															
8/16/04	6	1	4			ND													
8/9/04	6	1	4			ND													
8/6/04	6	1	4			ND													
8/2/04	6	1	4			ND		ND											

PERCHLORATE TEST RESULTS by WELL NAME
(ppb or parts per billion)

DATE	Action Level	Lab	Detection Limit	Tennant) *note 3	Jackson 1 *note 1	Nordstrom *note 2	Dunne 1	Dunne 2	Condit (off since 2/03)	San Pedro	Diana 1	Diana 2	Diana 3	Boys Ranch 1	Boys Ranch 2	Boys Ranch 3	Main 1	Main 2	Butterfield
Production (GPM)				425	590	1,000	500	550	200	600	950	1,300	450	1,200	550	400	1,000	1,100	450
7/28/04	6	1	4		ND		ND	ND	4	4	ND	ND	ND	ND	ND	ND	ND	ND	
7/26/04	6	1	4			ND													
7/19/04	6	1	4			ND													
7/12/04	6	1	4			ND													
7/7/04	6	1	4						5										
6/28/04	6	1	4			ND													
6/23/04	6	1	4		ND		ND	ND	5	ND	ND	ND	ND	ND	ND	ND		ND	
6/21/04	6	1	4			ND													
6/14/04	6	1	4			ND													
6/7/04	6	1	4			ND													
6/1/04	6	1	4			ND													
5/21/04	6	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
5/19/04	6	1	4			ND													
5/10/04	6	1	4			ND													
4/27/04	6	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
3/23/04	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
2/20/04	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		* note 1	
1/20/04	4	1	4	ND															
1/16/04	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
12/17/03	4	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
11/17/03	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
11/10/03	4	1	4			ND													
11/3/03	4	1	4			ND													
10/27/03	4	1	4			ND													
10/20/03	4	1	4		ND	ND	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND		
10/13/03	4	1	4			ND													
10/7/03	4	1	4			ND													
9/30/03	4	1	4			ND													
9/23/03	4	1	4		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
9/19/03	4	1	4			ND													
9/15/03	4	1	4			ND													
9/6/03	4	1	4			ND													
8/26/03	4	1	4		ND	ND	ND	ND	4.0	ND	ND	ND	ND	ND	ND	ND	ND		
8/22/03	4	1	4			ND													
8/14/03	4	1	4			ND													
7/28/03	4	1	4			ND													
7/22/03	4	1	4		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND		
7/21/03	4	1	4					ND											
7/15/03	4	1	4					ND											
7/3/03	4	2	4	ND															
7/1/03	4	1	4			ND		ND											
6/24/03	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
6/10/03	4	1	4	ND															
5/27/03	4	1	4		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
4/22/03	4	1	4		ND	ND	ND	ND	5 pre	ND	ND	ND	ND	ND	ND	ND	ND		
4/14/03	4	1	4																
3/25/03	4	1	4								ND								
3/19/03	4	2	4			ND	ND	ND	ND	ND									
3/18/03	4	1	4		ND	ND	ND	4.0	ND	ND	*note 1	ND	ND	ND	ND	ND			
3/13/03	4	1	4														ND		
3/12/03	4	1	4	ND															
2/28/03	4	1	4			ND con			ND con										
2/24/03	4	1	4		ND	6 pre	ND	ND	5 pre	ND	*note 1	ND	ND	ND	ND	ND	* note 1		
1/16/03	4	1	4		ND		ND	ND	ND	ND	*note 1	ND	ND	ND	ND	ND	ND		
12/16/02	4	1	4	ND															
12/3/02	4	1	4			ND													

PERCHLORATE TEST RESULTS by WELL NAME
(ppb or parts per billion)

DATE	Action Level	Lab	Detection Limit	Tennant) *note 3	Jackson 1 *note 1	Nordstrom *note 2	Dunne 1	Dunne 2	Condit (off since 2/03)	San Pedro	Diana 1	Diana 2	Diana 3	Boys Ranch 1	Boys Ranch 2	Boys Ranch 3	Main 1	Main 2	Butterfield
Production (GPM)				425	590	1,000	500	550	200	600	950	1,300	450	1,200	550	400	1,000	1,100	450
10/10/02	4	1	4							ND									
9/26/02	4	1	4	ND															
9/16/02	4	1	4	ND															
9/9/02	4	1	4			ND													
4/17/02	4	1	4	4 con															
3/18/02	4	1	4	7 pre															
12/10/01		1	4			ND													
12/10/01	18	1	4	ND															
10/1/01	18	1	4	ND															
4/30/01	18	1	4	5.1															
1/22/01	18	1	4			6.0													
1/18/01	18	1	4			6.2													
12/4/00	18	1	4			7.0													
				5.5 avg															
						3.0 avg			2.5 avg										
									ND con										
									2.5 avg										

pre=preliminary result
con=confirming
avg=average

*note 1 = well off-line for maintenance and/or rehab
*note 2 = since 8/2/03 results reported at point of connection with supply
*note 3 = since 10/7/04 results reported at point of connection with supply

Lab1 = BSK
Lab2=Zymax