REPORT

MONITORING SYSTEM EVALUATION AND CORRECTIVE ACTION EFFECTIVENESS

Yuba-Sutter Disposal, Inc. Landfill, Yuba County, California

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This report provides information requested by the Central Valley Regional Water Quality Control Board (RWQCB) by letter dated April 14, 2011.[1] The RWQCB requested the following items:

(1) a landfill gas (LFG) extraction well installation report for LF-3 (previously submitted by Recology),

(2) an evaluation of all background, detection, and corrective action monitoring wells certifying the monitoring systems meet the intent of 40 CFR, Part 258, Subpart E and Title 27, §20415, and

(3) a summary of the effectiveness of corrective action measures of LF-1 and LF-2 and whether additional corrective action is required to eliminate detected VOCs in groundwater.

Each of the three requested items is discussed below in the following three numbered sections. .

The Yuba-Sutter Disposal, Inc. (YSDI) Landfill is a 160-acre facility located in Yuba County, northeast of the City of Marysville (Figure 1). The landfill is comprised of three areas: the South Area (LF-1), the Peach Orchard (LF-2), and the North Area (LF-3) (Figure 2). Area LF-1 ceased accepting waste in 1984 and was closed in accordance with the regulations that existed at that time. The final cover for LF-2 was completed in 1995. Area LF-3 ceased accepting waste in 1996, and the final cover was completed in October 1997. In addition, the YSDA landfill (not associated with the YSDI facility) is located adjacent to the southwest boundary of LF-1; there is no separation of refuse between the two sites, restricting monitoring along that boundary.

1.0 LFG EXTRACTION WELL INSTALLATION REPORT FOR LF-3

The LFG extraction well installation report for the LF-2 area was transmitted to the RWQCB on April 27, 2011. The LF-3 LFG extraction system includes 15 new LFG extraction wells, four leachate sumps, four formerly passive LFG extraction trenches, and six formerly passive LFG vents. The LF-3 system was connected to the existing LFG flare that has been running the LF-1 perimeter LFG extraction wells (PEW-1 through PEW-22) and the LF-2 LFG extraction system (EW-1 through EW-21). The YSDI landfill gas extraction well locations are shown on Figure 2.

2.0 MONITORING SYSTEM EVALUATION

The following presents the monitoring system evaluation. The initial part of the discussion below presents a summary of the RWQCB questions, followed by, the regulatory requirements from 40 CFR, Part 258, Subpart E and Title 27, §20415, and a site-specific monitoring system evaluation.

2.1 Responses to RWQCB Questions

The evaluation shows that the monitoring system meets the intent of 40CFR, Part 258, Subpart E and Title 27, §20415, and answers the RWQCB questions from the April 14, 2011 letter as summarized below:

- The monitoring well screens are often set below the measured groundwater elevations, because the first-encountered groundwater is confined beneath a clay layer.
- The groundwater samples obtained from the wells are from the confined water-bearing zone that was first encountered during well installation. Therefore the groundwater samples are representative of first-encountered groundwater quality.
- Groundwater elevations are measured above the top of the well screen intervals, because the wells monitor groundwater that is confined beneath a clay layer and the

[1] RWQCB, April 14, 2011, Notice of Violation, Review of 2010 Second Semiannual and Annual Monitoring Report, Yuba-Sutter Disposal, Inc. Landfill, Yuba County.

water levels measured in the wells are piezometric heads in the aquifer that underlies the confining bed.

- No monitoring wells were installed in 2001 (as stated in the RWQCB letter), however, four wells were installed in 2002 (MW-11, MW-12, MW-13, and PZ-14). These wells were appropriately screened in the uppermost aquifer, which is confined. There is no water-table (unconfined) groundwater conditions at the site, therefore, the wells were not screened across the water table. Three of the four wells installed in 2002 have water levels that are mostly within the screened interval and only two to three times over the past nine years have the water levels occurred above the well screens and into the well sand-pack interval. The fourth well has had water levels mostly within the well sand-pack interval.
- The groundwater monitoring system has been designed by a registered civil engineer and/or geologist and was previously evaluated, as indicated in the Information Sheet for WDR R5-2003-0093.[2] The monitoring system is certified by the undersigned professional geologist.

2.2 Regulatory Requirements

The RWQCB letter states:

> 40 CFR, Part 258, Subpart E., states in part: *Proper selection of the vertical sampling interval is necessary to ensure that the monitoring system is capable of detecting a release from the MSWLF unit.*

Please note however, this statement is not from the cited regulation. Rather, the statement is from the *RCRA Ground-Water Monitoring: Draft Technical Guidance* (November 1992). 40 CFR 258, Subpart E states the following:

> *§ 258.51 Ground-water monitoring systems. (a) A ground-water monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from the uppermost aquifer…*

The definitions in 40 CFR, Part 258 for aquifer and uppermost aquifer are:

> *Aquifer means a geological formation, group of formations, or portion of a formation capable of yielding significant quantities of ground water to wells or springs.*
>
> *Uppermost aquifer means the geologic formation nearest the natural ground surface that is an aquifer, as well as, lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.*

Title 27 §20415 (b) (1) states:

> *(B) For DMP—for a detection monitoring program under §20420:*
>
> *1. a sufficient number of Monitoring Points (as defined in §20164) installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water passing the Point of Compliance and to allow for the detection of a release from the Unit;…*

[2] Einarson, Fowler & Watson February 27, 1998, *Evaluation of Groundwater Monitoring Network and Corrective Action Effectiveness, Yuba-Sutter Disposal, Inc. Landfill.*

5. Monitoring Point locations and depths that include the zone(s) of highest hydraulic conductivity in each ground water body monitored pursuant to this subsection.

2.3 Landfill Groundwater Monitoring System

As specified in MRP No. R5-2003-0093, the landfill has 13 groundwater monitoring wells (Figure 2):

- three background wells (MW-5, MW-6, and MW-7),
- two detection monitoring wells (MW-9 and MW-13),
- three LF-3 corrective action wells (MW-8, MW-11, and MW-12), and
- five LF-1/LF-2 corrective action wells (MW-1, MW-2, MW-3, MW-4, and MW-10).

Boring logs and well construction details for each monitoring well are attached to this letter (Appendix A). Geologic sections showing the monitoring well screen and sand pack intervals, geologic units, first encountered groundwater, static groundwater, and approximate base of the landfill are presented on Figures 3 and 4. Hydrographs showing historical groundwater elevations, well screen intervals, and sand pack intervals are presented in Appendix B.

2.4 Site Hydrogeology

The YSDI Landfill is typically underlain by three geologic units:

- an upper sand layer,
- a middle clay/silt layer, and
- a deeper sequence of interbedded clay, silt, sand, and gravel.

These sediments are flat-lying, deposited by alluvial processes. Groundwater has been found in the deeper interbedded sequence, underlying the clay/silt layer, which acts as a confining layer to the underlying water-bearing sediments. The uppermost sand layers within the interbedded sequence have water seasonally. The deeper sands are saturated and confined. The sand and gravel layers are lenticular to sheet-like in shape. The sand layers are interconnected either locally or on a regional scale.

The water-bearing zone monitored by each groundwater monitoring well underlies the confining clay/silt layer and consists of sand and silty to clayey sands and gravels. The saturated sands occur at an elevation below approximately 55 feet, MSL, and the initial groundwater encountered in the boring for each well subsequently rose under piezometric head approximately 5 to 10 feet following well installation.

2.5 Groundwater Monitoring Well Evaluations

The following summarizes the subsurface materials encountered in each monitoring well borehole, well construction, and subsequent groundwater levels for each monitoring well. See boring logs and well hydrographs in Appendix A and B, respectively. The well screen intervals, sand pack, and water levels are summarized on Table 1, below.

2.5.1 Monitoring Well MW-1

The boring for well MW-1 was drilled through 22 feet of silty to sandy clay (middle clay layer). Apparently, the upper sand layer was absent or not recognized. Underlying the clay layer was sandy clay to gravelly clay (interbedded sequence). Groundwater was first encountered within the interbedded sequence at a depth of 32 feet (42 feet, MSL). The well was constructed with 10 feet of well screens within the interbedded sequence to a depth of 39 feet (36 to 46 feet, MSL). The sand pack extends up to the base of the middle clay layer at a depth of 20 feet (54 feet, MSL). After well construction, the piezometric water level rose to a depth of approximately 23 feet (51 feet, MSL). The groundwater level in well MW-1 has fluctuated between 50 to 56 feet, MSL, which is mostly within the sand pack interval of the well.

2.5.2 Monitoring Well MW-2

The boring for well MW-2 was drilled through 10 feet of gravelly silty sand (upper sand layer), followed by silty clay to gravelly clay from 10 to 26 feet (middle clay layer). Underlying the clay layer was gravelly sandy clay to clayey gravel (interbedded sequence). Groundwater was first encountered within the gravelly layer and the well was constructed with 5 feet of well screens within the gravelly layer (46 to 51 feet, MSL). The piezometric water level in MW-2 rose to a depth of approximately 25 feet (53 feet, MSL) following well construction. The groundwater level in well MW-2 has fluctuated between 52 and 58 feet, MSL, which is slightly above the well screens.

2.5.3 Monitoring Well MW-3

The boring for well MW-3 was drilled through 12 feet of fill and sandy silt (upper sand layer), followed by clayey silt and silty clay from 12 to 20 feet (middle clay layer). The interbedded sequence underlying the clay consists of 20 feet of silty sand and gravelly sand. Groundwater was first encountered within the interbedded sequence at a depth of 27 feet (55 feet, MSL). The well was constructed with 6 feet of well screens to a depth of 35 feet (50 to 56 feet, MSL). The piezometric water level in well MW-3 rose to a depth of 26 feet (59 feet, MSL) following well construction. The groundwater level in well MW-3 has ranged from 55 to 62 feet, MSL, which is mostly within the well screen or sand pack interval.

2.5.4 Monitoring Well MW-4

The boring for well MW-4 was drilled through 20 feet of sandy silt and sand (upper sand layer), followed by sandy silt and clay from 20 to 37 feet (middle clay layer). Silty sand was encountered below the silt/clay layer. Groundwater was first encountered at 29 feet, within the silt/clay layer. The well was constructed with 10 feet of screen from 28.5 to 39.5 feet (46 to 56 feet, MSL). The piezometric water level in well MW-4 rose to a depth of 25 feet (59 feet, MSL) following well construction. The groundwater level in well MW-4 has ranged from 56 to 67 feet, MSL, which is within the well screens during the dry season of each year.

2.5.5 Monitoring Well MW-5

The boring for well MW-5 was drilled through the upper sand and middle clay layers and encountered the interbedded sequence at a depth of 23 feet. Groundwater was first encountered at the top of the interbedded sequence. The well was constructed with 20 feet of screen from 23.5 to 33.5 feet (46 to 56 feet, MSL). The piezometric water level in well MW-5 rose to a depth of 16 feet (63 feet, MSL) following well construction. The groundwater level has ranged from 61 to 66 feet, MSL, which is above the well screens and sand pack.

2.5.6 Monitoring Well MW-6

The boring for well MW-6 was drilled through the upper sand and middle clay layers and encountered the interbedded sequence at a depth of 27 feet. Groundwater was first encountered in the interbedded sequence. The well was constructed with 20 feet of screen from 25 to 35 feet (47 to 57 feet, MSL). The piezometric water level in well MW-6 rose to a depth of 20 feet (62 feet, MSL) following well construction. The groundwater level has ranged from 61 to 66 feet, MSL, which is above the well screens and sand pack.

2.5.7 Monitoring Well MW-7

The boring for well MW-7 was drilled through the upper sand and middle clay layers and encountered the interbedded sequence at a depth of 33 feet. Groundwater was first encountered in the interbedded sequence. The well was constructed with 10 feet of screen from 32 to 42 feet (41 to 51 feet, MSL). The piezometric water level in well MW-7 rose to a depth of 21 feet (62 feet, MSL) following well construction. The groundwater level has ranged from 62 to 66 feet, MSL, which is above the well screens and sand pack.

2.5.8 Monitoring Well MW-8

The boring for well MW-8 was drilled through 13 feet of the upper sand and 15 feet of the middle clay layer and encountered the interbedded sequence at a depth of 28 feet. Groundwater was first encountered in the interbedded sequence. The well was constructed with 10 feet of screen from 27 to 37 feet (48 to 58 feet, MSL). The piezometric water level in well MW-8 rose to a depth of 25 feet (60 feet, MSL) following well construction. The groundwater level has ranged from 60 to 66 feet, MSL, which is seasonally within the well sand pack interval.

2.5.9 Monitoring Well MW-9

The boring for well MW-9 was drilled through 8 feet of the upper sand and 19 feet of the middle clay layer and encountered the interbedded sequence at a depth of 27 feet. Groundwater was first encountered in a sand layer at 23 feet (60 feet, MSL). The well was constructed with 10 feet of screen from 26.5 to 36.5 feet (47 to 57 feet, MSL). The piezometric water level in well MW-9 dropped to below the sand layer to a depth of 25 feet (58 feet, MSL) following well construction. The groundwater level has ranged from 58 to 64 feet, MSL, which is seasonally within the well sand pack interval.

2.5.10 Monitoring Well MW-10

The boring for well MW-10 was drilled through 12 feet of fill and refuse, followed by the upper sand and middle clay layer, and encountered the interbedded sequence at a depth of 38 feet. Groundwater was first encountered in the interbedded sequence at 38 feet (54 feet, MSL). The well was constructed with 10 feet of screen from 40.5 to 50.5 feet (42 to 52 feet, MSL). The piezometric water level in well MW-10 dropped to a depth of 39 feet (53 feet, MSL) following well construction. The groundwater level has ranged from 52 to 62 feet, MSL, which is mostly within the well sand pack interval.

Well MW-10 is located along the site boundary between the YSDI landfill and the Yuba Sutter Disposal Area (YSDA) landfill. The YSDA landfill is not related to the YSDI landfill. The presence of refuse in the upper 12 feet of the MW-10 boring indicates that there is not unfilled land along the southwestern boundary of the site. If there is a desire to decrease the well spacing between wells MW-1 and MW-10, a well could be located at the southeast property corner approximately 350 feet southwest of MW-1. However, a well at this location could show influence from the adjacent YSDA landfill and potentially cause false-positive release indications.

2.5.11 Monitoring Well MW-11

The boring for well MW-11 was drilled through 16 feet of the upper sand layer and 10 feet of the middle clay layer, encountering the interbedded sequence at a depth of 26 feet. Groundwater was first encountered in the interbedded sequence at 27 feet (59 feet, MSL). The well was constructed with 10 feet of screen from 24 to 34 feet (52 to 62 feet, MSL). The water level in well MW-11 has ranged from 60 to 65 feet, MSL, which is within the well screen or sand pack interval.

2.5.12 Monitoring Well MW-12

The boring for well MW-12 was drilled through 15 feet of the upper sand layer and 10 feet of the middle clay layer, encountering the interbedded sequence at a depth of 25 feet. Groundwater was first encountered in the interbedded sequence at 27 feet (60 feet, MSL). The well was constructed with 10 feet of screen from 25 to 35 feet (52 to 62 feet, MSL). The water level in well MW-12 has ranged from 59 to 65 feet, MSL, which is within the well screen or sand pack interval.

2.5.13 Monitoring Well MW-13

The boring for well MW-13 was drilled through 3 feet of the upper sand layer and 8 feet of the middle clay layer, encountering the interbedded sequence at a depth of 11 feet. Groundwater was first encountered in the interbedded sequence at 13 feet (61 feet, MSL). The well was constructed with 10 feet of screen

from 17 to 27 feet (47 to 57 feet, MSL). The water level in well MW-13 has ranged from 59 to 65 feet, MSL, which is within the well sand pack interval.

2.5.14 Piezometer PZ-14

The boring for PZ-14 was drilled through 4 feet of the upper sand layer and 8 feet of the middle clay layer, encountering the interbedded sequence at a depth of 12 feet. Groundwater was first encountered in the interbedded sequence at 18 feet (59 feet, MSL). The well was constructed with 10 feet of screen from 14.5 to 24.5 feet (52 to 62 feet, MSL). The water level in well MW-13 has ranged from 59 to 64 feet, MSL, which is within the well screen or sand pack interval.

2.5.15 Monitoring Well Screen Evaluation

The following table (Table 1) provides a summary of groundwater elevation compared to the monitoring well screen and sand pack intervals.

Table 1. Monitoring Well Screen Evaluations

Well	Well Screen Interval (feet, MSL)	Top of Sand Pack (feet, MSL)	First Encountered Groundwater (feet, MSL)[1]	Historical Groundwater Elevation Range (feet, MSL)[2]	Groundwater Level vs. Well Screen Evaluation
MW-1	36-46	54	42	50 – 56	Mostly in sand pack
MW-2	46-51	51	45	52 - 58	Above well screen
MW-3	50-56	57	55	55 – 62	Mostly in well screen/sand pack
MW-4	46-56	58	54	56 - 67	Within sand pack in dry season
MW-5	46-56	58	56	61 – 66	Above screen/sand pack
MW-6	47-57	59	55	61 – 66	Above screen/sand pack
MW-7	41-51	55	50	62 – 66	Above screen/sand pack
MW-8	48-58	61	61	60 – 66	Within sand pack in dry season
MW-9	47-57	60	61	58 – 64	Within sand pack in dry season
MW-10	42-52	55	54	52 – 62	Mostly within sand pack
MW-11	52-62	64	59	60 – 65	Within well screen/sand pack
MW-12	52-62	65	60	59 – 65	Within well screen/sand pack
MW-13	47-57	60	61	59 – 65	Mostly within sand pack
PZ-14	52-62	65	59	59 - 64	Within screen/sand pack

1. Encountered during drilling
2. Includes water level rise due to piezometric head at well screen

While several of the monitoring wells have water levels above the wells screens or sand pack, these are piezometric water levels resulting from confined groundwater conditions caused by the overlying confining clay layer. The wells are properly constructed to meet the intent of 40 CFR and Title 27. Groundwater was first encountered in each of the wells within the interbedded sequence and the well screens and sand pack intervals were placed within the interbedded sequence. Therefore the groundwater samples obtained from the wells are representative of first encountered groundwater quality. Groundwater elevations have subsequently risen in many of the wells as a result of the confining nature of the overlying middle clay layer. Note that all of the piezometric groundwater elevations in the monitoring wells are within the depth range of the middle clay layer, deeper than the upper sand layer.

The groundwater samples from the wells are obtained from the first-encountered groundwater, within the interbedded sequence. Both 40 CFR and Title 27 require monitoring wells to *yield groundwater samples from the uppermost aquifer*. The interbedded sequence that underlies the confining middle clay layer is the uppermost aquifer underlying the landfill. Therefore, the monitoring wells are properly constructed to meet the requirements of 40 CFR and Title 27.

If there was an unconfined aquifer underlying the landfill, then, as stated in the *RCRA Ground-Water Monitoring: Draft Technical Guidance* (November 1992), "*the well screen typically would be positioned so that a portion of the well screen is in the saturated zone and a portion of the well screen is in the unsaturated zone (i.e., the well screen straddles the water table).*" Because the aquifer underlying the landfill is confined by the middle clay layer, monitoring well screens that *straddle the water table* are not possible.

3.0 EFFECTIVENESS OF LF-1 AND LF-2 CORRECTIVE ACTION MEASURES

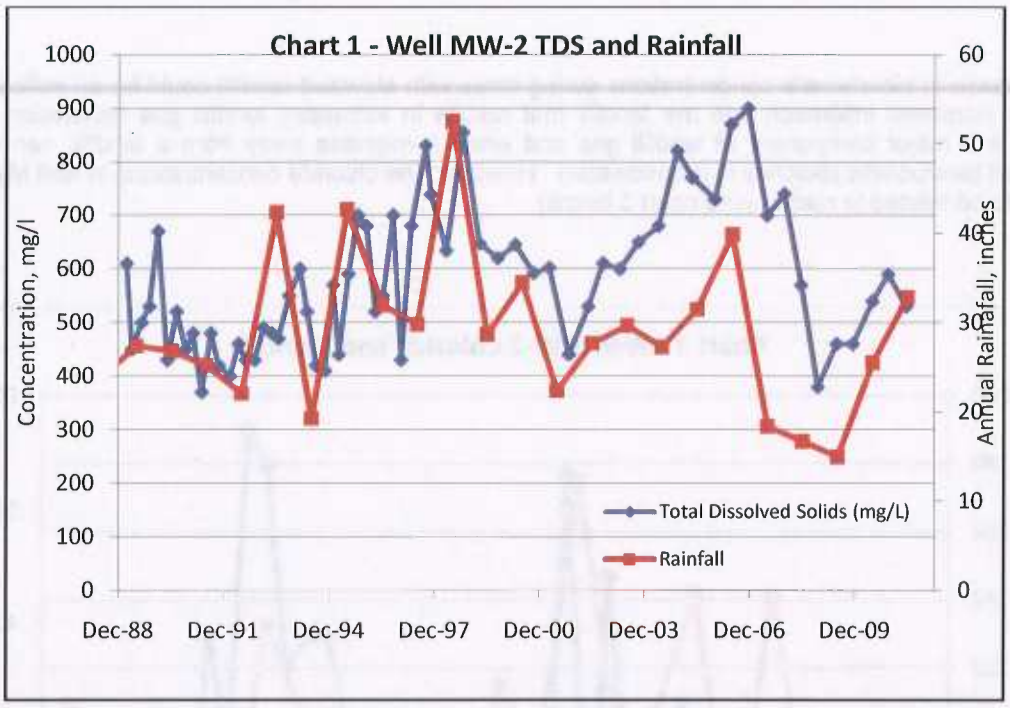
There are five corrective action monitoring wells located adjacent to LF-1 and LF-2 (MW-1, MW-2, MW-3, MW-4, and MW-10). Currently, there is only one VOC detected at a concentration above the method reporting limit, 1,4-dichlorbenzene in wells MW-2 and MW-10. Of the inorganic water quality parameters, there are concentration limit exceedances for specific conductance (SC), alkalinity, chloride, and total dissolved solids (TDS). Note that SC and TDS are directly correlative and alkalinity is a substantial portion of SC and TDS at the site. The following evaluations use data from representative wells to illustrate the relationships observed in multiple wells.

