

30 July 2007

Mr. Hector Hernandez
Central Coast Water Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-7906

Subject: Recommendation for Final Extraction Well Locations and Designs for Priority Zone A, Olin/Standard Fusee Site, Morgan Hill, California

Dear Mr. Hernandez:

This letter has been prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Olin Corporation (Olin) to notify the Central Coast Water Board (Water Board) as to the final recommended extraction well locations and designs for Priority Zone A in the Llagas Subbasin. This deliverable is provided in accordance with the project schedule presented in Section 4 of the Area I Extraction Well Installation Work Plan¹ (Well Installation Work Plan) for the Olin/Standard Fusee site at 425 Tennant Avenue in Morgan Hill, California (the Site), and in consideration of comments received from the Water Board² on 11 June 2007 in response to the Well Installation Work Plan. Recommendations for final extraction well locations and designs are presented by aquifer designation (shallow, intermediate and deep) in the following sections.

Shallow Aquifer

As discussed in detail in the Well Installation Work Plan, continued reductions in perchlorate concentrations have been observed in the off-Site shallow aquifer since successful completion of on-Site soil remediation activities in May 2006. Data from Second Quarter 2007³ confirmed observations from the First Quarter 2007⁴ that there are no longer perchlorate concentrations exceeding Priority Zone A in the shallow aquifer. In shallow well MW-61, located near where a shallow extraction well had been proposed in the original Area I Plume Migration Control Work Plan⁵, the perchlorate concentration continues to be low: 9 µg/L during the First Quarter of 2007 and 4.2 µg/L during the Second Quarter of 2007. Given the successful completion of the on-Site soil bioremediation program, the three years of on-Site hydraulic containment via the groundwater extraction and treatment system (GWTS), the consistent declines in shallow aquifer perchlorate concentrations both on-Site and in Area I, the absence of Priority Zone A perchlorate

concentrations in the shallow aquifer, and the planned continued operation of the on-Site GWTS to contain the only remaining shallow aquifer area with groundwater exceeding Priority Zone A, a shallow aquifer extraction well in Area I is not required to meet the Area I remediation goals.

In response to the Water Board's reference to comments from the Water District regarding elevated perchlorate detections at monitoring wells MW-61-056, MW-062-055 and MW-63-057, it is important to emphasize that these wells do not monitor the shallow aquifer, but rather monitor the underlying aquitard (A/B aquitard) that separates the shallow aquifer from the intermediate aquifer. The groundwater monitored by these wells can be expected to be subject to low migration rates, predominately vertically downward, and would not be contained or captured by a shallow aquifer remedy well, regardless of its location. Migration of perchlorate through the A/B aquitard will enter the intermediate zone and therefore will be addressed by the intermediate zone remedy (discussed below).

As stated in the Well Installation Work Plan, quarterly shallow aquifer perchlorate data will continue to be reviewed and evaluated with respect to the utility of installing extraction wells in the shallow aquifer.

Intermediate Aquifer

Based on the data through the Second Quarter 2007, it appears that an intermediate aquifer extraction well located near existing well MW-65 would be a more conservative approach for containment of Priority Zone A in the intermediate aquifer rather than the location presented in the Well Installation Work Plan. The location near MW-65 is the location initially identified for the intermediate aquifer extraction well in the Area I Work Plan⁵. Figure 1 presents the distribution of perchlorate in Priority Zone A in the intermediate aquifer based on the Second Quarter 2007 data, and shows the recommended final location of the intermediate aquifer extraction well.

Although a well-specific capture zone estimate will not be generated until the completion of well construction and testing, the approximate maximum width of capture achievable by a single well can be estimated based on the hydraulic gradient, available drawdown, and anticipated well efficiency. Based on an available drawdown of 60 feet, hydraulic gradient of 0.0035, and an estimate of well efficiency of 75% (professional experience), it is expected that the maximum hydraulic capture width achievable from IEW-1 will be ~4,500 feet perpendicular to IEW-1 and

~9,000 feet near the Site. These capture widths are much greater than required to capture the Priority Zone A groundwater and therefore it is expected that hydraulic containment can be achieved with a single intermediate zone extraction well.