The evaluation of corrective action measures presented below shows that the quality of groundwater downgradient of LF-2 has improved and there is no need to implement additional corrective actions at LF-2. Based on the rate of concentration decline, two of the VOCs (cis-1,2-dichloroethene and vinyl chloride) detected in groundwater downgradient of LF-1 will fall below the method detection limit within the next two to three years. The remaining VOCs (1,4-dichlorobenzene, 1,2-dichlorobenzene, and chlorobenzene) are declining, but appear to fluctuate dependant on the amount of annual rainfall. Inorganic parameters (mainly bicarbonate alkalinity and chloride) also remain above concentration limits and react to changes in annual rainfall. Because of the remaining VOCs and inorganic parameters in groundwater downgradient of LF-1, a recommendation is made to perform a risk assessment to evaluate whether there are additional corrective actions that could be implemented at LF-1 to reduce the groundwater impacts.

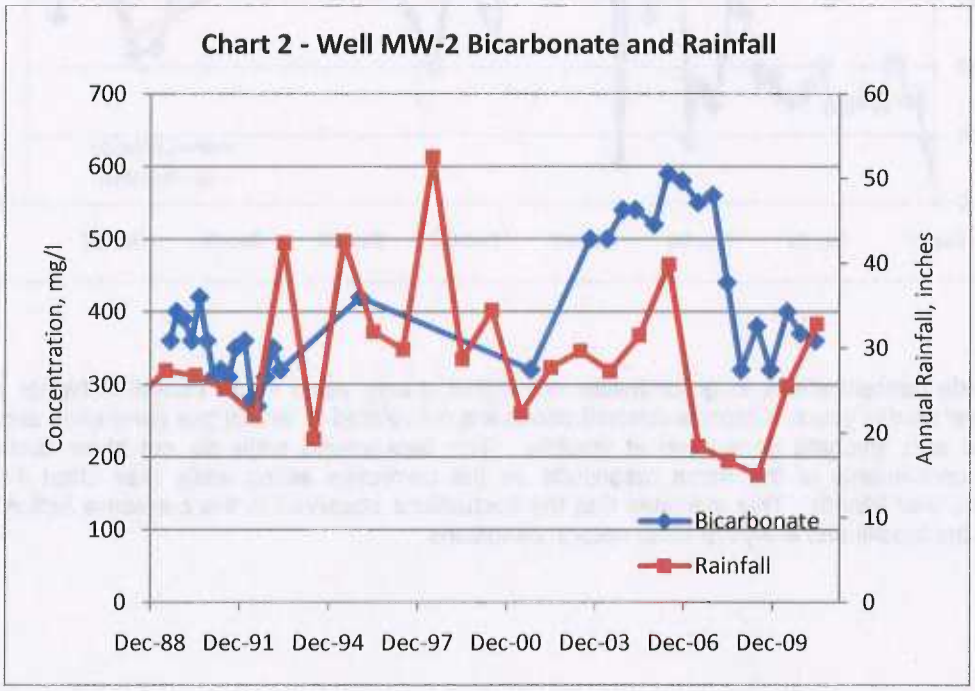
3.1 Inorganic Parameters in Groundwater

Some of the inorganic parameter concentration fluctuations in the corrective action monitoring wells appear to be related to the amount of seasonal rainfall.[3] For example, as shown in chart 1 below, the TDS concentration in well MW-2 moves up and down in a similar pattern as the annual rainfall. When rainfall is higher, the TDS concentration is generally higher. Similar fluctuations are evident in other corrective action wells.

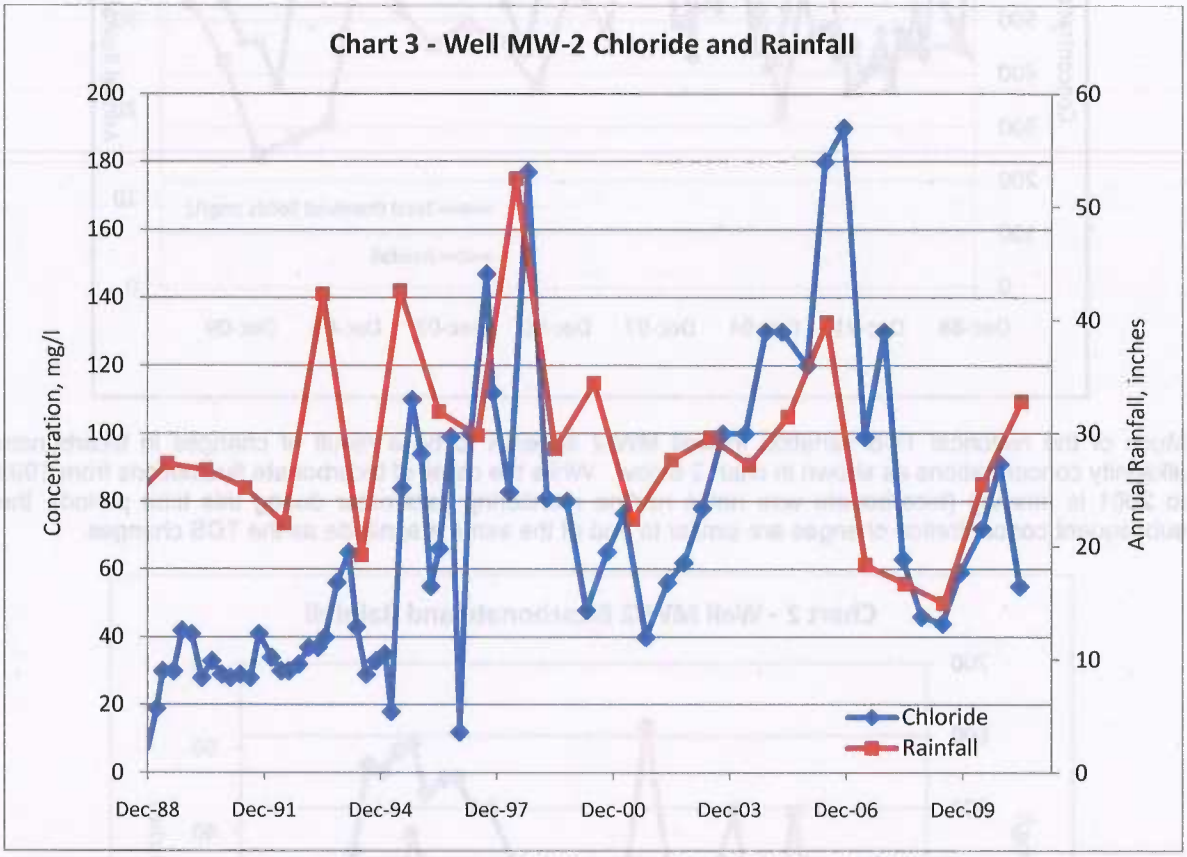
[3] Browns Valley Station, California Irrigation Management Information System, http://www.ipm.ucdavis.edu/



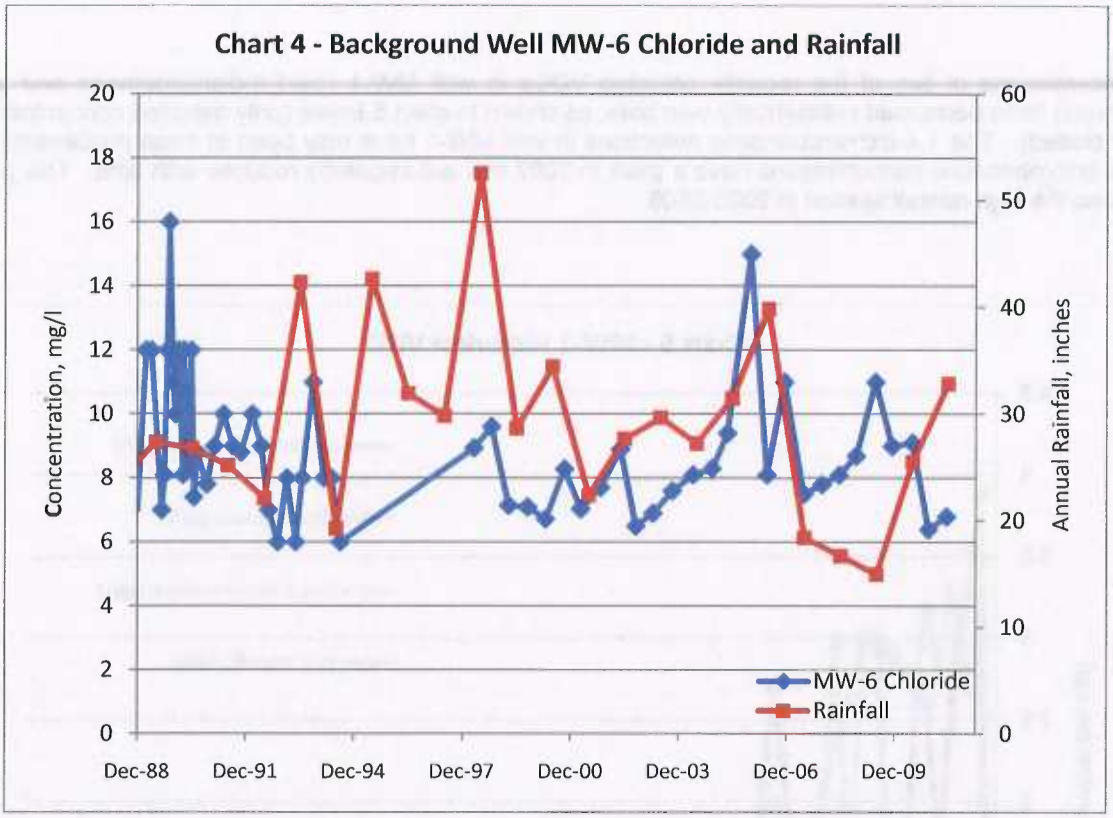
Much of the historical TDS variation in well MW-2 appears to be a result of changes in bicarbonate alkalinity concentrations as shown in chart 2 below. While the detail of bicarbonate fluctuations from 1993 to 2001 is missing (bicarbonate was not a routine monitoring parameter during this time period), the subsequent concentration changes are similar to and of the same magnitude as the TDS changes.



The increase in bicarbonate concentrations during times with elevated rainfall could be an indication that there is increased infiltration into the landfill that results in increased landfill gas generation (carbon dioxide is a major component of landfill gas and when it migrates away from a landfill, can result in increased bicarbonate alkalinity in groundwater). However, the chloride concentrations in well MW-2 also appear to be related to rainfall (see chart 3 below).



The chloride concentrations in groundwater are higher during years when rainfall is higher and lower during lower rainfall years. Chloride concentrations are not related to landfill gas generation and are often associated with leachate generation at landfills. The background wells do not show fluctuations of inorganic constituents of the same magnitude as the corrective action wells (see chart 4 below for background well MW-6). This indicates that the fluctuations observed in the corrective action wells are related to the landfill and likely not other natural conditions.



Overall, the changes in groundwater chemistry in the corrective action wells appear to be from two potential sources: leachate and/or landfill gas. The alkalinity increases are indicative of landfill gas, while the chloride concentrations point toward leachate as a source. Whichever is the dominant source, the data indicate that infiltration into the landfill during wetter years could be the cause of the increased leachate or increased landfill gas influence on groundwater, and the resulting increases in inorganic constituents.

3.2 VOCs in Corrective Action Wells

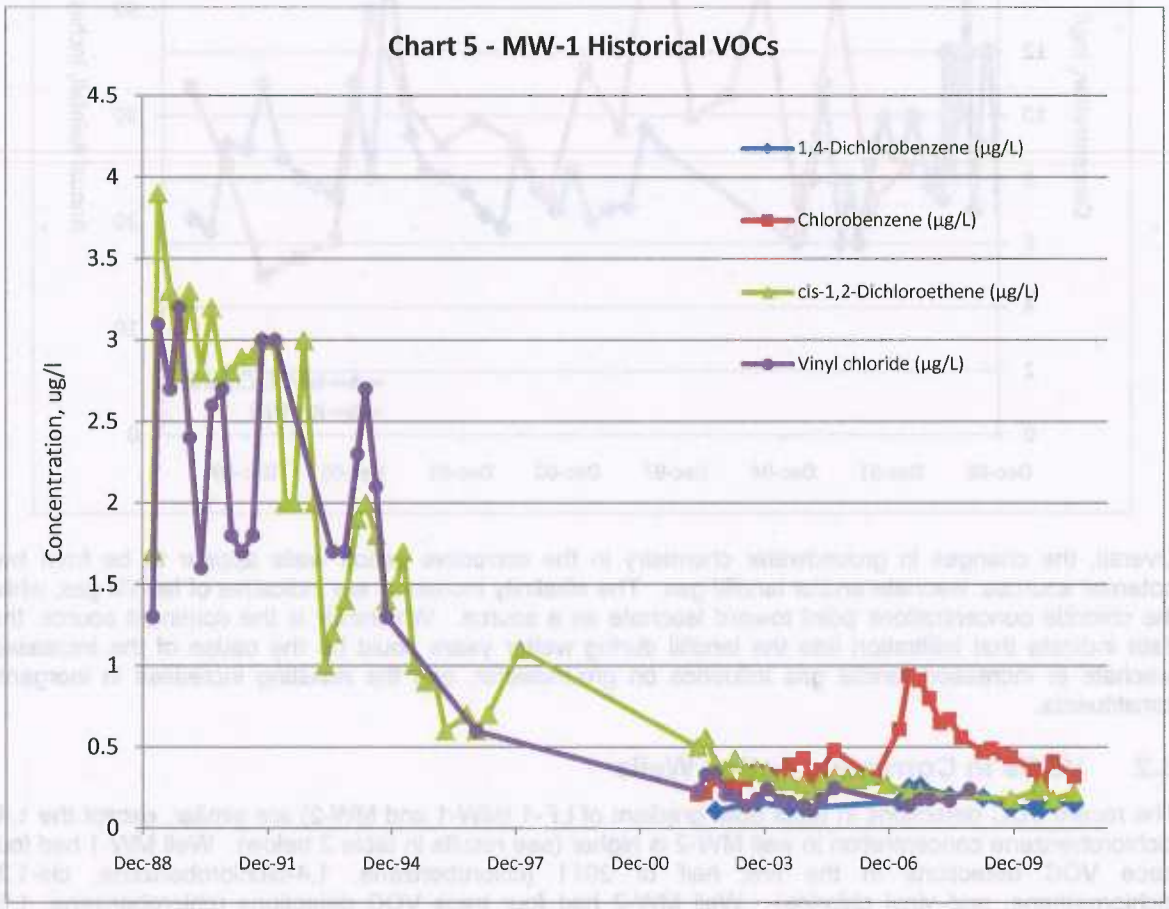
The recent VOC detections in wells downgradient of LF-1 (MW-1 and MW-2) are similar, except the 1,4-dichlorobenzene concentration in well MW-2 is higher (see results in table 2 below). Well MW-1 had four trace VOC detections in the first half of 2011 (chlorobenzene, 1,4-dichlorobenzene, cis-1,2-dichloroethene, and vinyl chloride). Well MW-2 had four trace VOC detections (chlorobenzene, 1,2-dichlorobenzene, cis-1,2-dichloroethene, and vinyl chloride) and 1,4-dichlorobenzene above the reporting limit.

Table 2 – Recent VOC Results for LF-1 Corrective Action Wells

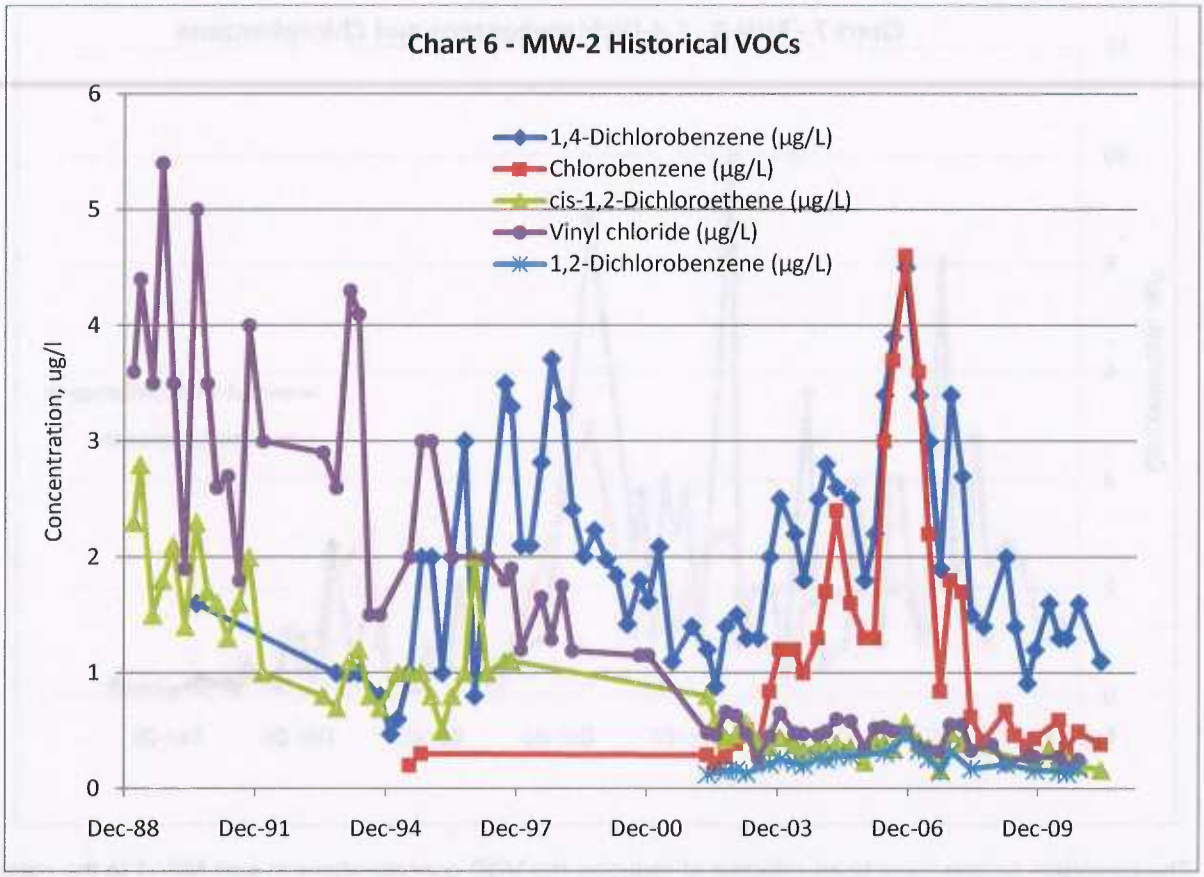
Well		MW-1		MW-2	
Parameter/Date	**unit**	**3/8/11**	**6/10/11**	**3/8/11**	**6/10/11**
Chlorobenzene	µg/l	0.39 j	0.32 j	0.47 j	0.38 j
1,2-Dichlorobenzene	µg/l	<0.072	<0.072	0.18 j	<0.072
1,4-Dichlorobenzene	µg/l	0.16 j	0.15 j	**1.6**	**1.1**
cis-1,2-Dichloroethene	µg/l	0.22 j	0.22 j	0.23 j	0.16 j
Vinyl chloride	µg/l	0.12 j	<0.12	0.24 j	<0.12

j - trace concentration between the reporting limit and detection limit; result is an estimate.

Concentrations of two of the recently detected VOCs in well MW-1 (cis-1,2-dichloroethene and vinyl chloride) have decreased substantially over time, as shown in chart 5 below (only detected concentrations are plotted). The 1,4-dichlorobenzene detections in well MW-1 have only been at trace concentrations. The chlorobenzene concentrations have a peak in 2007 that subsequently reduced with time. This peak follows the high rainfall season in 2005-2006.



VOC concentration trends in well MW-2 are similar to those in well MW-1 (see chart 6 below of detected VOC concentrations in well MW-2). The cis-1,2-dichloroethene and vinyl chloride concentrations have decreased substantially, while chlorobenzene and 1,4-dichlorobenzene have peak concentrations that appear to correlate with high rainfall years, 1997-1998 and 2005-2006. After the VOC concentrations peak during high rainfall years, the concentrations decline.

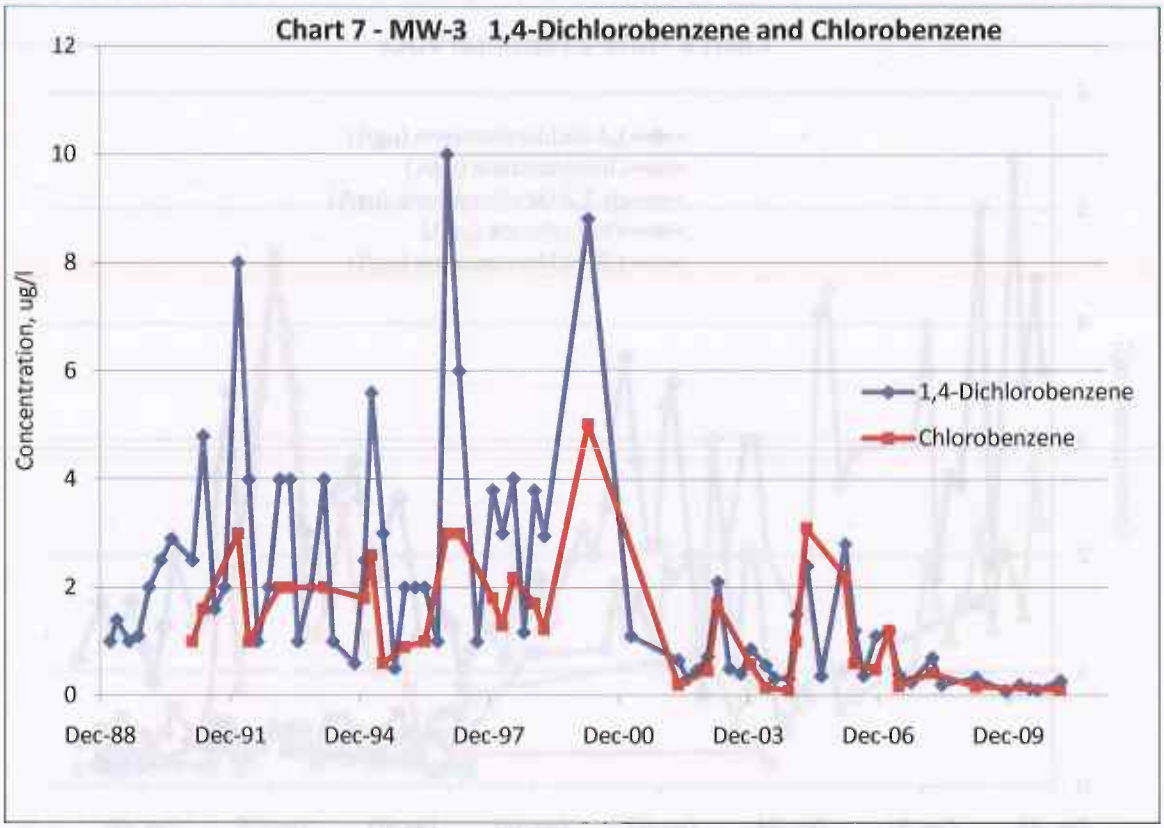


Downgradient of LF-2, there were two trace VOC detections in well MW-3 in March 2011, but no VOC detections in June 2011. No VOCs were detected in well MW-4. The recent monitoring results are summarized in table 3 below.

Table 3 - Recent VOC Results for LF-2 Corrective Action Wells

Well		MW-3		MW-4	
Parameter/Date	**unit**	**3/8/11**	**6/10/11**	**3/8/11**	**6/10/11**
Chlorobenzene	µg/l	0.11 j	<0.093	<0.093	<0.093
1,2-Dichlorobenzene	µg/l	<0.072	<0.072	<0.072	<0.072
1,4-Dichlorobenzene	µg/l	0.28 j	<0.062	<0.062	<0.062
cis-1,2-Dichloroethene	µg/l	<0.085	<0.085	<0.085	<0.085
Vinyl chloride	µg/l	<0.12	<0.12	<0.12	<0.12

The two VOCs detected at trace concentrations in well MW-3 in March were chlorobenzene and 1,4-dichlorobenzene. Over the last four years of monitoring, these are the only VOCs that have been detected in well MW-3. Historical concentrations of chlorobenzene and 1,4-dichlorobenzene are shown in chart 7 below (only detections are plotted). The concentrations have decreased from 5 to 10 µg/l in 1997, to trace concentrations.



The corrective actions have been effective at reducing the VOC concentrations in well MW-3 to the point that VOCs are only detected sporadically at trace concentrations.

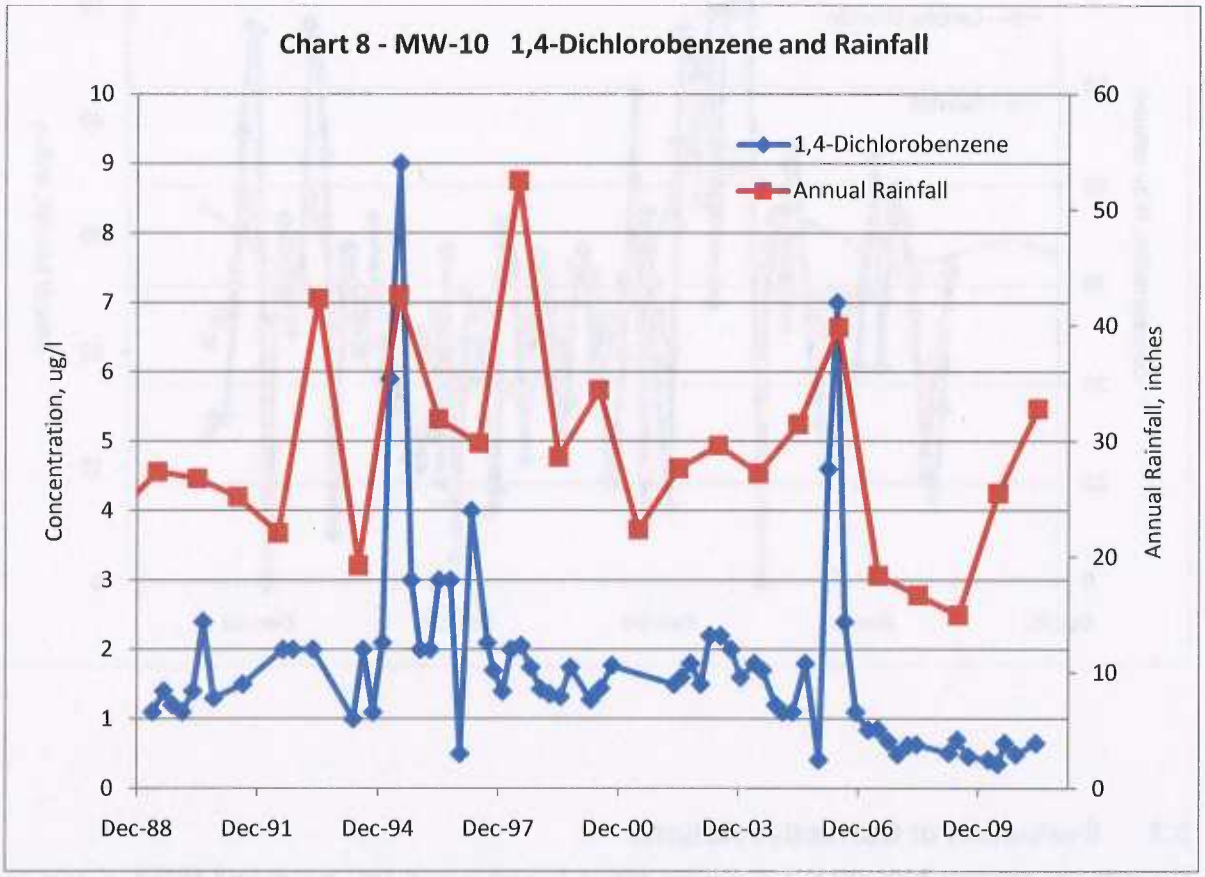
There have been no recent field or general water quality parameters detected above concentration limits in well MW-4. Other than acetone, which has been sporadically detected, the last VOC detection in well MW-4 was in 2006. The corrective actions have been effective at cleaning up groundwater at well MW-4.

Well MW-10 has one VOC detection, 1,4-dichlorobenzene (see table 4 below). No other VOCs have been detected in well MW-10 since 2006.

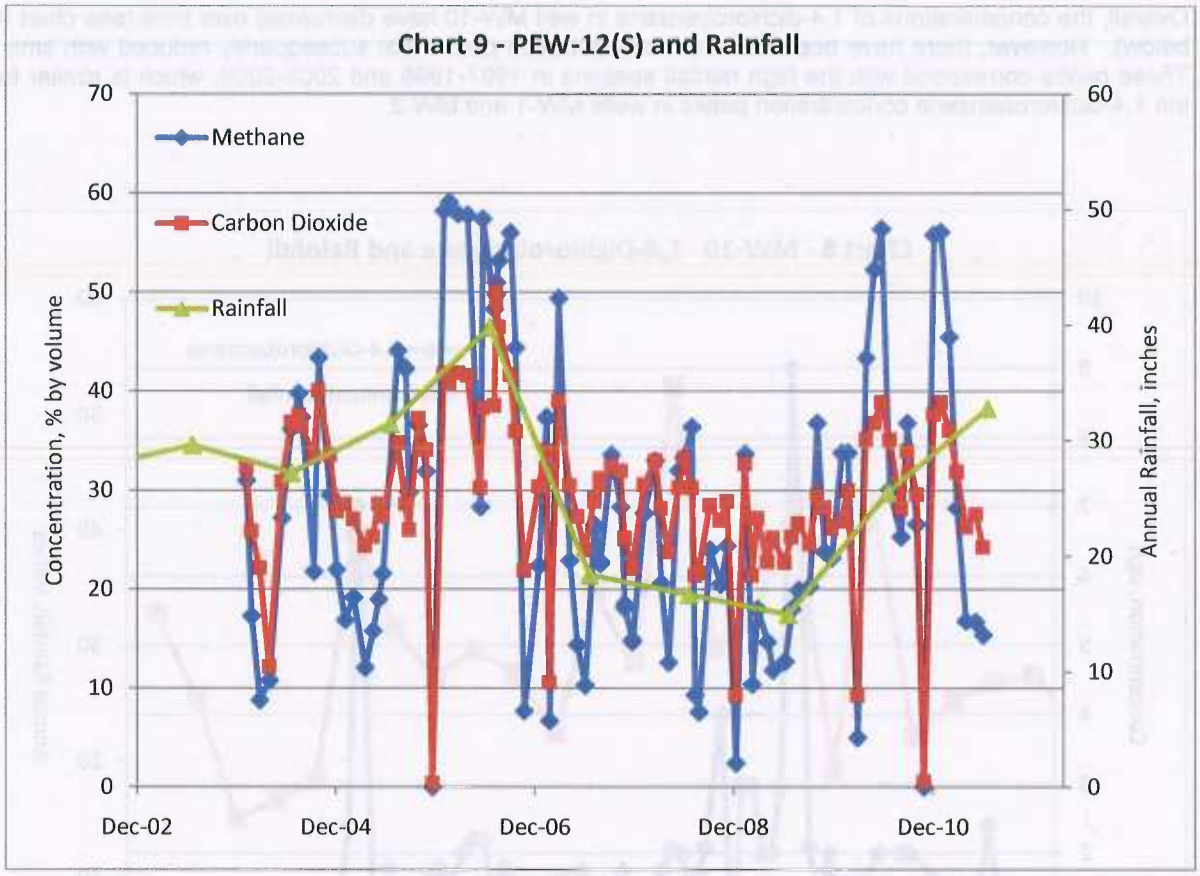
Table 4 – Recent VOC Results in Corrective Action Well MW-10

Well		MW-10	
Parameter/Date	**unit**	**3/8/11**	**6/10/11**
Chlorobenzene	µg/l	<0.093	<0.093
1,2-Dichlorobenzene	µg/l	<0.072	<0.072
1,4-Dichlorobenzene	µg/l	**0.57**	**0.65**
cis-1,2-Dichloroethene	µg/l	<0.085	<0.085
Vinyl chloride	µg/l	<0.12	<0.12

Overall, the concentrations of 1,4-dichlorobenzene in well MW-10 have decreased over time (see chart 8 below). However, there have been two main concentration peaks that subsequently reduced with time. These peaks correspond with the high rainfall seasons in 1997-1998 and 2005-2006, which is similar to the 1,4-dichlorobenzene concentration peaks in wells MW-1 and MW-2.



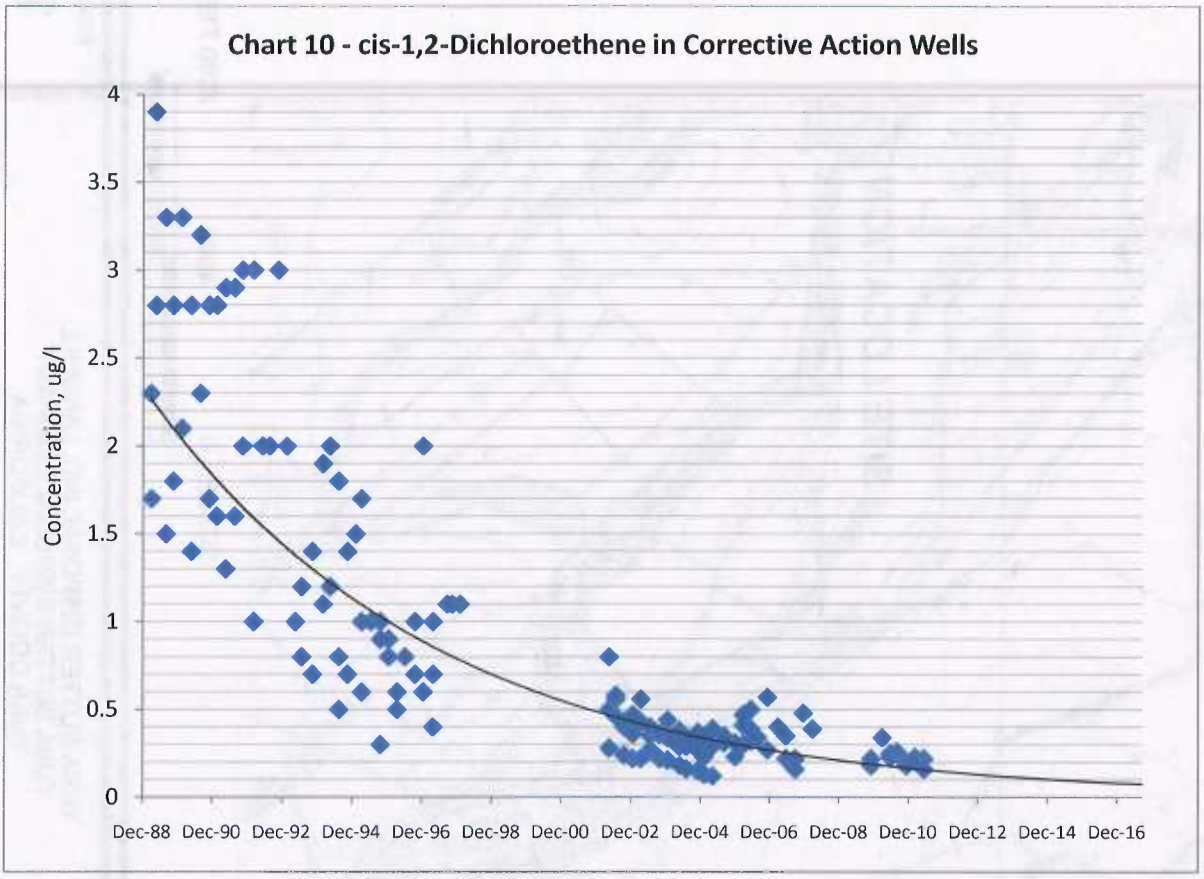
There are indications that the landfill gas concentration in the landfill is higher during wetter years (for example, see chart 9 below for perimeter landfill gas extraction well PEW-12S, located in LF-1 east of GP-7). The methane and CO_2 concentrations were higher during the wetter years of 2004 through 2006 and 2009 through 2011. This may be the result of the rainfall sealing off the landfill surface and confining the gas inside the landfill or increased gas generation resulting from refuse with higher water content. Note that PEW-12S is a landfill gas extraction well and operation of the landfill gas extraction system also can influence the gas concentration measured in a well.



3.3 Evaluation of Corrective Actions

Groundwater downgradient of LF-2 no longer shows impact in well MW-4 and well MW-3, except for intermittent, trace VOC detections in MW-3 and chloride just above the concentration limit in MW-3. The final cover placed on LF-2 in 1995 and the ongoing landfill gas extraction appear to have been effective corrective actions and no further corrective actions are considered necessary.

Historical VOC concentrations in groundwater downgradient of LF-1 show that the chlorinated hydrocarbon concentrations (e.g., cis-1,2-dichloroethene and vinyl chloride) have decreased substantially and have only been detected at trace concentrations during the last nine years (since 2002). Chart 10 below shows the historical cis-1,2-dichloroethene concentrations in LF-1 corrective action wells MW-1, MW-2, and MW-10. Projection of the concentration trendline indicates that concentrations of cis-1,2-dichloroethene will be below the method detection limit (approximately 0.1 µg/l) within the next two to three years. Vinyl chloride concentrations are already mostly below the method detection limit. No further corrective actions appear to be necessary to address the chlorinated hydrocarbons in the LF-1 area.

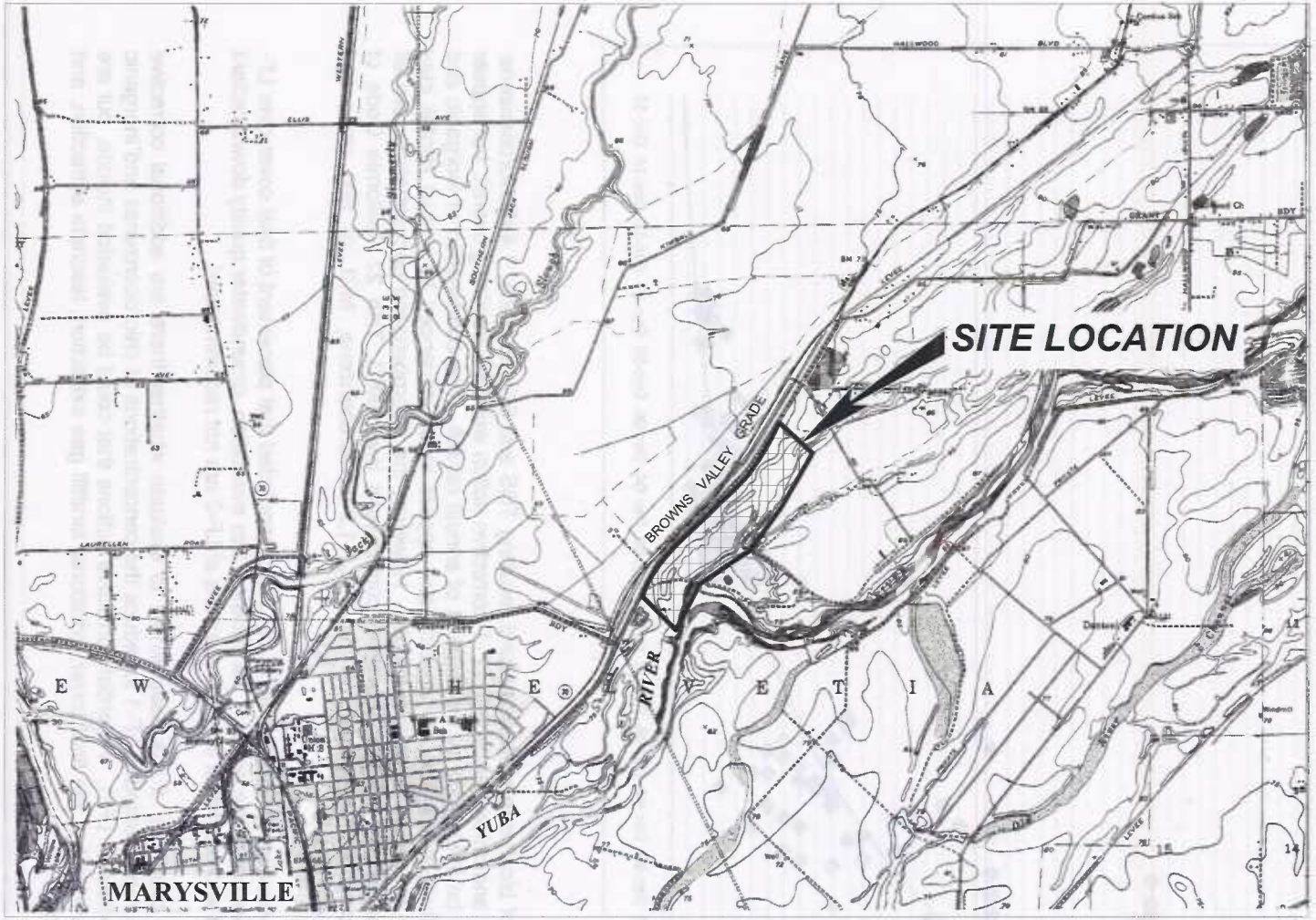


The concentrations of bicarbonate alkalinity (and resulting TDS and EC), chloride, 1,4-dichlorobenzene, 1,2-dichlorobenzene, and chlorobenzene in LF-1 corrective action wells are declining overall, but appear to fluctuate and may be influenced by the amount of annual rainfall. The combination of inorganic and VOC concentration fluctuations that are ongoing and appear to be influenced by annual rainfall may warrant additional or enhanced corrective actions. However, the chlorobenzene concentrations are all below their respective drinking water maximum contaminant level (MCL Title 22 California Code of Regulations): 1,4-dichlorobenzene, MCL of 5.0 µg/L; 1,2-dichlorobenzene, MCL of 600 µg/L; and chlorobenzene, MCL of 70 µg/L.

A corrective action evaluation was prepared in 1993 and concluded that placement of final cover over LF-2 would be an effective corrective action. [4] As shown in this evaluation, groundwater quality downgradient of LF-2 has improved and additional corrective actions at LF-2 are not recommended.

Golder recommends preparing a risk assessment to evaluate whether there are additional corrective actions that could be implemented at LF-1 to reduce the concentrations of chlorobenzenes and inorganic parameters downgradient of LF-1. Potential corrective actions that could be evaluated include, but are not limited to: improvement of the final cover, additional landfill gas extraction, leachate extraction, and groundwater extraction.

[4] EMCON Associates, *Amendment to Report of Waste Discharge, Yuba-Sutter Disposal, Inc. Landfill*, August 1993.



Base map from USGS 7.5' Quad. Map: Yuba City, CA (PR 1973).