The perchlorate distribution within the intermediate aquifer generally decreases with depth. Of the three depth intervals identified within the intermediate aquifer (upper, middle, lower), the Priority Zone A groundwater occurs predominately in the upper intermediate aquifer, with sporadic detections in the middle intermediate aquifer. Priority Zone A groundwater has not been detected in the lower intermediate aquifer. Therefore, extraction well IEW-1 will be constructed to extract from the upper and middle portions of the intermediate zone. As shown on Figure 2, the approximate screen interval of extraction well IEW-1 will be 75 to 150 feet below ground surface (ft bgs). The actual depth interval will be determined at the time of drilling based on stratigraphy encountered in the borehole.

Because IEW-1 will be constructed across a large thickness of aquifer that is subject to known stratification of perchlorate concentrations and potentially significant vertical hydraulic gradients, it is anticipated that the well will be constructed with three screen intervals separated by sections of blank casing that can be used to emplace packers if needed. Figure 3 provides a schematic of the proposed well design for IEW-1. The blank casing sections would be designed to accommodate a packer assembly inside the casing and a thin (2-ft) bentonite seal in the borehole annulus. The blank casing sections are likely to be a minimum of 10 ft in length to allow for reliable construction of the seal. Packers could be placed in the well under either of the following conditions:

- During foreseeable, prolonged non-operational periods if observations indicate that the well casing is acting as a vertical conduit for the flow of perchlorate in groundwater; or
- During well operations if conditions change such that extraction from one or several depth intervals is preferable or is no longer required.

As per Olin's June 30, 2007 letter to the Water Board regarding selection of on-Site recharge as the final water disposition option, the design of the proposed intermediate aquifer extraction well is expected to conform to the on-Site recharge design outlined in the Well Installation Work Plan. However, as noted below, data from recent deep aquifer characterization activities may affect the size of Priority Zone A, which may change the volume of water requiring treatment.

This could in turn necessitate revisiting the water disposition option and in turn the extraction well design, as further discussed below.

Deep Aquifer

Data from ongoing deep aquifer characterization activities at well locations MW-59 and MW-60 indicate that Priority Zone A in the deep aquifer extends further south than initially understood during preparation of the Area I and Well Installation Work Plans. Additional activities are currently being planned by MACTEC to further characterize Priority Zone A in the deep aquifer. Selection of final deep aquifer extraction well location(s) will need to be deferred to such time as Priority Zone A in the deep aquifer is adequately characterized. Olin will provide the Water Board with proposed deep aquifer extraction well location(s) when sufficient deep aquifer characterization data are available from the characterization activities.

Potential Impact of Deep Aquifer Characterization Results on FS Addendum

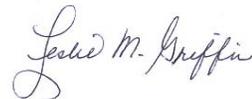
In keeping with the schedule presented in Section 4 of the Well Installation Work Plan, Olin notified the Water Board of its selection of on-Site recharge as the Final Water Disposition Option on 30 June 2007, following detailed evaluation of all other water disposition options. At that time, perchlorate data from deep aquifer wells MW-59 and MW-60 were not available, and the distribution of Priority Zone A was understood to be limited to the area between the Site and Maple Avenue, as shown in Figure 2-6 of the Well Installation Work Plan. The new data, available in early July 2007, indicates that Priority Zone A extends further south in the deep aquifer. As indicated above, additional deep aquifer characterization will be required to fully delineate Priority Zone A in the deep aquifer before the plume migration control strategy for the deep aquifer can be fully developed. Given the increased size of Priority Zone A in the deep aquifer, it is likely that additional groundwater extraction will be required, which may require revisiting the water treatment and disposition options. This will in turn likely impact the schedule for design, installation, testing and startup of Priority Zone A containment. While installation and testing of the intermediate aquifer can be completed within the months leading up to the anticipated FS Addendum submittal, installation and hydraulic testing of the deep aquifer extraction well(s) is unlikely to be completed by December 2007 (as initially contemplated in the Well Installation Work Plan), given that additional deep aquifer characterization is required before final location(s) of deep aquifer wells can be selected. Olin

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will keep the Water Board apprised of potential changes to the extraction well installation schedule as data emerges from the continuing deep aquifer characterization program.