Golder Associates

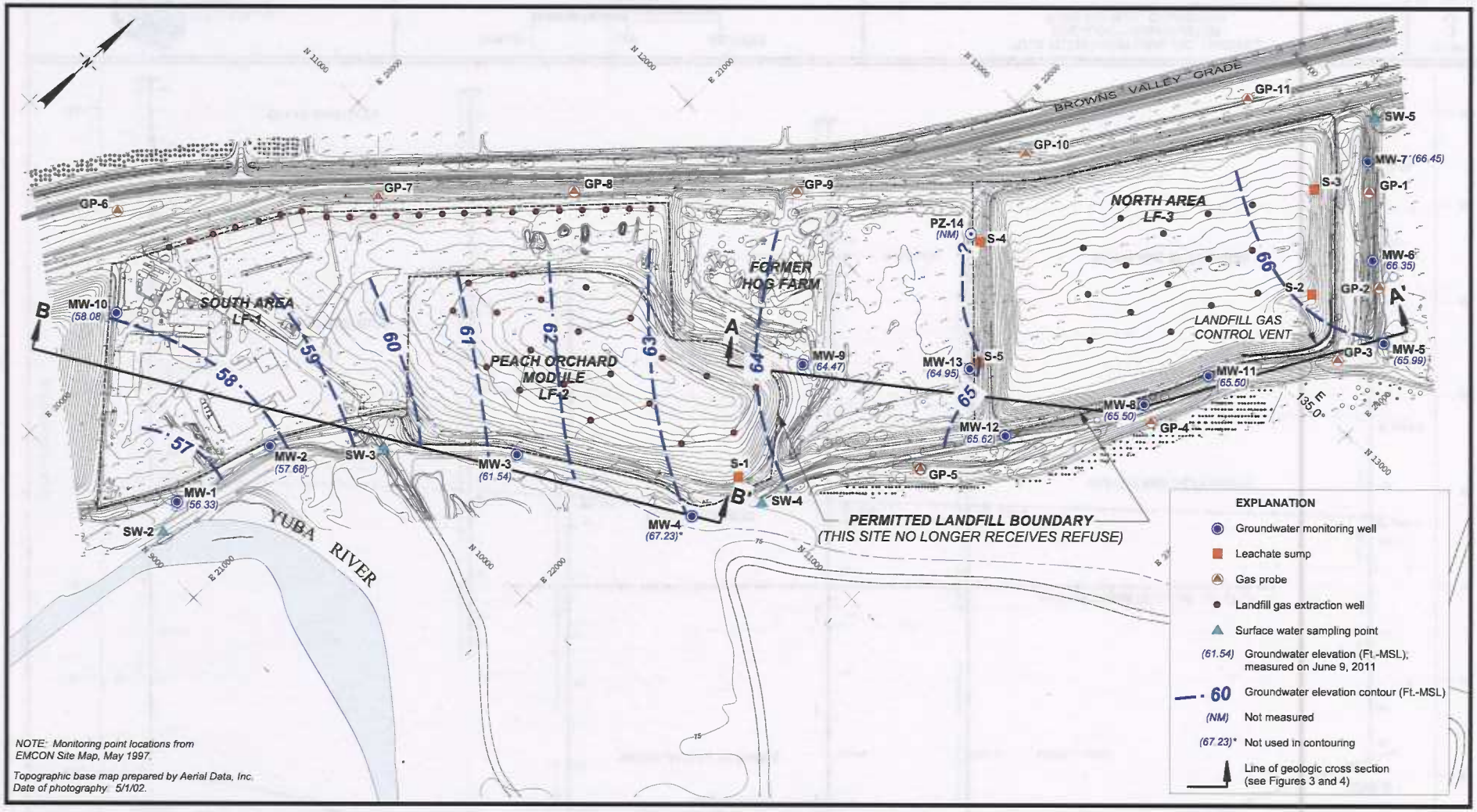
YUBA SUTTER DISPOSAL INC. LANDFILL
YUBA SUTTER DISPOSAL COMPANY
YUBA COUNTY, CALIFORNIA

SITE LOCATION

FIGURE
1

PROJECT NO.
053-7442-08

G:\053-7442-08\FIGURES\SITELOC.DSF 7/24/08



Golder Associates

SCALE: 0 400 800 FEET

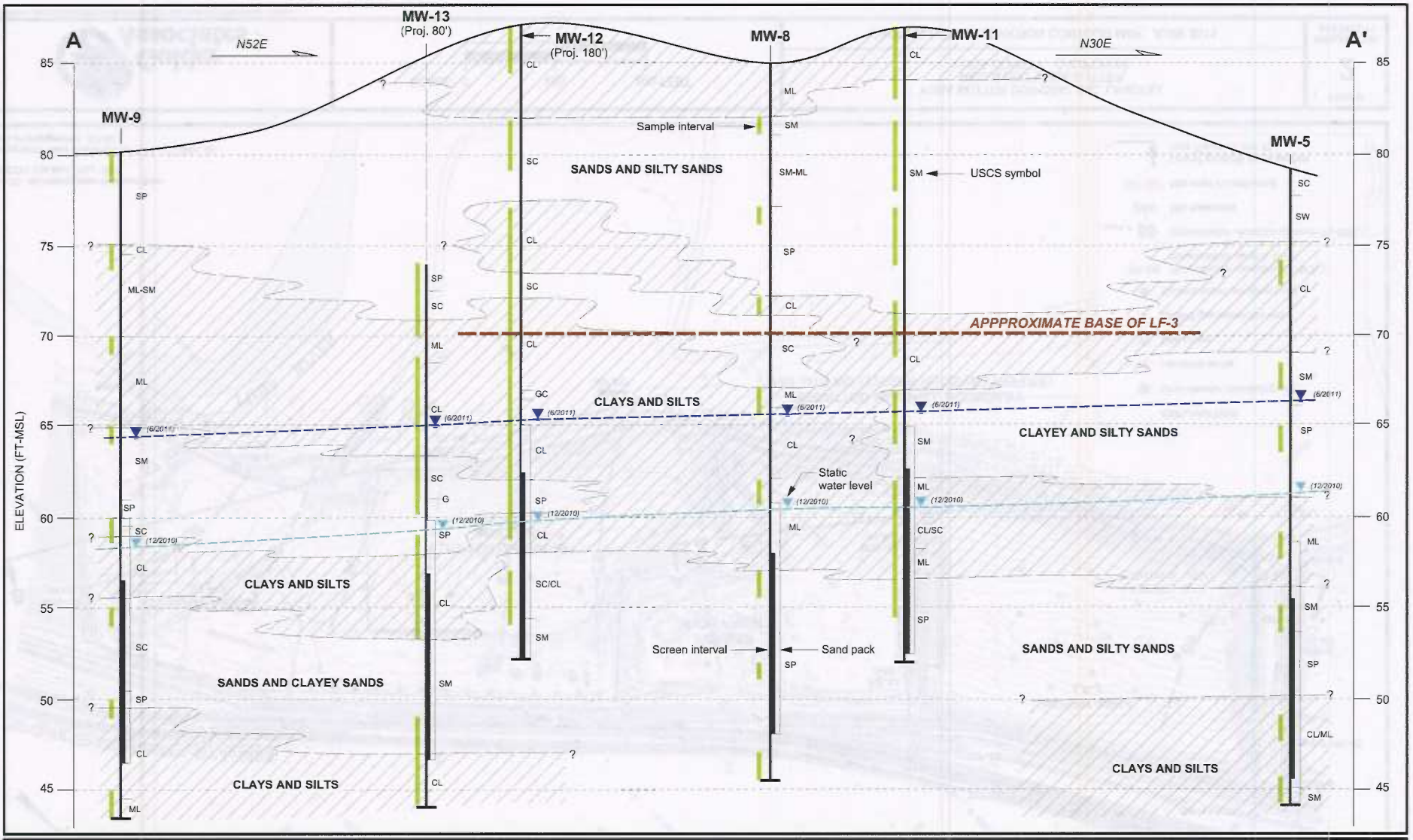
YUBA SUTTER DISPOSAL INC. LANDFILL
RECOLOGY YUBA-SUTTER
YUBA COUNTY, CALIFORNIA

GROUNDWATER ELEVATION CONTOUR MAP, JUNE 2011

FIGURE 2

PROJECT NO. 053-7442-11

G:\053-7442-11\FIGURES\MONITORING AND CROSS SECTION LOCATIONS.DSF 7/28/11



SCALE: 0 200 400 FEET
(HORIZONTAL)

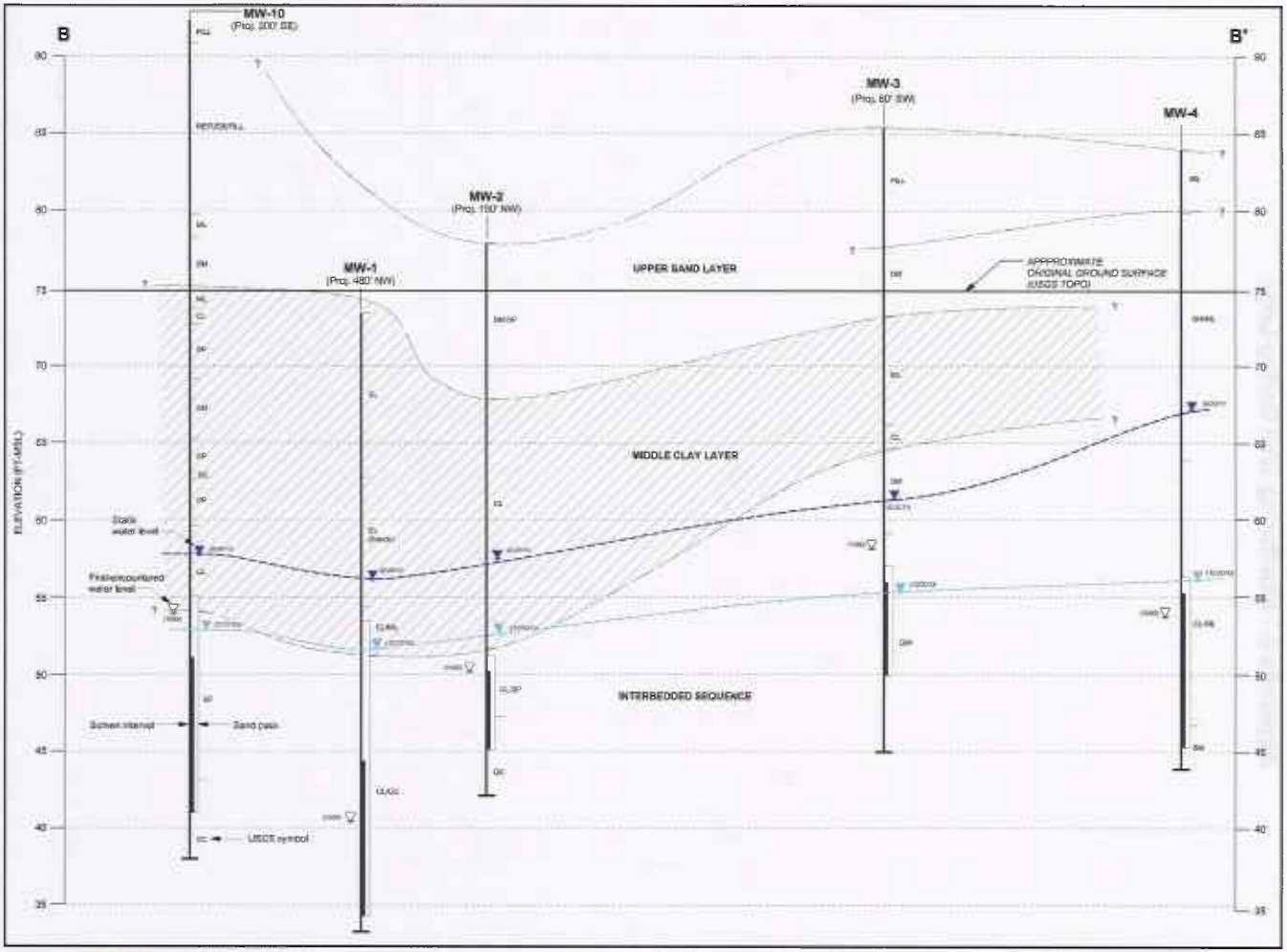
YUBA SUTTER DISPOSAL INC. LANDFILL
RECOLOGY YUBA-SUTTER
YUBA COUNTY, CALIFORNIA

GEOLOGIC CROSS SECTION A-A'

FIGURE
3

PROJECT NO.
053-7442-11

G:\053-7442-11\FIGURES\XSECAA.DSF 7/22/11



Golder Associates	SCALE: 0 200 400 FEET (HORIZONTAL)	YUBA SUTTER DISPOSAL INC. LANDFILL RECOLOGY YUBA-SUTTER YUBA COUNTY, CALIFORNIA GEOLOGIC CROSS SECTION B-B'	FIGURE 4 PROJECT NO. 053-7442-11

Appendix A - Monitoring Well Boring Logs

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-1

PROJECT NAME YUBA SUTTER DISPOSAL INCORPORATED PAGE 1 OF 1

BY John Batchelder DATE 12/8/80 SURFACE ELEV. 73.61'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
				0		CL		SILTY CLAY, medium brown (slightly reddish); damp.
				5		CL		CLAY, dark brown; damp to moist.
								@ 8': medium grayish brown; plastic.
				10		CL		SLIGHTLY SANDY CLAY, slightly limonitic brown; dry.
				15				
				20		CL ML		@ 19': increase in silt; moist.
						CL GC		SANDY CLAY to GRAVELLY CLAY; coarse sand and gravel.
				25				@ 27': decrease in gravel.
				30				@ 30': moist.
								@ 32': wet.
								@ 33': moist.
				35				@36': some high plasticity clay matrix; moist.
				40				BORING TERMINATED AT 40 FEET.

REMARKS

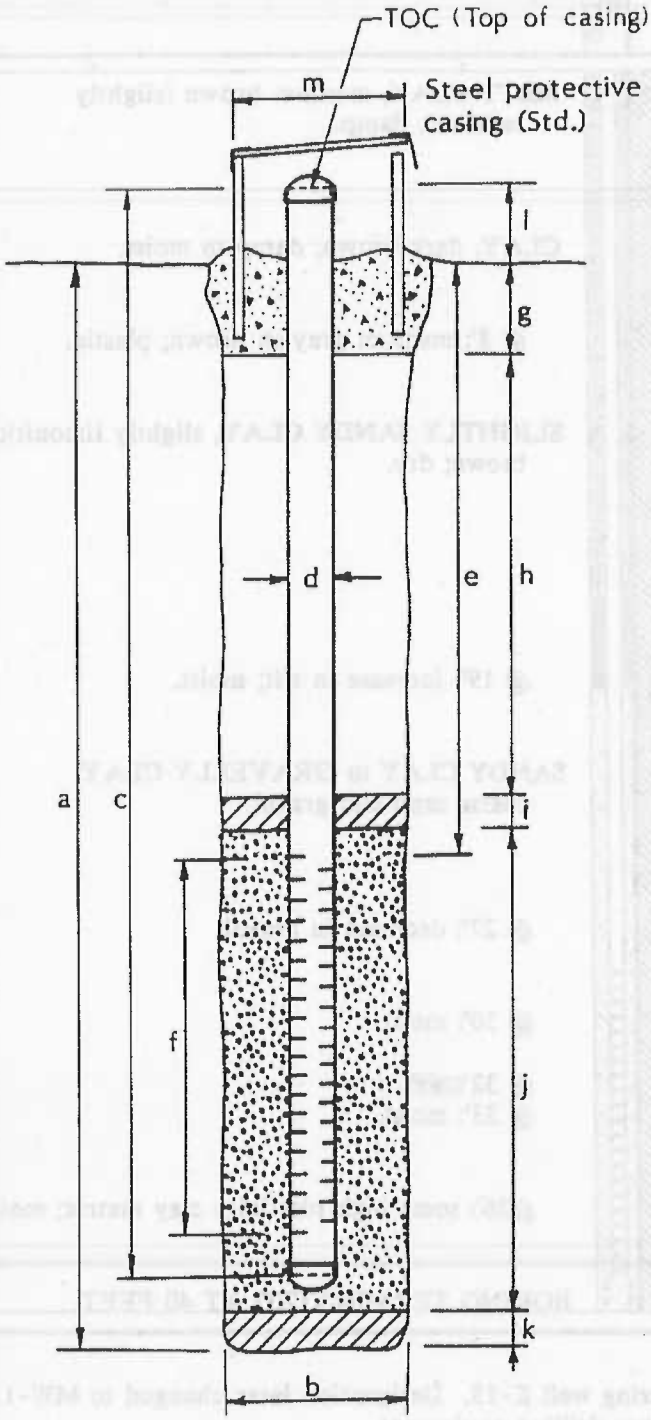
Originally drilled in 1980 as monitoring well E-15. Designation later changed to MW-1. Drilled with 8-inch hollow-stem auger drilling equipment.

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba Sutter
LOCATION Yuba County
WELL PERMIT NO. _____

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 74.33'
GROUND SURFACE ELEV. 73.61'
DATUM MSL
INSTALLATION DATE 12/8/80



EXPLORATORY BORING

a. Total depth 40 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 39 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 29 ft.
f. Perforated length 10 ft.
Perforated interval from 29 to 39 ft.
Perforation type hand slotted
Perforation size wrapped
g. Surface seal 17 ft.
Seal material Cement
h. Backfill _____ ft.
Backfill material _____
i. Seal 3 ft.
Seal material Bentonite
j. Gravel pack 20 ft.
Pack material Sand
k. Bottom seal 1 ft.
Seal material Soil
l. Casing stickup _____ ft.
m. Protective casing diameter _____ in.
* Originally E-15

Form prepared by _____

PLATE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-2

PROJECT NAME YUBA SUTTER DISPOSAL INCORPORATED PAGE 1 OF 2

BY John Batchelder DATE 12/8/80 SURFACE ELEV. 78.16'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRA-TION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
				0		SM SP		GRAVELLY SILTY SAND, tan to light bluish gray; 10% fines; 1/2-inch-diameter gravel clasts; damp.
				5				
								@8': brown.
				10		CL		SILTY CLAY, yellowish brown; >95% high-plasticity fines; <5% medium to coarse sand; damp to moist.
				15				
				20		CL		GRAVELLY CLAY.
			▼	25		CL SP		GRAVELLY SANDY CLAY, fine to coarse sand; 1-inch-diameter gravel clasts; occasional interbeds of gravelly coarse sand; very moist to wet.
				30		GC		SANDY GRAVELLY CLAY to CLAYEY GRAVEL, 2-inch-diameter gravel clasts; wet.
				35				
				40				

REMARKS

Originally drilled in 1980 as monitoring well #E-18A. Designation later changed to MW-2. Drilled with 8-inch diameter hollow-stem auger drilling equipment.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-2

PROJECT NAME YUBA SUTTER DISPOSAL INCORPORATED PAGE 2 OF 2

BY John Batchelder DATE 12/8/80 SURFACE ELEV. 78.16'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRA-TION (Blows/ Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
				45				SANDY GRAVELLY CLAY to CLAYEY GRAVEL (continued)
				50				BORING TERMINATED AT 44 FEET.
				55				
				60				
				65				
				70				
				75				
				80				

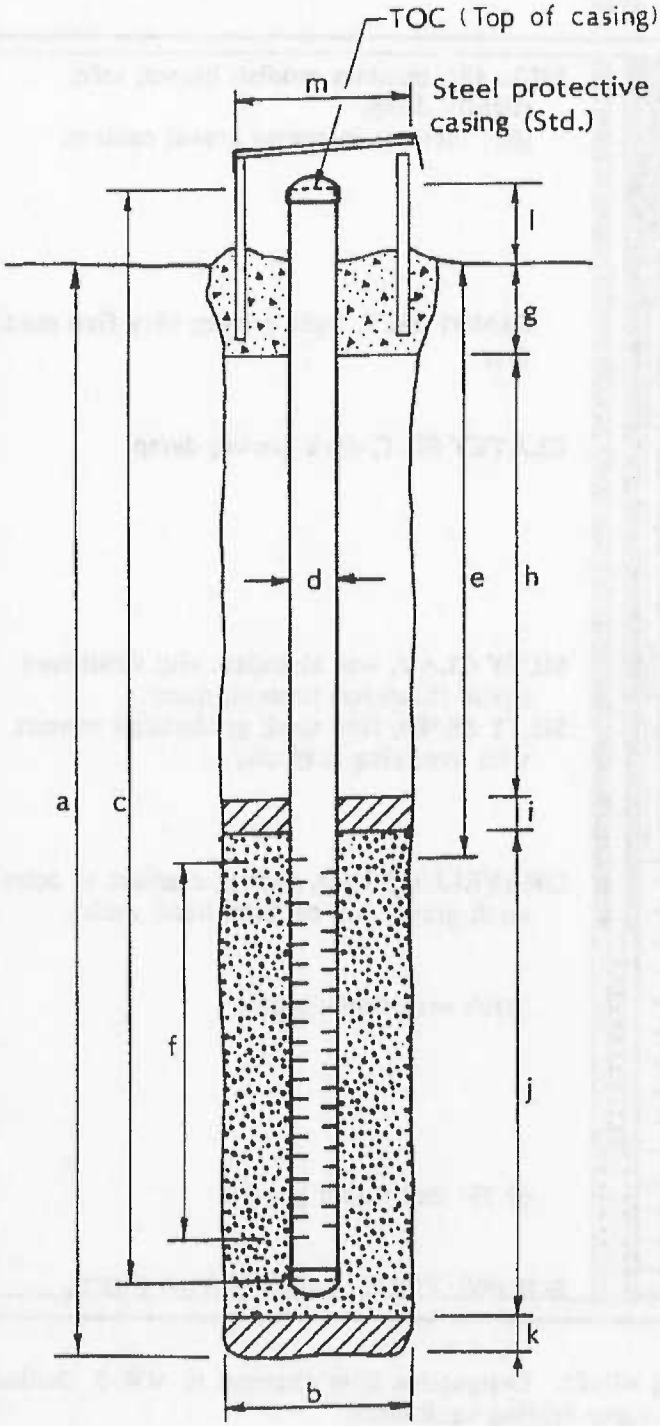
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter
LOCATION Yuba County
WELL PERMIT NO. _____

BORING / WELL NO. MW-2
TOP OF CASING ELEV. 79.16
GROUND SURFACE ELEV. 78.16±
DATUM MSL
INSTALLATION DATE 12/8/80



EXPLORATORY BORING

a. Total depth 44 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 32.67 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 27.67 ft.
f. Perforated length 5 ft.
Perforated interval from 27.67 to 32.67 ft.
Perforation type hand saw and wrap
Perforation size _____
g. Surface seal 21.67 ft.
Seal material Bentonite/Cement
h. Backfill _____ ft.
Backfill material _____
i. Seal (@21.67) 6 ft.
Seal material Bentonite
j. Gravel pack 5 ft.
Pack material sand
k. Bottom seal _____ ft.
Seal material _____
l. Casing stickup _____ ft.
m. Protective casing diameter _____ in.

* Originally E-18A drilled 12/8/80

Form prepared by njs

PLATE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-3

PROJECT NAME YUBA SUTTER DISPOSAL INCORPORATED PAGE 1 OF 1

BY **John Batchelder** DATE 12/8/80 SURFACE ELEV. 85.32'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
				5				FILL, silt, medium reddish brown; soft; slightly damp. @2': increase in coarse gravel content.
				10		SM		SANDY SILT, light brown; very fine sand; dry.
						ML		CLAYEY SILT, dark brown; damp.
1.5/1.5		13		15				
				20		CL		SILTY CLAY, tan; abundant silt; weathered pyrite (limonite) present; damp.
1.5/1.5		41				SM		SILTY SAND, fine sand; gradational contact with overlying silty clay.
				25				
1.5/1.5		64				GW		GRAVELLY SAND, brown; medium to coarse sand; gravel and cobbles; hard; moist.
				30				
1.5/1.5		101						@30': very dense; wet.
				35				@ 36': decreasing gravel.
				40				BORING TERMINATED AT 40 FEET.

REMARKS

Originally drilled in 1980 as boring #E-22. Designation later changed to MW-3. Drilled with 8-inch diameter hollow-stem auger drilling equipment.

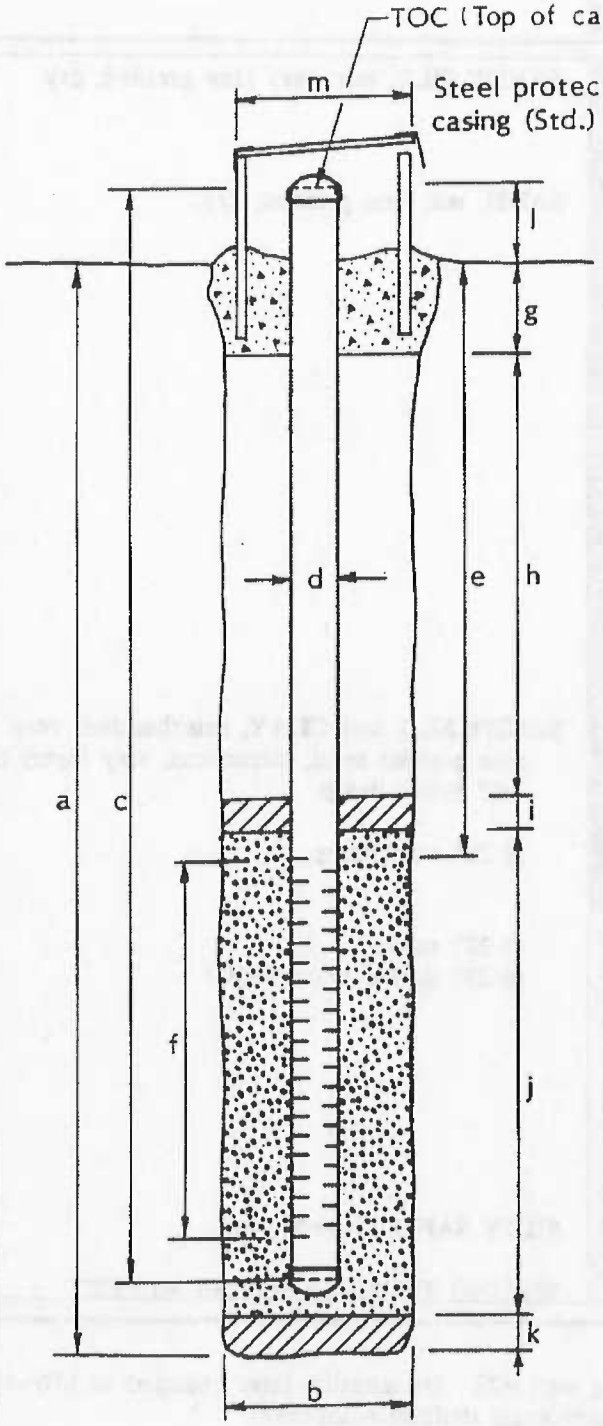
EMCON ASSOCIATES

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter
LOCATION Yuba County
WELL PERMIT NO. _____

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 86.97
GROUND SURFACE ELEV. 85.32±
DATUM MSL
INSTALLATION DATE 12/8/80



EXPLORATORY BORING

a. Total depth 40 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 35.17 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 29.17 ft.
f. Perforated length 6 ft.
Perforated interval from 29.17 to 35.17 ft.
Perforation type hand saw & wrapped-
Perforation size _____
g. Surface seal 22.17 ft.
Seal material cement/bentonite
h. Backfill _____ ft.
Backfill material _____
i. Seal 6 ft.
Seal material Bentonite
j. Gravel pack 7 ft.
Pack material Sand
k. Bottom seal 4.83 ft.
Seal material Native
l. Casing stickup _____ ft.
m. Protective casing diameter _____ in.

* Originally E-22

Form prepared by njs

PLATE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-4

PROJECT NAME YUBA SUTTER DISPOSAL INCORPORATED PAGE 1 OF 1

BY John Batchelder DATE 12/8/80 SURFACE ELEV. 84.08'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
				0		ML		SANDY SILT, tan; very fine grained; dry.
				5		SM ML		SAND, tan; fine grained; dry.
				10				
				15				
		5		20		CL ML		SANDY SILT and CLAY, interbedded; very fine grained sand; micaceous; clay layers to 1/2" thick; damp.
				25				@ 25': very damp.
				30				@ 28': moist. @ 29': darker color; wet.
				35				
				40		SM		SILTY SAND; gravelly; wet. BORING TERMINATED AT 40 FEET.

REMARKS

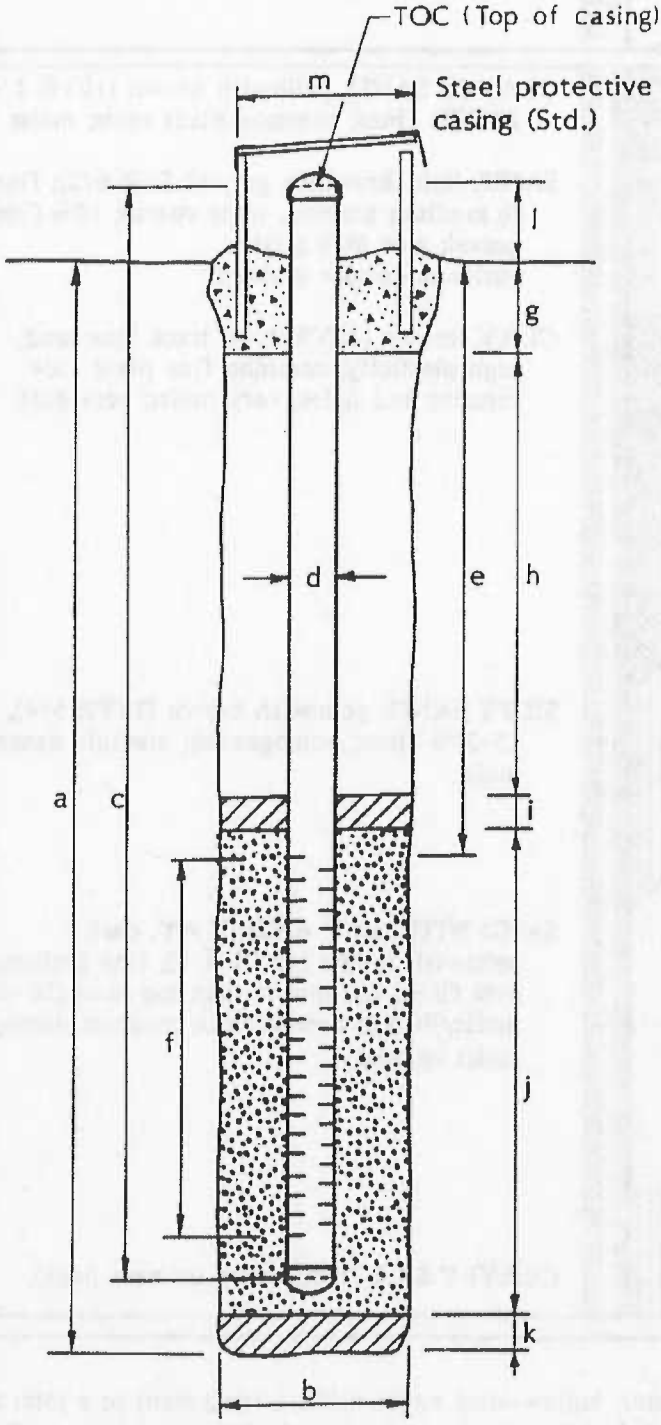
Originally drilled in 1980 as monitoring well #23. Designation later changed to MW-4. Drilled with 8-inch diameter hollow-stem auger drilling equipment.

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter
LOCATION Yuba County
WELL PERMIT NO. _____

BORING / WELL NO. MW-4
TOP OF CASING ELEV. 85.08
GROUND SURFACE ELEV. 84.08±
DATUM MSL
INSTALLATION DATE 12/8/80



EXPLORATORY BORING

a. Total depth 40 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 41.25 ft.
Material Schedule 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 28.5 ft.
f. Perforated length 10 ft.
Perforated interval from 28.5 to 38.5 ft.
Perforation type hand sawed & wrapped
Perforation size _____
g. Surface seal 21.5 ft.
Seal material cement/bentonite
h. Backfill _____ ft.
Backfill material _____
i. Seal 6 ft.
Seal material bentonite
j. Gravel pack 11 ft.
Pack material sand
k. Bottom seal 1.5 ft.
Seal material soil
l. Casing stickup 2.75 ft.
m. Protective casing diameter _____ in.

* originally E-23

Form prepared by _____

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-5

PROJECT NAME Yuba-Sutter Landfill Expansion PAGE 1 OF 2

BY Barry A. Benko DATE 6/9/88 SURFACE ELEV. 79.00'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
			▽			SC		CLAYEY SAND, yellowish brown (10YR 5/4); 20-40% fines; common plant roots; moist.
						SW		SAND, light brownish gray (2.5YR 6/2); fine to medium grained, trace coarse; 10% fine gravel; wet; 90% quartz; varies to coarser grained.
						CL		CLAY, brown (10YR 4/3), trace fine sand; high plasticity; common fine plant root remains and holes; very moist; very stiff.
1.5/1.5		20		5	■			
				10		SM		SILTY SAND, yellowish brown (10YR 5/4); 15-20% fines; homogenous; medium dense; moist.
1.5/1.5		31			■			
						SP		SAND WITH SILT AND CLAY, dark yellowish brown (10YR 4/4); fine grained; 5+% fines; less quartz than top sand (30-40% mafic/lithic); homogenous; medium dense; moist to wet.
1.5/1.5		16		15	■			
			▽			ML		CLAYEY SILT (description on next page).
				20				

REMARKS

Boring drilled with 10-inch diameter, hollow-stem auger drilling equipment to a total depth of 35.0 feet. Borings were converted to 4-inch diameter groundwater monitoring wells.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. M-5

PROJECT NAME Yuba-Sutter Landfill Expansion PAGE 2 OF 2

BY Barry A. Benko DATE 6/9/88 SURFACE ELEV. 79.00'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
1.5/1.5		36				ML		CLAYEY SILT, light brownish gray (10YR 6/2), with orange brown iron-oxide weathered zones; variable sand, 10-15%; variable consistancy, 2-3" fractured brittle zones; common oxidation along breaks; root holes; very moist to wet. @ 21': becomes more clayey, and more dense.
						SM		SILTY SAND, brown (10YR 4/3); with brown-black oxidation; variable sand composition; occasional Fe-O cemented laminations; wet.
1.5/1.5		37		25		SP		SAND, grayish brown (2.5YR 5/2); fine-medium grained to predominantly fine at 25.5 feet; 50% felsic min; 50% mafic; subrounded to subangular; wet.
						CL ML		SILTY CLAY TO CLAYEY SILT, light yellowish brown (10YR 6/4) to pale brown (10YR 6/3); highly plastic; occasional poorly developed horizontal laminations; occasional FeO laminations; very stiff to hard; moist.
1.3/1.5				30				
						ML		SILT WITH SAND, colors as at 30'; 15-25% sand; wet.
1.5/1.5						SM		SILTY SAND, brown (10YR 5/3); 15% fines; wet.
				35				BOTTOM OF BORING AT 35 FEET BORING TERMINATED.
				40				

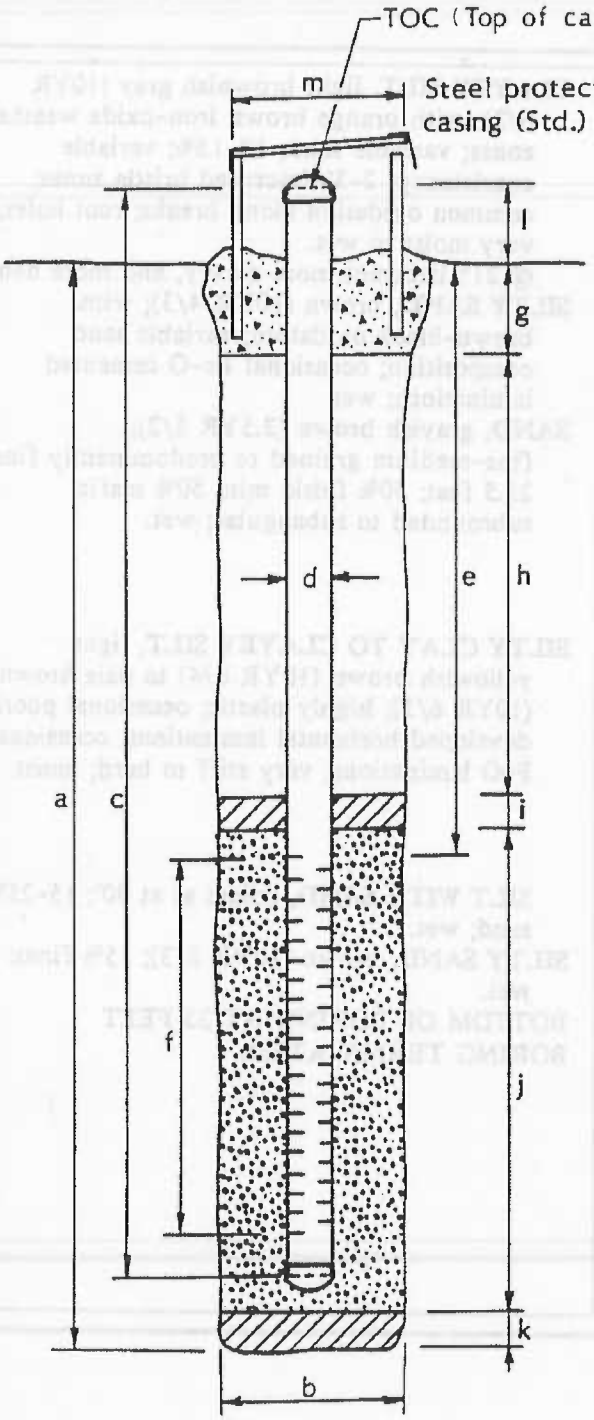
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter Disp.
LOCATION Yuba County
WELL PERMIT NO. --

BORING / WELL NO. MW-5
TOP OF CASING ELEV. 80.00
GROUND SURFACE ELEV. 79.00
DATUM MSL
INSTALLATION DATE 6/9/88



EXPLORATORY BORING

a. Total depth 35 ft.
b. Diameter 10 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 35 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 23½ ft.
f. Perforated length 10 ft.
Perforated interval from 23½ to 33½ ft.
Perforation type Machine Slots
Perforation size 0.020 inch
g. Surface seal 1 ft.
Seal material Cement
h. Backfill 19½ ft.
Backfill material Cement/Bentonite
i. Seal -- ft.
Seal material --
j. Gravel pack 14½ ft.
Pack material #2/12 Sand
k. Bottom seal -- ft.
Seal material --
l. Casing stickup 1.85 ft.
m. Protective casing diameter 8 in.

Form prepared by bab

PLATE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. M-6

PROJECT NAME Yuba-Sutter Landfill Expansion PAGE 1 OF 2

BY Barry A. Benko DATE 6/7/88 SURFACE ELEV. 82.00'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
						SW		SAND, light olive gray (5Y 6/2); fine to medium grained; 10-20% fine gravel, subrounded; moist.
0.5/1.5			▽	5				@ 5 feet; wet.
1.5/1.5		63		10		ML		CLAYEY SILT WITH SAND, strong brown (7.5YR 4/6); 15-20% fine sand; low plasticity; homogenous; hard; slightly moist.
1.0/1.5		23/50/5"		15				
						SC		CLAYEY SAND, yellowish brown (10YR 5/4); 30-40% fines; fine grained; wet.
				20				

REMARKS

Boring drilled with 10-inch diameter, hollow-stem auger drilling equipment to a total depth of 37.5 feet. Borings were converted to 4-inch diameter groundwater monitoring wells.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. M-6

PROJECT NAME Yuba-Sutter Landfill Expansion PAGE 2 OF 2

BY Barry A. Benko DATE 6/7/88 SURFACE ELEV. 82.00'

RECOVERY (FT/FT)	POCKET PENETROMETER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
					SC			CLAYEY SAND (CONTINUED)
		39			ML			CLAYEY SILT WITH SAND, brown (10YR 5/3); slightly clayey; 15-20% fine sand; trace medium grained sand; homogenous; moist.
				25	CL			CLAY, pale yellow (5Y 7/3) with lesser yellow (2.5Y 6/2), and brown-black staining; faint horizontal bedding; moist.
1.5/1.5		19			SP			SAND WITH SILT, light brownish gray (2.5YR 6/2) with yellowish brown (10YR 5/8) mottling; brown-black stains; 10-15% fines; fine grained; poorly graded; micaceous; medium dense; wet.
				30				
				35	ML			SILT, light brownish gray (2.5Y 6/2) with orange-brown iron oxide stains; 5-10% fine sand; slightly clayey; trace fine organic matter; structurally homogenous; hard; moist.
1.5/1.5		23/43/50						
								BOTTOM OF BORING AT 37.5 FEET. BORING TERMINATED.
				40				

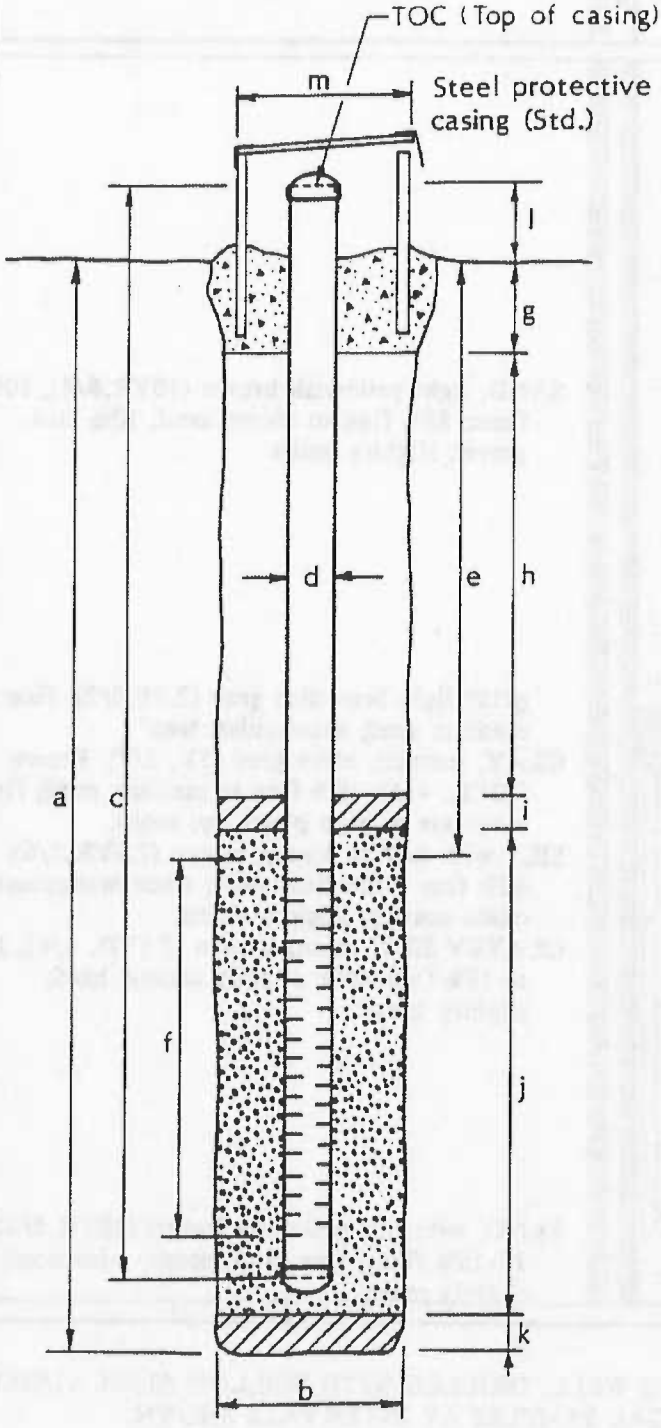
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter Disp.
LOCATION Yuba County
WELL PERMIT NO. --

BORING / WELL NO. MW-6
TOP OF CASING ELEV. ____
GROUND SURFACE ELEV. 82.00
DATUM MSL
INSTALLATION DATE 6/7/88



EXPLORATORY BORING

a. Total depth 37½ ft.
b. Diameter 10 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 37 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 25 ft.
f. Perforated length 10 ft.
Perforated interval from 25 to 35 ft.
Perforation type Machine Slots
Perforation size 0.020 inch
g. Surface seal 1 ft.
Seal material Cement
h. Backfill 21 ft.
Backfill material Cement/Bentonite
i. Seal 1 ft.
Seal material Bentonite/Pellets
j. Gravel pack 14½ ft.
Pack material #2/12 Sand
k. Bottom seal -- ft.
Seal material --
l. Casing stickup 1.8 ft.
m. Protective casing diameter 8 in.

Form prepared by bab

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-7

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 1 OF 3

BY BENKO DATE 6/6/88 SURFACE ELEV. 83.68'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
						SP		
1.5/1.5		5 5 5		5				**SAND**, light yellowish brown (10YR,6/4); 10% fines; 80% fine to coarse sand; 10% fine gravel; slightly moist.
1.5/1.5		3 5 41		10		CL ML		@10': light brownish gray (2.5Y,6/2); fine to medium sand; subangular; wet. **CLAY**, mottled, olive gray (5Y, 5/2), Brown (10YR, 4/3); 10% fine to medium sand; firm; moderate to high plasticity; moist. **SILT with SAND**, strong brown (7.5YR,5/6); 30% fine to medium sand; trace manganese oxide coating; slightly damp.
9"/9"		32 50/3"		15		ML		**CLAYEY SILT**, strong brown (7.5YR, 5/6); 10 to 15% fine sand; slightly clayey; hard; slightly moist.
				20		SM SP		**SAND**, with silt, yellowish brown (10YR,5/6); 10-15% fines; fine sand; dense; micaceous; slightly moist.

REMARKS

GROUND-WATER MONITORING WELL. DRILLED WITH HOLLOW STEM AUGER. SPLIT SPOON AND MODIFIED CAL SAMPLES AT INTERVALS SHOWN.