Please feel free to contact Mr. Rick McClure at Olin (423.336.4576) if you have any questions with the information contained in this letter.

Sincerely,



Leslie M. Griffin, PE
Project Manager



John D. Gallinatti, CHg
Associate Hydrogeologist



Evan E. Cox, MSc
Principal In Charge

Attachment: Figures

Copies to: Ms. Thea Tyron, Central Coast Water Board
Mr. Rick McClure, Olin
Mr. David Share, Olin
Mr. Thomas Mohr, SCVWD
Mr. Don Smallbeck, MACTEC
Ms. Sylvia Hamilton, PCAG Chairperson

References

GR3918/GA070102.doc

1. Geosyntec. 2007. Area I Extraction Well Installation Work Plan, Olin/Standard Fusee Site, Morgan Hill, California. Prepared by Geosyntec Consultants Incorporated, 30 April 2007.
2. Water Board. 2007. Site Cleanup Program: 425 Tennant Avenue, Morgan Hill; Response to Olin's Area I Extraction Well Installation Work Plan. June 11, 2007.
3. MACTEC Engineering and Consulting, Inc. (MACTEC). 2007a. Second Quarter (April-June) 2007 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Ave, Morgan Hill, California. Prepared by MACTEC Engineering & Consulting, Inc., July 30, 2007.
4. MACTEC Engineering and Consulting, Inc. (MACTEC). 2007b. First Quarter (January-March) 2007 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Ave, Morgan Hill, California. Prepared by MACTEC Engineering & Consulting, Inc., April 30, 2007.
5. Geosyntec. 2006. Area I Plume Migration Control Work Plan, Olin/Standard Fusee Site, Morgan Hill, California. Prepared by Geosyntec Consultants Incorporated, 6 December 2006.



-  Monitoring Well
-  Existing Extraction Well (B - intermediate aquifer)
-  Proposed Extraction Well IEW - intermediate aquifer extraction well
-  Intermediate Aquifer Priority Zone A (Perchlorate > 24.5 µg/L)



**Distribution of Perchlorate in Priority Zone A
Intermediate Aquifer**

**Recommendation for Area I Final Extraction Well Design and Locations
Olin/Standard Fusee Site, Morgan Hill, California**