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. M-7

PROJECT NAME Yuba-Sutter Landfill Expansion

BY Barry A. Benko DATE 6/6/88 SURFACE ELEV. 83.50'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
1.5/1.5		71				SP		SAND WITH SILT, yellowish brown (10YR 5/6); 10-15% fines; fine grained; homogenous; dense; moist; micaceous; 70% quartz.
						CL		SILTY CLAY, light yellowish brown (10YR 6/4); 5-15% fine sand; trace medium grained sand; hard moist.
1.5/1.5		43		25				
								thin soft zone.
1.5/1.5				30				@ 30 feet; some iron oxide coatings; trace fine sand; trace rootlets; hard; moist.
						SP		SAND WITH SILT, brown (7.5YR 4/4); mottled with lesser light brownish gray (2.5Y 6/5); 10-15% fines; fine grained; mica flakes; homogenous; medium dense; wet.
1.5/1.5		17		35				
								increase fines to 15-20%.
1.5/1.5		17				SM		SILTY SAND, brown (10YR 4/3) and light brownish gray (2.5Y 6/2); micaceous; 25% + fines; fine grained; medium dense; wet.
				40				

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. M-7

PROJECT NAME Yuba-Sutter Landfill Expansion PAGE 3 OF 3

BY Barry A. Benko DATE 6/6/88 SURFACE ELEV. 83.50'

RECOVERY (FT/FT)	POCKET PENETRO-METER (TSF)	PENETRATION (Blows/Ft.)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	WELL DETAILS	DESCRIPTION
1.5/1.5		20				ML		SILT, light yellowish brown (2.5Y 6/2) with disseminated orange-brown iron oxides; 10% fine sand; homogenous; very stiff; moist.
1.0/1.0		26		45				BOTTOM OF BORING AT 44 FEET. BORING TERMINATED.
				50				
				55				
				60				

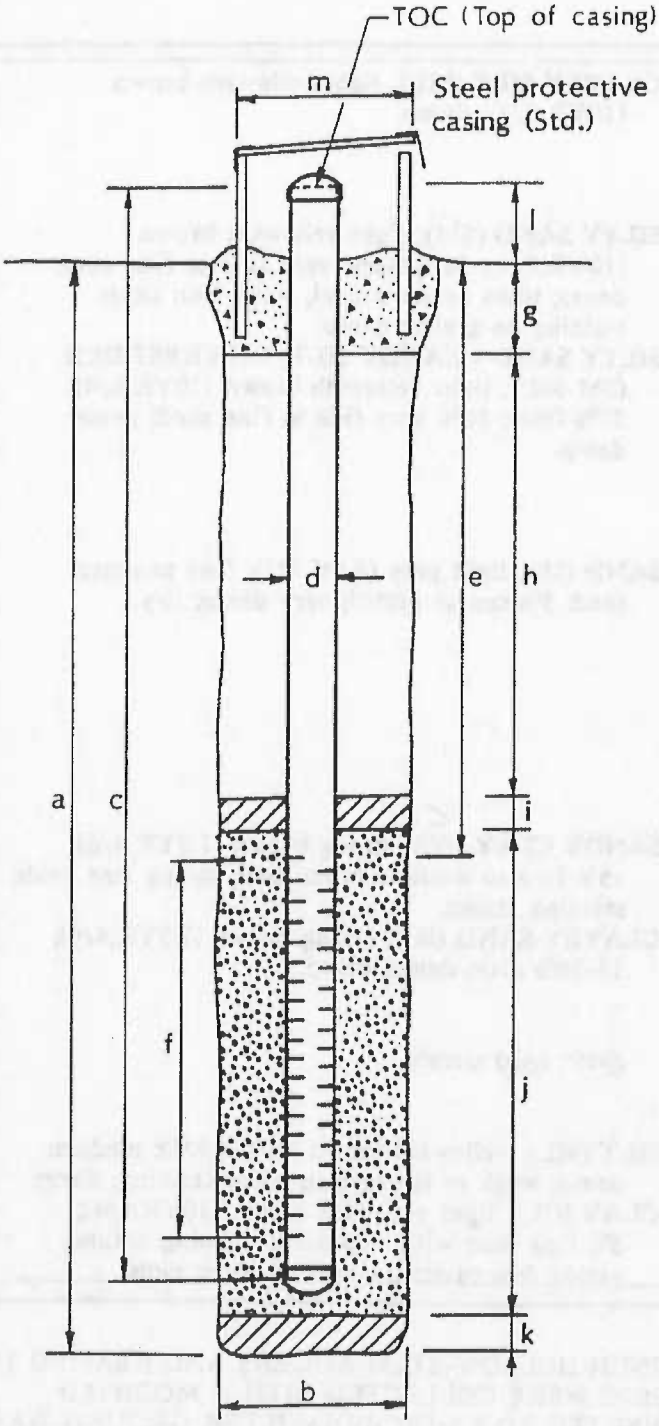
REMARKS

EMCON ASSOCIATES

WELL DETAILS

PROJECT NUMBER 174-02.07
PROJECT NAME Yuba-Sutter Disp.
LOCATION Yuba County
WELL PERMIT NO. --

BORING / WELL NO. MW-7
TOP OF CASING ELEV. 84.8
GROUND SURFACE ELEV. 82.95
DATUM MSL
INSTALLATION DATE 6/6/88



EXPLORATORY BORING

a. Total depth 44 ft.
b. Diameter 10 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Total casing length 44½ ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 32 ft.
f. Perforated length 10 ft.
Perforated interval from 32 to 42 ft.
Perforation type Machine Slots
Perforation size 0.020 inch
g. Surface seal 1 ft.
Seal material Cement
h. Backfill 26 ft.
Backfill material Cement/Bentonite
i. Seal 1 ft.
Seal material Bentonite Pellets
j. Gravel pack 14 ft.
Pack material #2/12 Sand
k. Bottom seal -- ft.
Seal material --
l. Casing stickup 2½ ft.
m. Protective casing diameter 8 in.

Form prepared by bab

PLATE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-8

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 1 OF 2

BY SPEAKER DATE 1/14/89 SURFACE ELEV. 85.25 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							CLAYEY SILT (ML), light yellowish brown (10YR,6/4); damp.	
.96/.96		30 50/5.5"		5			**SILTY SAND** (SM), light yellowish brown (10YR,6/4); 10% fines; very fine to fine sand; dense; trace coarse gravel; weak iron oxide staining on grains; damp. **SILTY SAND - SANDY SILT, INTERBEDDED** (SM-ML), light yellowish brown (10YR,6/4); 20% fines; 80% very fine to fine sand; dense; damp.	
.83/.83		38 50/4"		10			**SAND** (SP), light gray (2.5Y,7/2); fine to coarse sand; 5% coarse gravel; very dense; dry.	
.83/.83		21 50/4"		15			**SANDY CLAY** ~~(SC)~~ CL, strong brown (7.5YR,4/6); 15% fine to medium sand; hard; strong iron oxide staining; damp. **CLAYEY SAND** (SC), strong brown (7.5YR,4/6); 15-20% clay; dense; damp. @16': hard streak.	
1.5/1.5		28 34 40		20			**SILT** (ML), yellowish brown (10YR,5/6); medium dense; weak to strong iron oxide staining; damp. **CLAY** (CL), light yellowish brown (10YR,6/4); 5% fine sand with iron oxide staining around grains; low plasticity; stiff to hard; moist.	

EMCON ASSOCIATES

REMARKS

BORING DRILLED WITH 6.25-INCH HOLLOW-STEM AUGERS AND REAMED TO 10". SOIL SAMPLES FOR LOGGING WERE COLLECTED WITH A MODIFIED SPLIT-SPOON SAMPLER. CONVERTED TO 4.5-INCH DIAMETER GROUND-WATER MONITORING WELL.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-8

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 2 OF 2

BY SPEAKER DATE 1/14/89 SURFACE ELEV. 85.25 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							CLAY (CL), continued.	
1.25F		38 40 50/3"					@23': trace of wood debris. **SILT** (ML), strong brown (7.5YR,4/6); moist. **SANDY SILT** (ML), stron brown (7.5YR,4/6); 15-20% fine to medium sand; some sand occurs in pockets (balled-up) in clay, pink white (7.5YR,8/2); dense; moist to wet.	
			1/17/89	25				
1.5/1.5		21 32 46		30			**SAND** (SP), yellowish brown (10YR,5/4); fine to medium grain; sub-rounded; dense; wet.	
.75/.75		17 50/3"		35			@33': increase in clay to 5%.	
1.5/1.5		15 17 25		40			@38': no clay. **BORING TERMINATED AT 39.5' AND CONVERTED TO GROUND-WATER MONITORING WELL. SEE WELL CONSTRUCTION DETAILS.**	

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-9

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 1 OF 2

BY SPEAKER DATE 1/18/89 SURFACE ELEV. 83.13 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (SP), light yellowish brown (10YR,6/4); fine to medium grained; subround to subangular; loose; weak iron oxide staining on grains; damp.	
1.5/1.5		8 10 14		5			@3': trace fine to coarse, round quartz gravel; sand is loose to medium dense; damp.	
1.5/1.5		7 13 22		10			CLAY (CL), pale brown (10YR,6/3); vegetative debris; strong iron oxide staining; low plasticity; moist. SANDY SILT-SILTY SAND-INTERBEDDED (ML-SM), light yellowish brown (10YR,6/4); very fine grain sand; medium dense; strong iron oxide staining; vegetative debris; moist to wet.	
.95/.95		21 50/5.5"		15			SANDY SILT (ML), strong brown (7.5YR,4/6); 15% very fine sand; strong iron oxide staining; damp to moist.	
.95/.95		40 50/5.5"		20			SILTY SAND (SM), STRONG BROWN (7.5YR,5/6); 10-15% fines; fine to medium sand; dense to very dense; strong iron oxide staining; damp.	

EMCON ASSOCIATES

REMARKS

BORING DRILLED WITH 6.5-INCH DIAMETER HOLLOW-STEM AUGERS AND REAMED TO 10". SOIL SAMPLES FOR LOGGING WERE COLLECTED WITH A MODIFIED SPLIT-SPOON SAMPLER. CONVERTED TO 4.5-INCH DIAMETER GROUND-WATER MONITORING WELL.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-9

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 2 OF 2

BY SPEAKER DATE 1/18/89 SURFACE ELEV. 83.13 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SILTY SAND (SM) continued.	
1.4/1.4		16 33 50/5"	1/19/89	25			SAND (SP), yellowish brown (10YR,5/6); 5% fines; fine to medium sand; weak iron oxide staining on some grains; wet. CLAYEY SAND (SC), yellowish brown (10YR,5/4); 15% slightly plastic clay; fine sand; wet. SANDY CLAY (CL), very pale brown (10YR,5/4); 10% fine sand; weak iron oxide staining; wet to damp.	
.95/.95		40 50/5.5"		30			CLAYEY SAND (SC), light yellowish brown (10YR,6/4); 15% low plasticity clay; fine to medium sand; dense to very dense; wet. SANDY CLAY (CL), light yellowish brown (10YR,6/4); 15% fine to medium sand; dense to hard; wet. CLAYEY SAND (SC), light yellowish brown (10YR,6/4); 15% low plasticity clay; fine to medium sand; dense to very dense; wet.	
.75/.75		40 50/3"		35			SAND (SP), yellowish brown (10YR,5/4); fine sand; dense; wet. SILTY CLAY (CL), light yellowish brown (10YR,6/4); 5% fine sand; hard; wet to moist.	
1.25 FT		23 35 50/3"		40			CLAY (CL), pale brown (10YR,6/3); stiff; wet. CLAYEY SILT (ML), pale brown (10YR,6/3); very dense; moist. BORING TERMINATED AT 39.5'.SEE WELL CONSTRUCTION DETAILS.	

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-10

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 1 OF 3

BY SPEAKER DATE 1/18/89 SURFACE ELEV. 92.36 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							FILL SILTY SAND (SM), very dark gray brown (10YR,3/2); medium sand; grass roots; dry.	
1.5/1.5		34 40 50		5			REFUSE AND FILL, very dark gray brown (10YR,3/2); silty sand as above; 15% fines; weak iron oxide staining on some grains; 10% glass; damp.	
1.5/1.5		11 22 34		10			REFUSE AND FILL, dark gray brown (2.5Y,4/2); sandy clay fill; 15% fine to medium sand; 15% glass, paper, screen; damp.	
1.5/1.5		8 10 25		15			CLAYEY SILT (ML), dark grayish brown (2.5Y,4/2); minor vegetative debris; stiff; weak iron oxide staining; damp. SILTY SAND (SM), dark grayish brown (2.5Y,4/2); 12% silt; fine to medium sand; medium dense; damp.	
1.5/1.5		8 10 25		20			SANDY SILT (ML), dark gray brown (2.5Y,4/2); 10% very fine sand; firm; damp. CLAY (CL), dark gray brown (2.5Y,4/2); stiff; moist. SAND (SP) continued on next page.	

EMCON ASSOCIATES

REMARKS

BORING DRILLED WITH 6.25-INCH HOLLOW-STEM AUGERS AND REAMED TO 10". SOIL SAMPLES FOR LOGGING WERE COLLECTED WITH A MODIFIED SPLIT-SPOON SAMPLER. CONVERTED TO 4.5-INCH DIAMETER GROUND-WATER MONITORING WELL.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-10

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 2 OF 3

BY SPEAKER DATE 1/18/89 SURFACE ELEV. 92.36 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							SAND (SP), continued, light gray (10YR, 7/1); fine grain; medium dense; round to subround; damp.	
1.5/1.5		10 14 16		25			SANDY SILT (ML), brown (10YR,4/3); 15% very fine sand; medium dense; damp.	
1.5/1.5		14 20 29		30			SAND (SP), light yellowish brown (10YR,6/4); very fine to fine grained; round to subround; weak to moderate iron oxide staining; damp. CLAYEY SAND (SC), gray brown (2.5Y,5/2); 10% clay; very fine sand; medium dense; damp. SAND (SP), gray brown (2.5Y,5/2); very fine to fine grained; dense; weak iron oxide staining; damp.	
1.5/1.5		18 30 50		35			SILTY CLAY (CL), olive gray (5Y,5/2); low plasticity; weak iron oxide staining; hard; moist.	
.83/.83		44 50/4"	1/19/89	40			GRAVELLY SAND (SP), dark gray brown (2.5Y,5/2); 5% fines; fine to coarse sand; 20% fine to coarse gravel; dense; wet.	

REMARKS

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 174-02.07 BORING NO. MW-10

PROJECT NAME YUBA SUTTER SANITARY LANDFILL PAGE 3 OF 3

BY SPEAKER DATE 1/18/89 SURFACE ELEV. 92.36 ft

RECOVERY (FT/FT)		PENETRATION (BLWS/6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							GRAVELLY SAND (SP), continued.	
.75/.75		42 50/3"					**SAND** (SP), light brownish gray (2.5Y,6/2); 10% fines; very fine to fine sand; trace medium sand; dense to very dense; **wet.**	
				45				
1.3/1.3		23 38 50/3"					**GRAVELLY SAND** (SP), dark gray brown (2.5Y,4/2); 5% fines; fine to coarse sand; 20% fine to coarse gravel; dense; **wet.** **SAND** (SP), grayish brown (2.5Y,5/2); fine sand; dense; **wet.** **CLAYEY SAND** (SC), grayish brown (2.5Y,5.2); 15% fines; fine sand; very dense; **wet.**	
				50				
				55			**BORING TERMINATED AT 54' AND CONVERTED TO GROUND-WATER MONITORING WELL. SEE WELL CONSTRUCTION DETAILS.**	
				60				

REMARKS

EMCON ASSOCIATES

Conor Pacific

EFW

BORING NO: MW-11
WELL NO.: MW-11
SHEET: 1 of 2

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 15, 2002
DATE(S) WELL INSTALLED: July 15, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KHJ
CHECKED BY: KHJ

GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 35 ft. bgs
BOREHOLE DIAMETER: 8 in.

Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
										Gravel road base fill
			CC							Silty clay fill (CL): - reddish brown, firm, dry
										Silty sand (SM): - olive gray, 10-20% fines, fine gravel, loose, damp
			CC				5			@ 8' bgs: Silty sand with gravel (SM): - 10-20% gravel to 1.5" diameter, fine-medium grained, old road base gravel?
			CC				10			- occasional 2-4" thick layers of sand (SP); gray, fine-medium grained, damp, loose
			CC				15			@ 15.5' bgs: - very moist, dark gray, slight H2S odor (likely due to anoxic condition)
							20			Sandy clay (CL): - light reddish brown, 10-20% fine sand, low plasticity, stiff, moist; color at top is olive brown grading to reddish brown

Conor Pacific

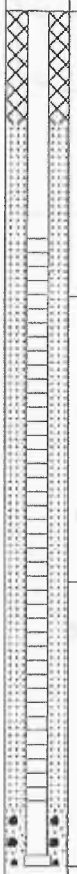
EFW

BORING NO: MW-11
WELL NO.: MW-11
SHEET: 2 of 2

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 15, 2002
DATE(S) WELL INSTALLED: July 15, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KHJ
CHECKED BY: KHJ

GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 35 ft. bgs
BOREHOLE DIAMETER: 8 in.



Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
			CC			▼	25			Silty sand (SM): - olive gray, 10-20% fines, fine grained, speckled with caliche cement at 22' bgs, loose, very moist to wet
			CC			▽				Sandy silt (ML): - olive brown, 10-20% fine sand, cemented, hard, moist
										Clayey sand (SC) to Sandy clay (CL): - reddish brown, 40-60% fine, fine grained cemented in thin layers, hard, very moist to wet in fractures along bedding, scattered caliche
							30			Sandy silt (ML): - olive brown with iron oxide mottling, 20-30% fine sand, slightly cemented, hard, moist
			CC							Sand (SP): - reddish olive brown, fine grained, trace fine gravel, loose, wet @ 34' bgs: sand heaved into hole to 34
							35			Bottom of Boring
							40			

Conor Pacific EFW

WELL CONSTRUCTION DETAILS

BORING DESIGNATION: MW-11

INSTALLATION

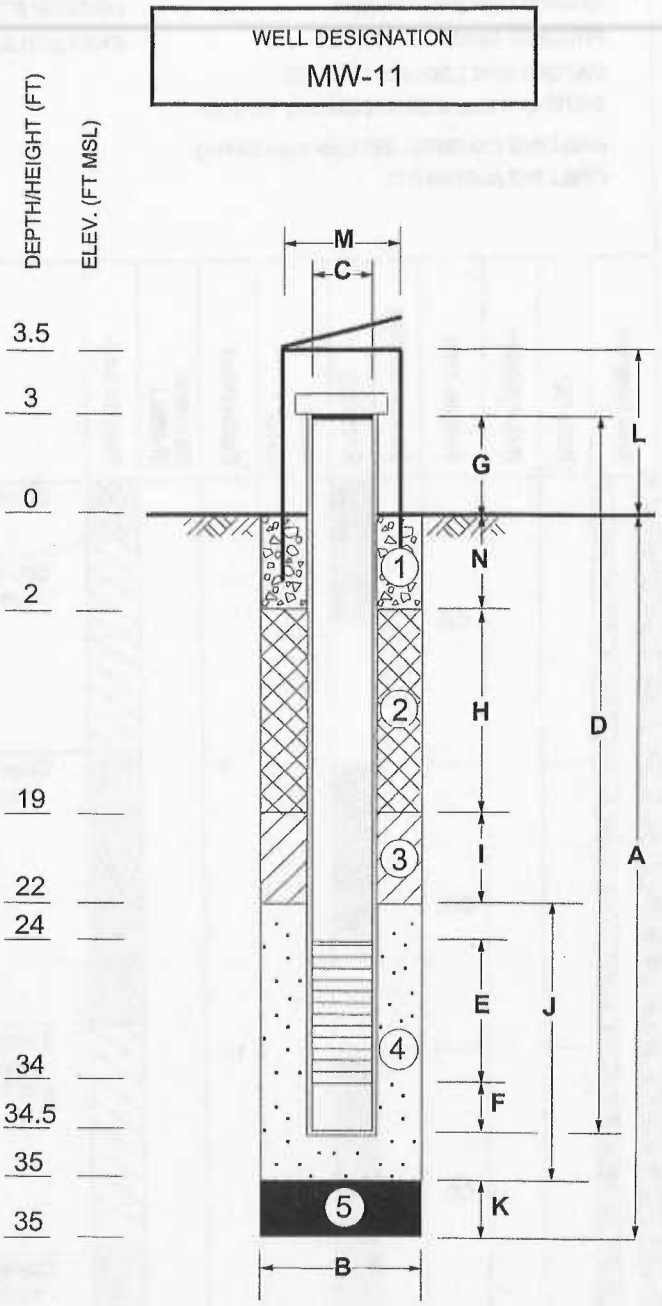
DATE: 7/15/02 BY: K. Johnson

DIMENSIONS

A	Total Depth of Boring (ft.)	35'
B	Borehole Diameter (in.)	8"
C	Well Casing Diameter (in.)	2"
D	Well Casing Length (ft.)	37.5'
E	Well Casing Slotted Interval (ft.)	10'
F	Well Casing End Cap or Sump (ft.)	0.5'
G	Well Casing Height (ft.)	3'
H	Annular Seal Interval (ft.)	2-19'
I	Annular Seal Interval (ft.)	19-22'
J	Sand Pack Interval (ft.)	24-34'
K	Bottom Material Interval (ft.)	NA
L	Protective Cover Height (ft.)	3.5'
M	Protective Cover Diameter (in.)	4"
N	Annular Seal Interval (ft.)	0-2'
	Well Centralizer Depth(s) (ft.)	NA

MATERIALS DATA

Monument Footing	(1)	Concrete
Annular Seal	(2)	Cement grout
Annular Seal	(3)	Bentonite
Sand Pack	(4)	#2/12 silica sand
Bottom Material	(5)	Native
Slotted Casing		0.02" slot Sch. 40 PVC
Well Casing		2" diam. Sch. 40 PVC
Well Centralizers		NA
Protective Cover		Steel lock box



SECTION VIEW *(not to scale)*

NOTES:
Sand bridged during well construction and casing lifted with augers. Used fresh water to flush augers and get casing back down. Native sand and filter pack to 30'

SITE: Yuba Sutter Landfill
PROJ. NO: YSD103
N. -- *E.* --
WELL PERMIT NO: Yuba Co. receipt No. 12577

I:\YSD\103\FIGURES\MW-11 DETAIL DSF 8/2/02

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EFW

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 16, 2002
DATE(S) WELL INSTALLED: July 16, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KTB
CHECKED BY: KHJ

BORING NO: MW-12
WELL NO.: MW-12
SHEET: 1 of 2
GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 35 ft. bgs
BOREHOLE DIAMETER: 8 in.

Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
			CC				0			Gravel road base fill
										Silty clay fill (CL): - reddish brown, firm, dry
			CC				5			Clayey sand (SC): - 40% fines, trace gravel, loose, dry
			CC				10			Sandy clay (CL): - sandy clay mixture, reddish brown, damp, soft, low placiticity, mottling with black, grading to clayey sand, 20-30% fine sanc
			CC				15			Clayey sand (SC): - 10-20% fines, medium to fine grained, loose, moist
										Sandy clay (CL): - low plasticity, 10% gravel, stiff, 10% fine-grained sand, coarse to fine, moist
							20			@ 19' bgs: sand increases to 30%, firm, mois

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BORING NO: MW-12
WELL NO.: MW-12
SHEET: 2 of 2

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 16, 2002
DATE(S) WELL INSTALLED: July 16, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KTB
CHECKED BY: KHJ

GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 35 ft. bgs
BOREHOLE DIAMETER: 8 in.

Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
										Gravel layer 1-1.5" clasts, roundec
			CC							Sandy clay (CL): - moist, 10-20% fines and occasional large clasts, firm
						▼	25			Sand (SP): - wet, 10% fines, loose, fine to medium grained
			CC			▽				Silty clay (CL): - 10-20% fine sand, mottled with iron oxide, stiff, low plasticity
							30			Clayey sand (SC) to sandy clay (CL): - 50-60% fines, cemented in thin layers, hard, wet
			CC							Silty sand (SM): - medium to fine grained, trace gravel, medium dense, wet, 10-20% fines
							35			Bottom of Boring
							40			

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WELL CONSTRUCTION DETAILS

BORING DESIGNATION: MW-12

INSTALLATION

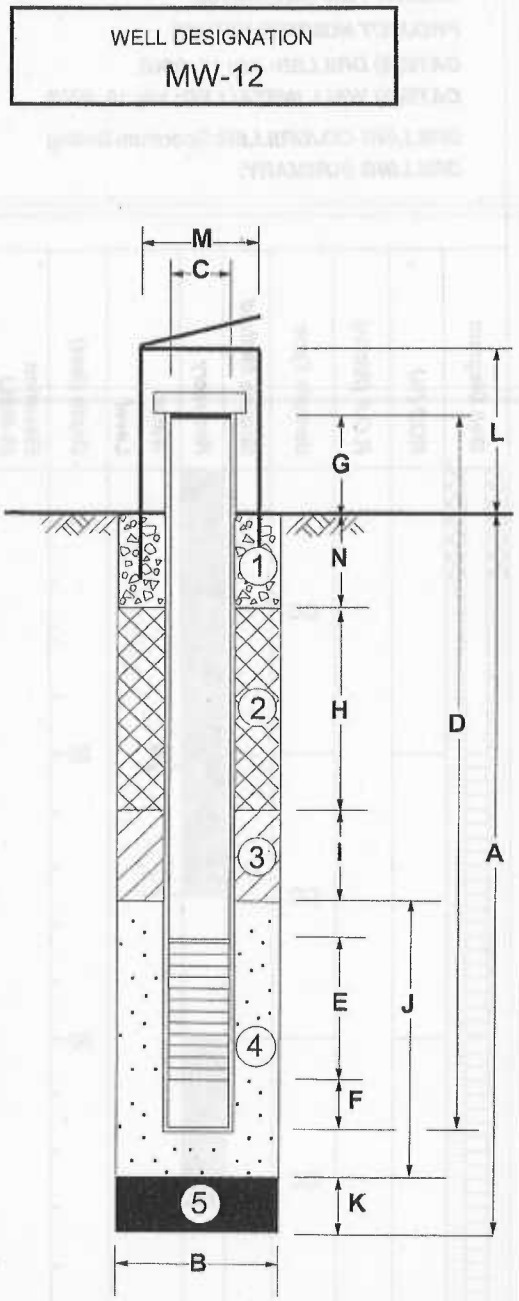
DATE: 7/16/02 BY: K. Broderick

DIMENSIONS

A Total Depth of Boring (ft.)	35'
B Borehole Diameter (in.)	8"
C Well Casing Diameter (in.)	2"
D Well Casing Length (ft.)	38'
E Well Casing Slotted Interval (ft.)	24.5-34.5'
F Well Casing End Cap or Sump (ft.)	0.5'
G Well Casing Height (ft.)	3'
H Annular Seal Interval (ft.)	2-19'
I Annular Seal Interval (ft.)	19-22'
J Sand Pack Interval (ft.)	22-35'
K Bottom Material Interval (ft.)	NA
L Protective Cover Height (ft.)	3.4'
M Protective Cover Diameter (in.)	4"
N Annular Seal Interval (ft.)	0-2'
Well Centralizer Depth(s) (ft.)	NA

MATERIALS DATA

Monument Footing	(1)	Concrete
Annular Seal	(2)	Cement grout
Annular Seal	(3)	Bentonite
Sand Pack	(4)	#2/12 silica sand
Bottom Material	(5)	Native
Slotted Casing		0.02" slot Sch. 40 PVC
Well Casing		2" diam. Sch. 40 PVC
Well Centralizers		NA
Protective Cover		Steel lock box



SECTION VIEW *(not to scale)*

NOTES:

SITE: Yuba Sutter Landfill
PROJ. NO: YSD103
N. -- *E.* --
WELL PERMIT NO: Yuba Co. receipt No. 12577

Conor Pacific

EFW

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 15, 2002
DATE(S) WELL INSTALLED: July 15, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KHJ
CHECKED BY: KHJ

BORING NO: MW-13
WELL NO.: MW-13
SHEET: 1 of 2
GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 30 ft. bgs
BOREHOLE DIAMETER: 8 in.

Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
										Sand (SP): - 10% fines, fine to coarse grained, 10% gravel (to 0.5"), dry
			CC							Clayey sand (SC): - 30-40% fines, fine to coarse grained, trace gravel (to 0.5"), loose, dry
										Sandy silt (ML): - 20-30% fine to medium sand with trace fine gravel, firm, damp to dry, mottled with iron oxide, laminated
			CC				5			Sandy clay (CL): - 40-50% fine to medium sand, trace fine gravel, laminated, firm, moist, abundant manganese mottling/staining, slightly cemented in occasional layers, low plasticity, grading to clayey sand
			CC			▼	10			Grading to clayey sand (SC): - 10-20% fines, fine to medium grained, trace fine gravel, loose, very moist to wet
										@13' bgs: fine to medium grained sandy gravel layer approx. 1" thic
							15			Sand (SP): - 10% fines, trace fine gravel, fine to medium grained sand, loose, very moist to moist
			CC							Silty clay (CL): - 10% fine sand, dense, laminated, iron oxide staining, very moist
							20			

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EFW

BORING NO: MW-13
WELL NO.: MW-13
SHEET: 2 of 2

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 15, 2002
DATE(S) WELL INSTALLED: July 15, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KHJ
CHECKED BY: KHJ

GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 30 ft. bgs
BOREHOLE DIAMETER: 8 in.

Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
			CC				25			Silty sand (SM): - 10-20% fines, loose, wet, fine grained
			CC				30			Silty clay (CL): - 10-20% fine sand, mottled with iron/manganese oxide, stiff and hard, moist, low to medium plasticity
							35			Bottom of Boring
							40			

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WELL CONSTRUCTION DETAILS

BORING DESIGNATION: MW-13

INSTALLATION

DATE: 7/15/02 BY: K. Johnson

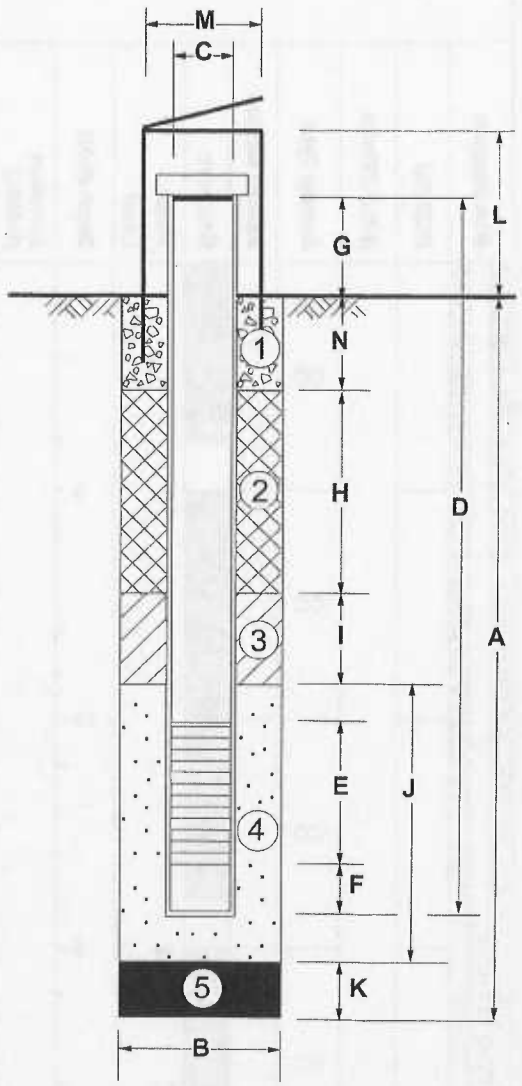
DIMENSIONS

A Total Depth of Boring (ft.)	30'
B Borehole Diameter (in.)	8"
C Well Casing Diameter (in.)	2"
D Well Casing Length (ft.)	30'
E Well Casing Slotted Interval (ft.)	17-27'
F Well Casing End Cap or Sump (ft.)	0.5'
G Well Casing Height (ft.)	2.5'
H Annular Seal Interval (ft.)	2-11'
I Annular Seal Interval (ft.)	11-14'
J Sand Pack Interval (ft.)	14-30'
K Bottom Material Interval (ft.)	NA
L Protective Cover Height (ft.)	3.5'
M Protective Cover Diameter (in.)	4"
N Annular Seal Interval (ft.)	0-2'
Well Centralizer Depth(s) (ft.)	NA

MATERIALS DATA

Monument Footing	(1)	Concrete
Annular Seal	(2)	Cement grout
Annular Seal	(3)	Bentonite
Sand Pack	(4)	#2/12 silica sand
Bottom Material	(5)	Native
Slotted Casing		0.02" slot Sch. 40 PVC
Well Casing		2" diam. Sch. 40 PVC
Well Centralizers		NA
Protective Cover		Steel lock box

WELL DESIGNATION
MW-13



SECTION VIEW *(not to scale)*

NOTES:

SITE: Yuba Sutter Landfill
PROJ. NO: YSD103
N. -- *E.* --
WELL PERMIT NO: Yuba Co. receipt No. 12577

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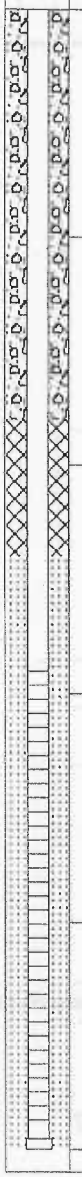
EFW

BORING NO: PZ-14
WELL NO.: PZ-14
SHEET: 1 of 1

SITE: Yuba Sutter Disposal Landfill
CLIENT: Yuba Sutter/Norcal
PROJECT NUMBER: YSD103
DATE(S) DRILLED: July 16, 2002
DATE(S) WELL INSTALLED: July 16, 2002
DRILLING CO./DRILLER: Spectrum Drilling
DRILLING SUMMARY:

LOGGED BY: KTB
CHECKED BY: KHJ

GROUND ELEVATION:
T.O.C. ELEVATION:
COORDINATES:
DRILLING METHOD: Hollow stem auger
BOREHOLE TOTAL DEPTH: 25 ft. bgs
BOREHOLE DIAMETER: 8 in.



Well Diagram	RQD (%)	R.O.P (ft/min)	Sample Type	Sample Method	Recovery	Water Level	Depth (feet)	Elevation (ft-MSL)	Graphic Log	LITHOLOGY
			CC				0			Clayey sand (SC): - 30-40% fines, loose, dry, trace gravel to 1.5"
			CC				5			Sandy clay (CL): - 40% fines, fine to medium grained sand, firm, moist, manganese oxide mottling, grading to clayey sand, slightly cemented in layers
			CC				10			Clayey sand (SC): - 10-20% fines, moist, occasional trace of fine gravel, moderately loose
			CC			▼	15			Sand (SP): - 10% fines, fine grained sand, very moist to wet
						▽				Silty clay (CL): - 10-15% sand, laminated with iron oxide, firm, very moist
			CC				20			Sandy clay (CL) - 40% fines, fine to medium grained sand, firm, occasional cemented layers
										Sand (SP): - 10% fines, fine grained sand, occasional fine gravel, wet, loose, uniform Bottom of boring @ 25' bgs
							25			

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WELL CONSTRUCTION DETAILS

BORING DESIGNATION: PZ-14

INSTALLATION

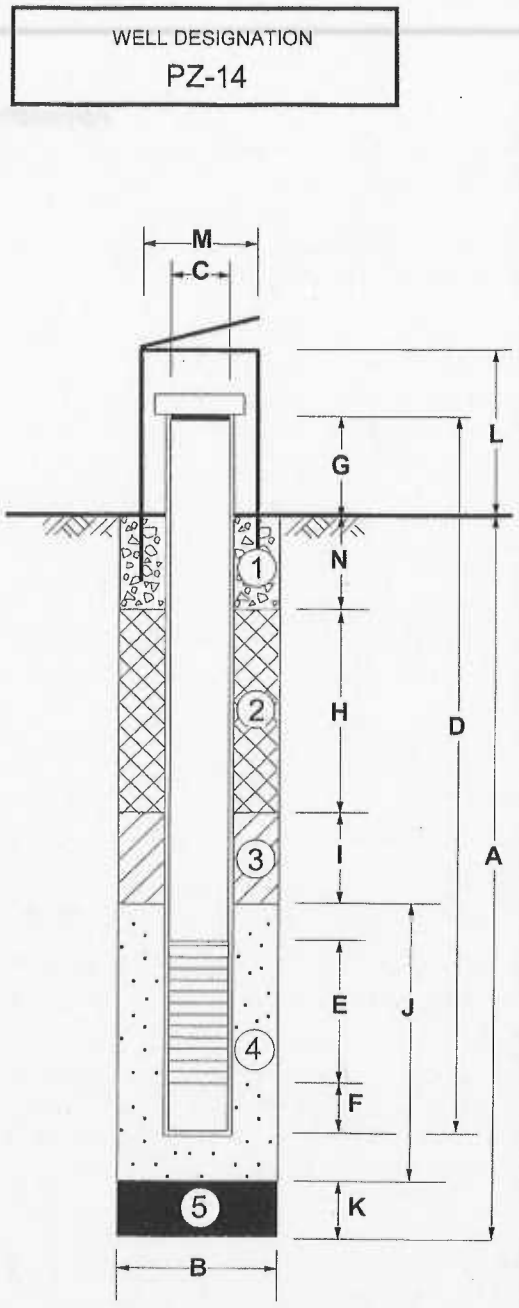
DATE: 7/16/02 BY: K. Broderick

DIMENSIONS

A	Total Depth of Boring (ft.)	25'
B	Borehole Diameter (in.)	8"
C	Well Casing Diameter (in.)	2"
D	Well Casing Length (ft.)	28'
E	Well Casing Slotted Interval (ft.)	14.5-24.5'
F	Well Casing End Cap or Sump (ft.)	0.5'
G	Well Casing Height (ft.)	3'
H	Annular Seal Interval (ft.)	2-9'
I	Annular Seal Interval (ft.)	9-12'
J	Sand Pack Interval (ft.)	12-25'
K	Bottom Material Interval (ft.)	NA
L	Protective Cover Height (ft.)	3.5'
M	Protective Cover Diameter (in.)	3.5"
N	Annular Seal Interval (ft.)	0-2'
	Well Centralizer Depth(s) (ft.)	NA

MATERIALS DATA

Monument Footing	(1)	Concrete
Annular Seal	(2)	Cement grout
Annular Seal	(3)	Bentonite
Sand Pack	(4)	#2/12 silica sand
Bottom Material	(5)	Native
Slotted Casing		0.02" slot Sch. 40 PVC
Well Casing		2" diam. Sch. 40 PVC
Well Centralizers		NA
Protective Cover		Steel lock box



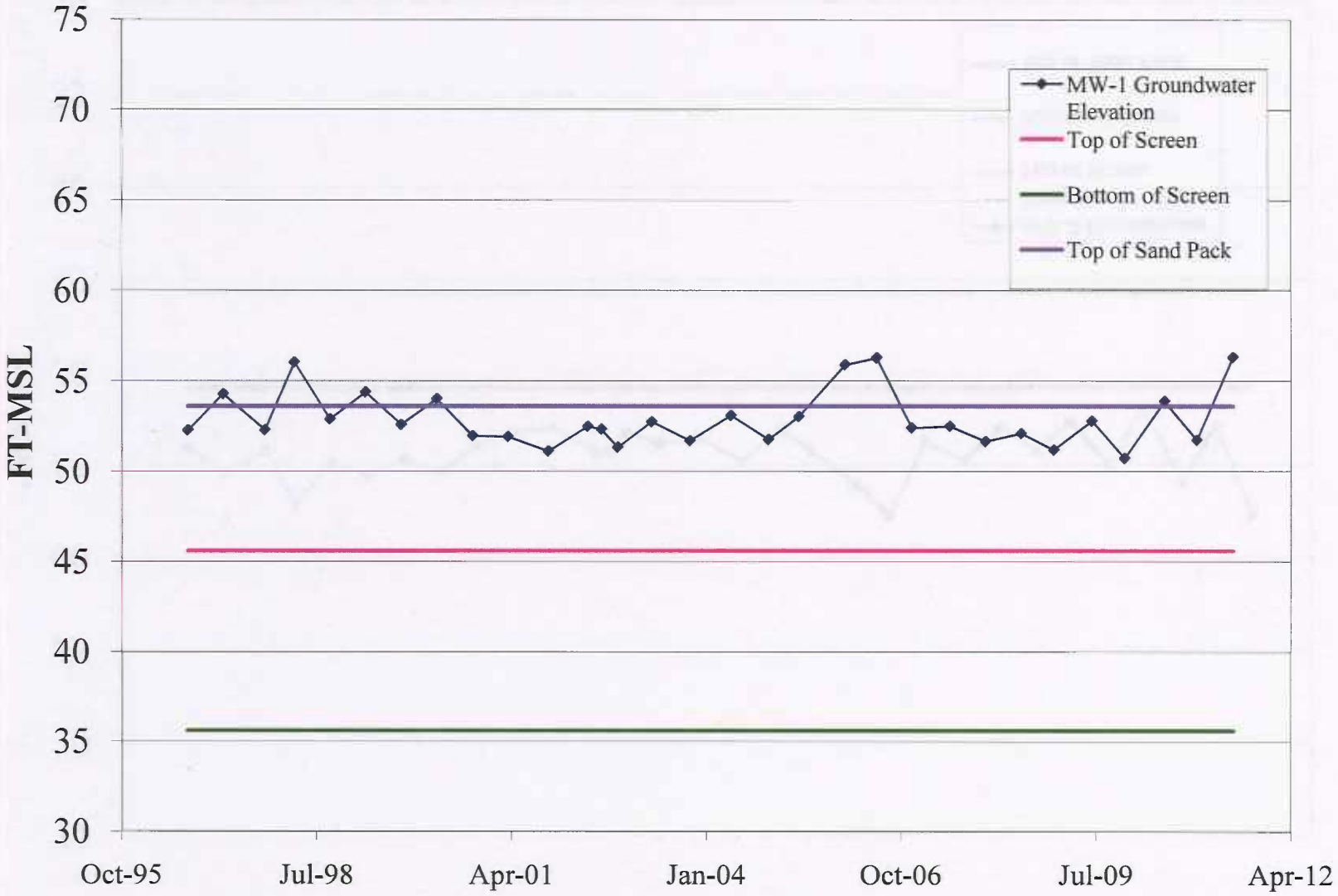
SECTION VIEW *(not to scale)*

NOTES:

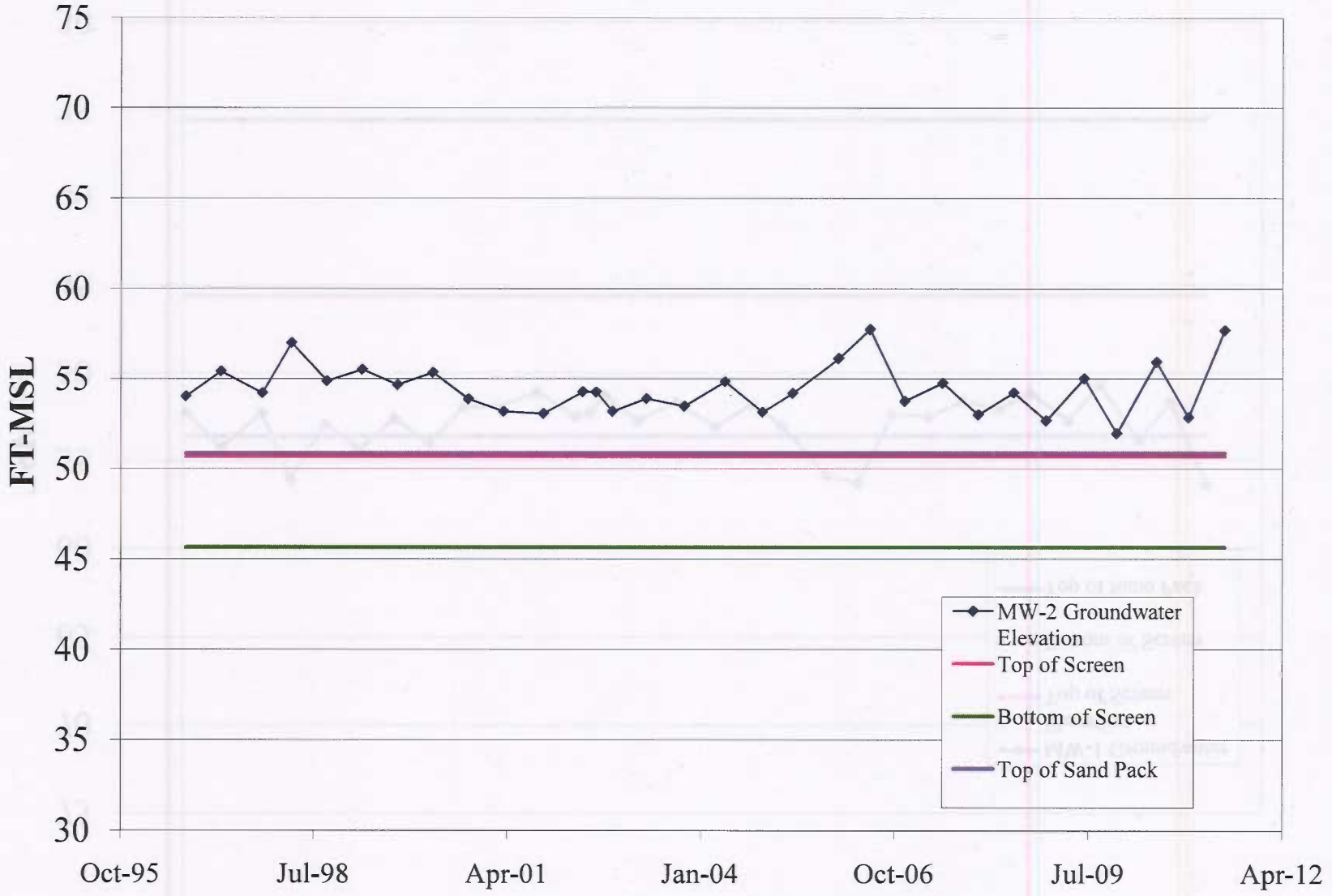
SITE: Yuba Sutter Landfill
PROJ. NO: YSD103
N. -- *E.* --
WELL PERMIT NO: Yuba Co. receipt No. 12577