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consultants



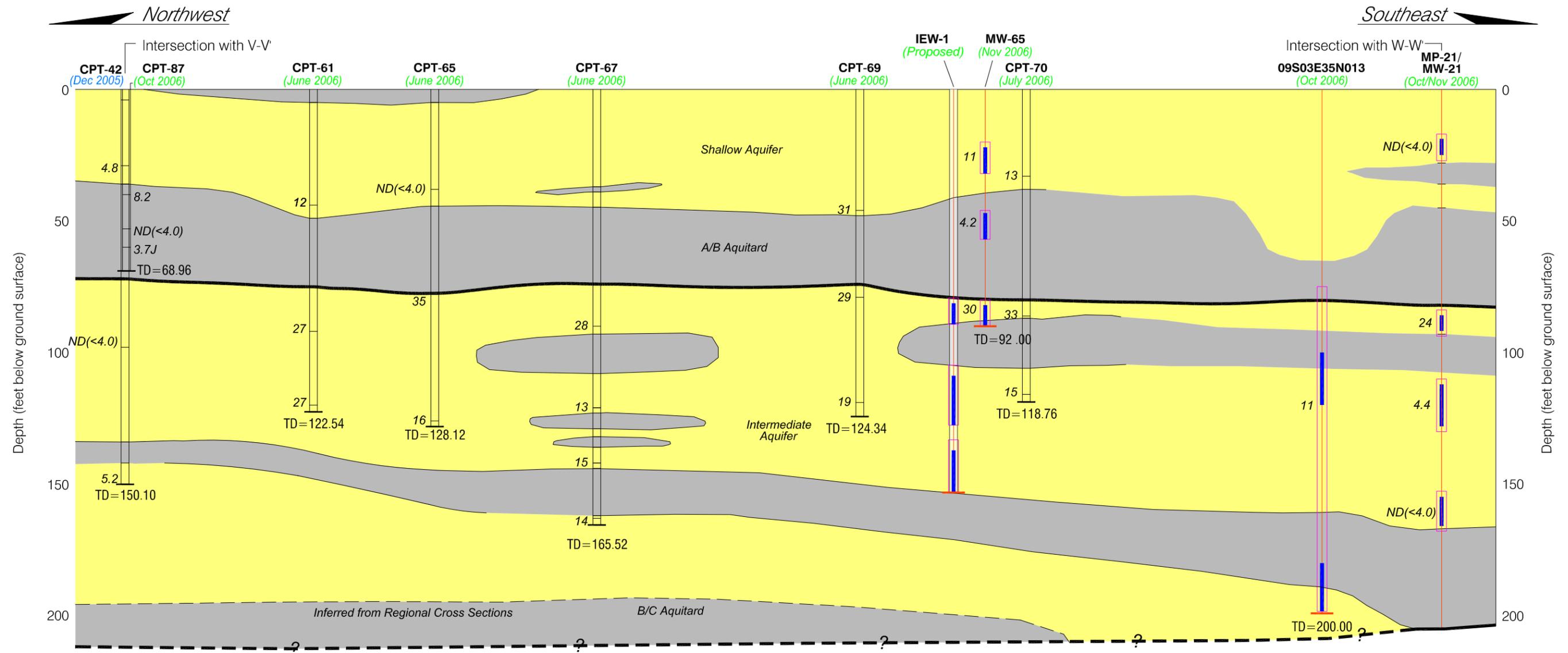
Figure
1

Plume Source: MACTEC, Second Quarter 2007 Groundwater Monitoring Report, July 30, 2007

Kennesaw, Georgia

20-JULY-2007

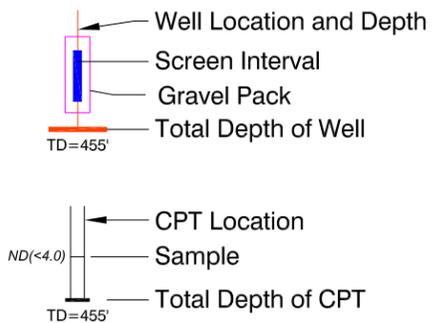
S:\Morgan Hill GIS 2006\Area I Extraction Well Workstation Figures_RAS_25-APR-2007_C88918_500-01



Legend

Geologic Units (as described on driller's logs):

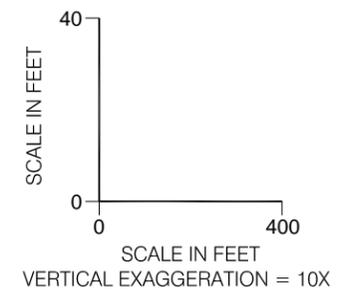
- Coarse Material, Facies B and C (Gravel & Sand)
- Fine Material, Facies D and E (Silt & Clay)



- 7.5 Perchlorate Concentration ($\mu\text{g/l}$)
- ND (<4.0) Perchlorate Not Detected At or Above the Reporting Limit
- J Laboratory Reports This as an Estimated Value
- NS Well Not Sampled

- Aquifer Zone Boundary
- Aquifer Zone Boundary Inferred

- Shallow Aquifer
- Intermediate Aquifer
- Deep Aquifer



Note:

- Cross-section and legend reproduced from Figures 3.4 and 4.13 of Mactec, 2007, "Llagas Subbasin Characterization -2006 Olin/Standard Fusee Site - Morgan Hill, California"

Proposed IEW-1 Screen Intervals

Olin/Standard Fusee Site
Morgan Hill

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July 2007

Figure

2