Appendix B – Monitoring Well Hydrographs

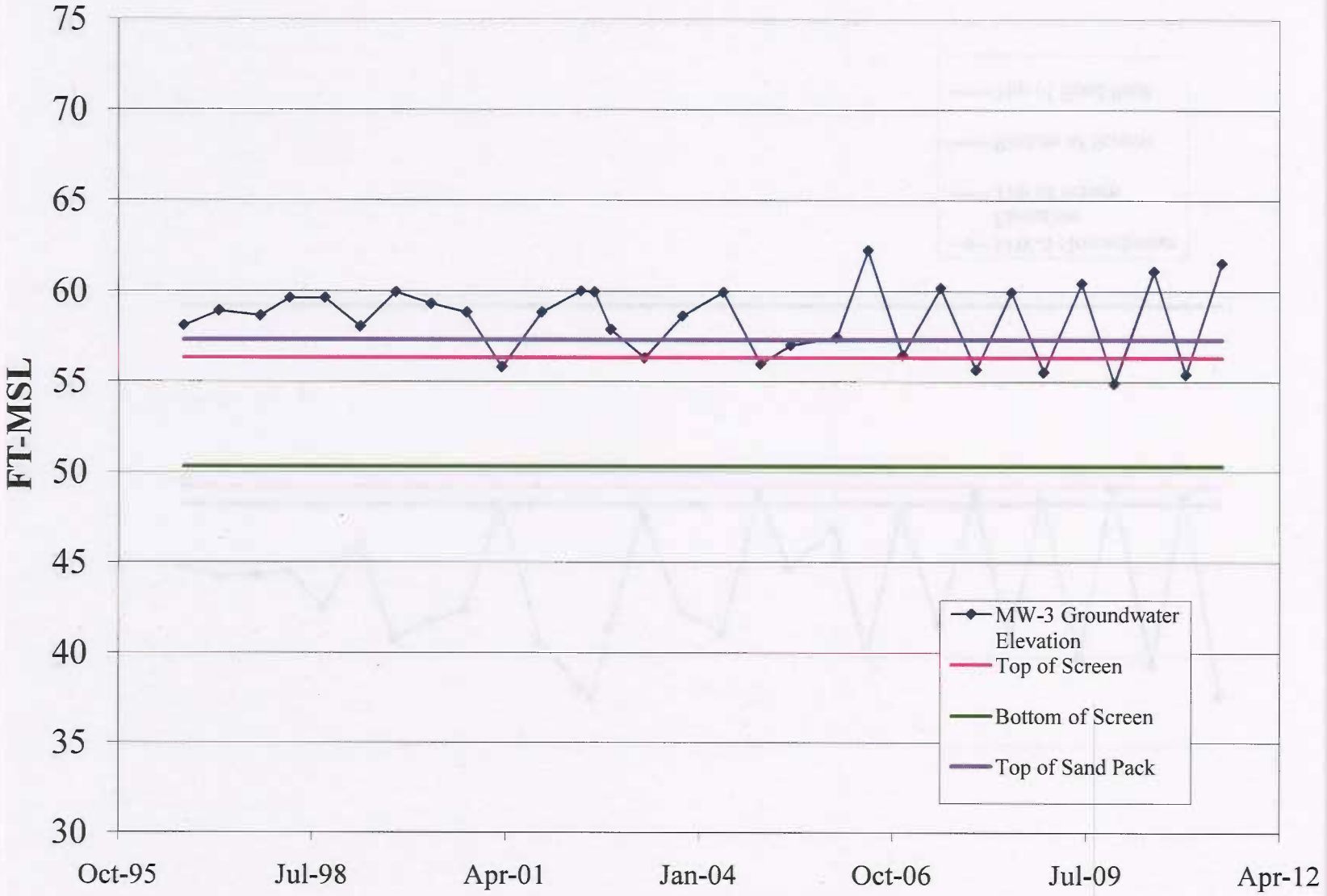
YSDI Monitoring Well MW-1



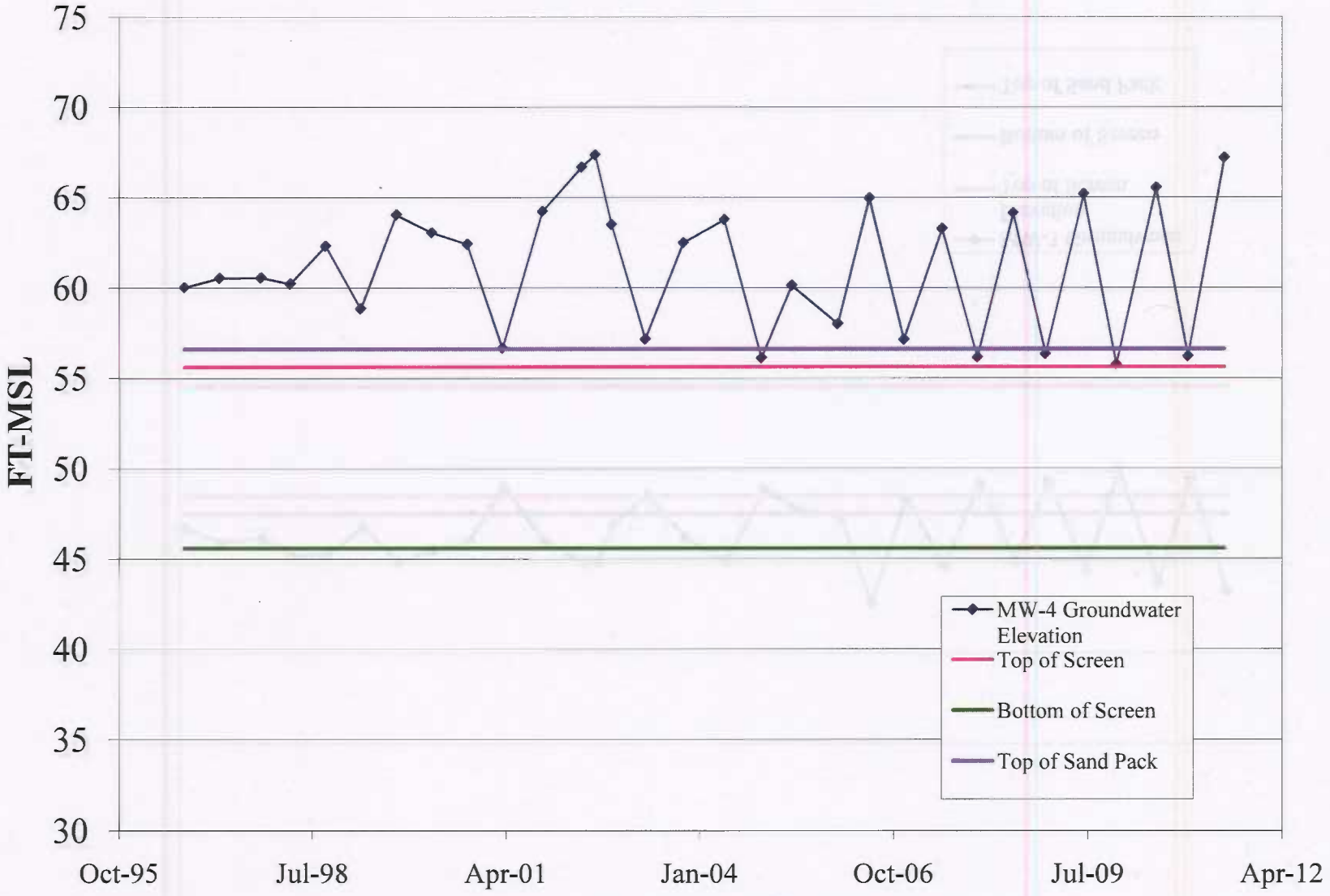
YSDI Monitoring Well MW-2



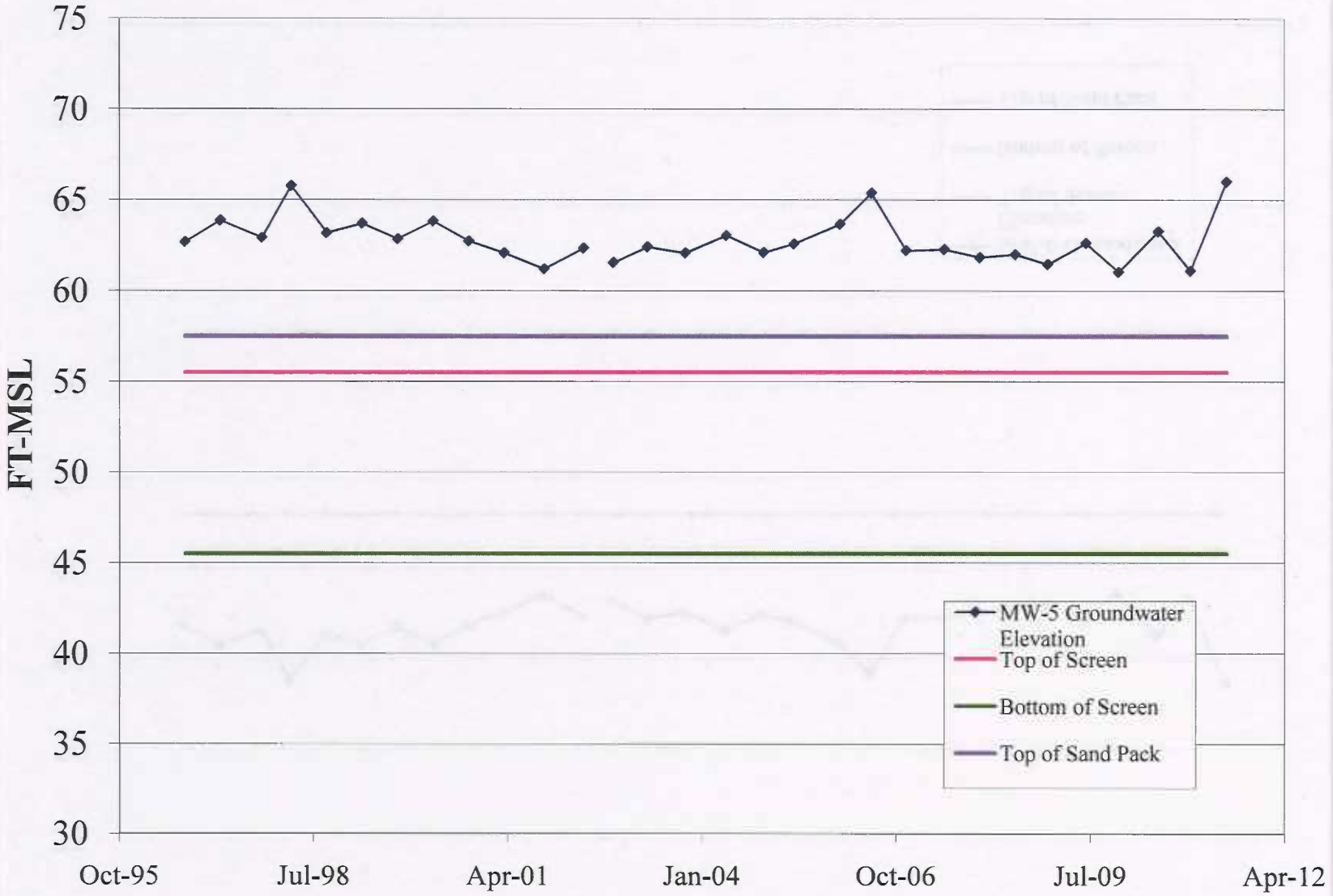
YSDI Monitoring Well MW-3



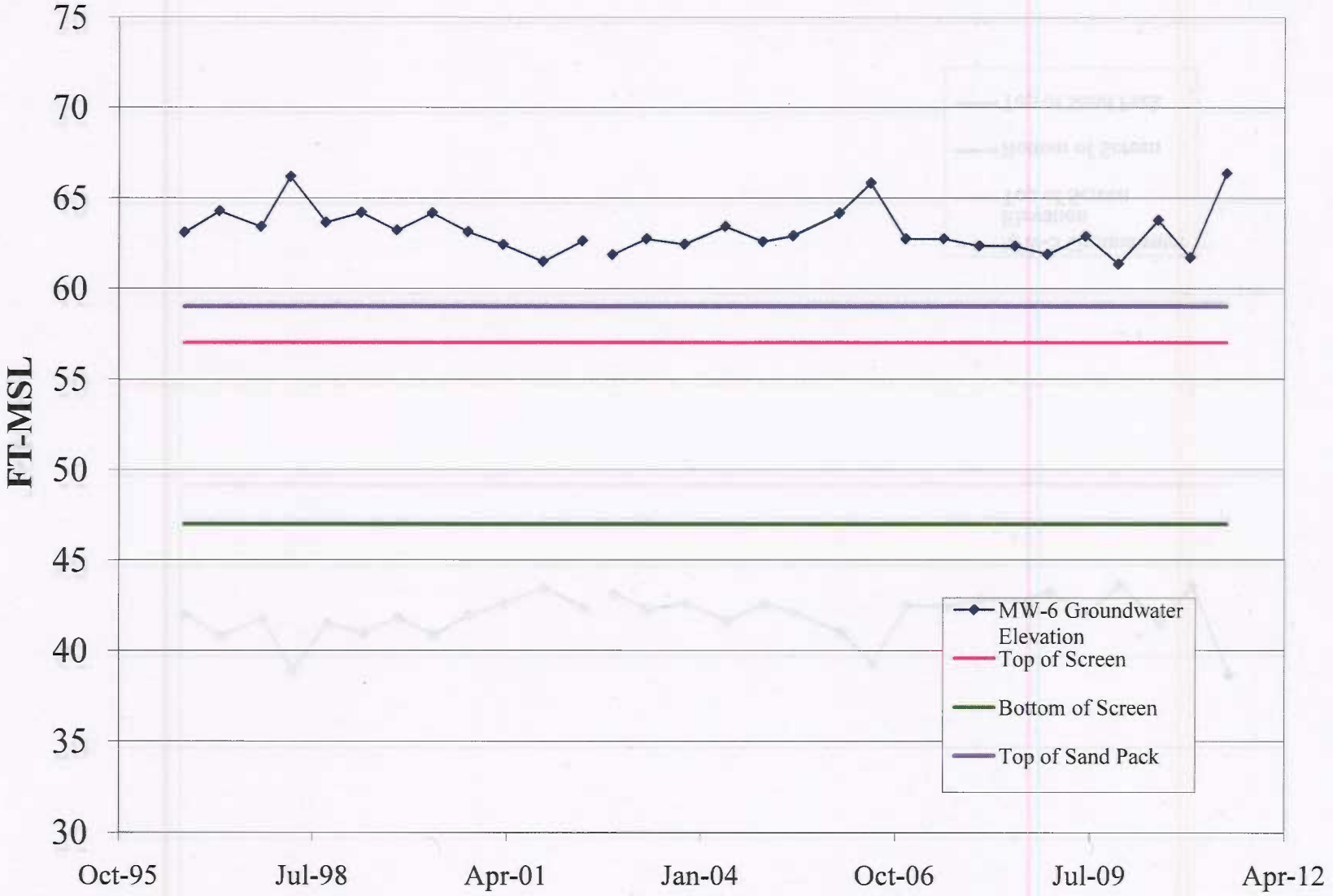
YSDI Monitoring Well MW-4



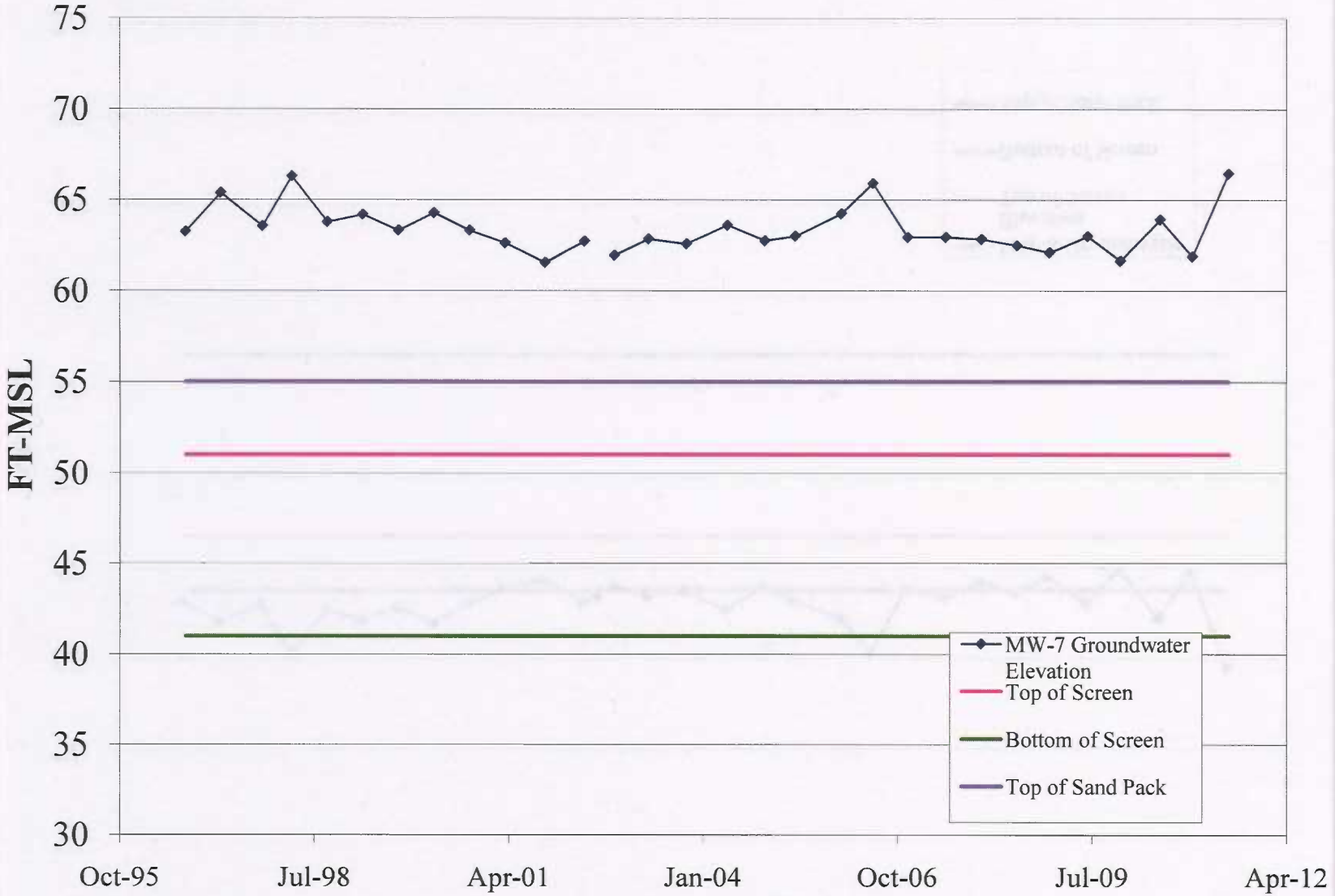
YSDI Monitoring Well MW-5



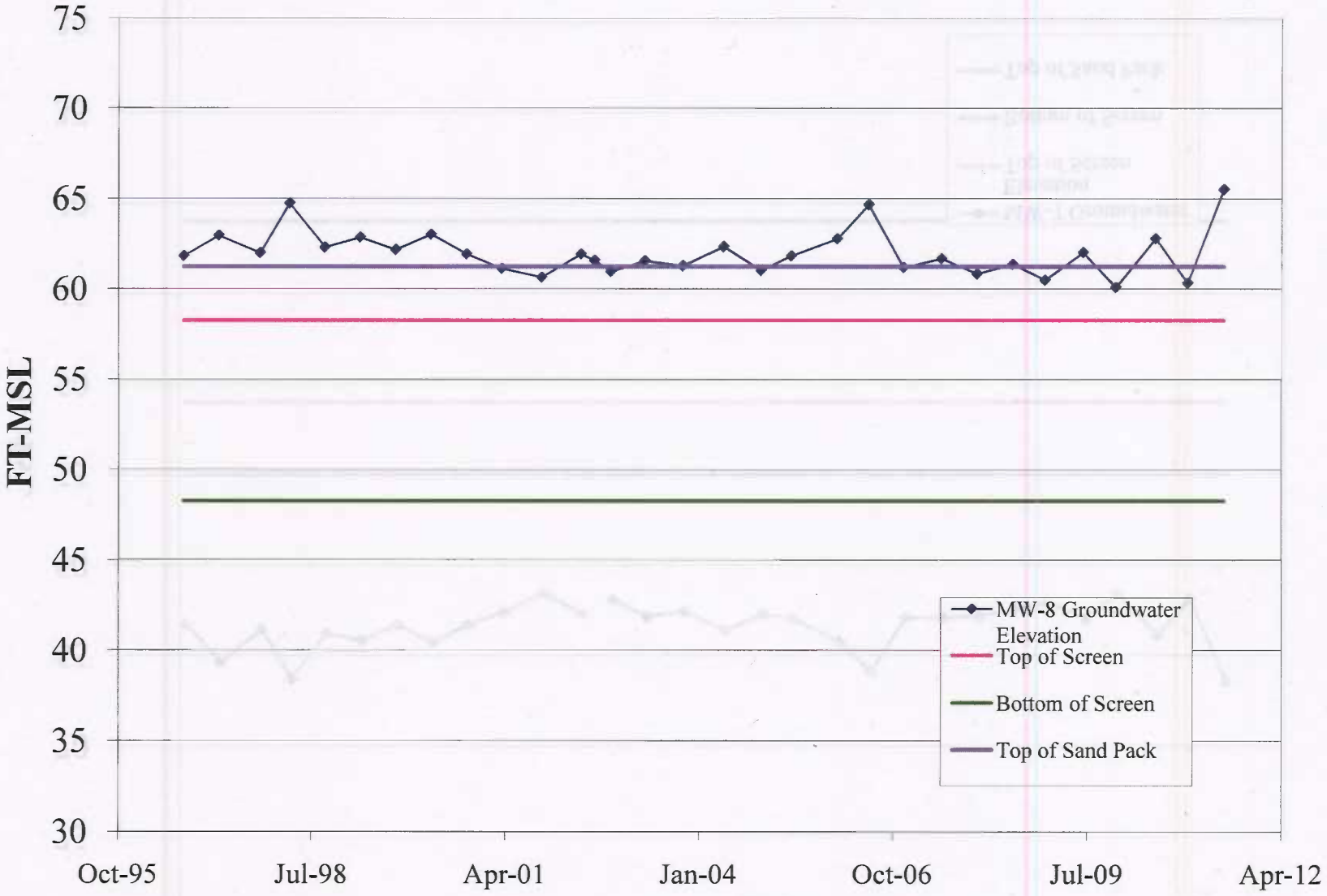
YSDI Monitoring Well MW-6



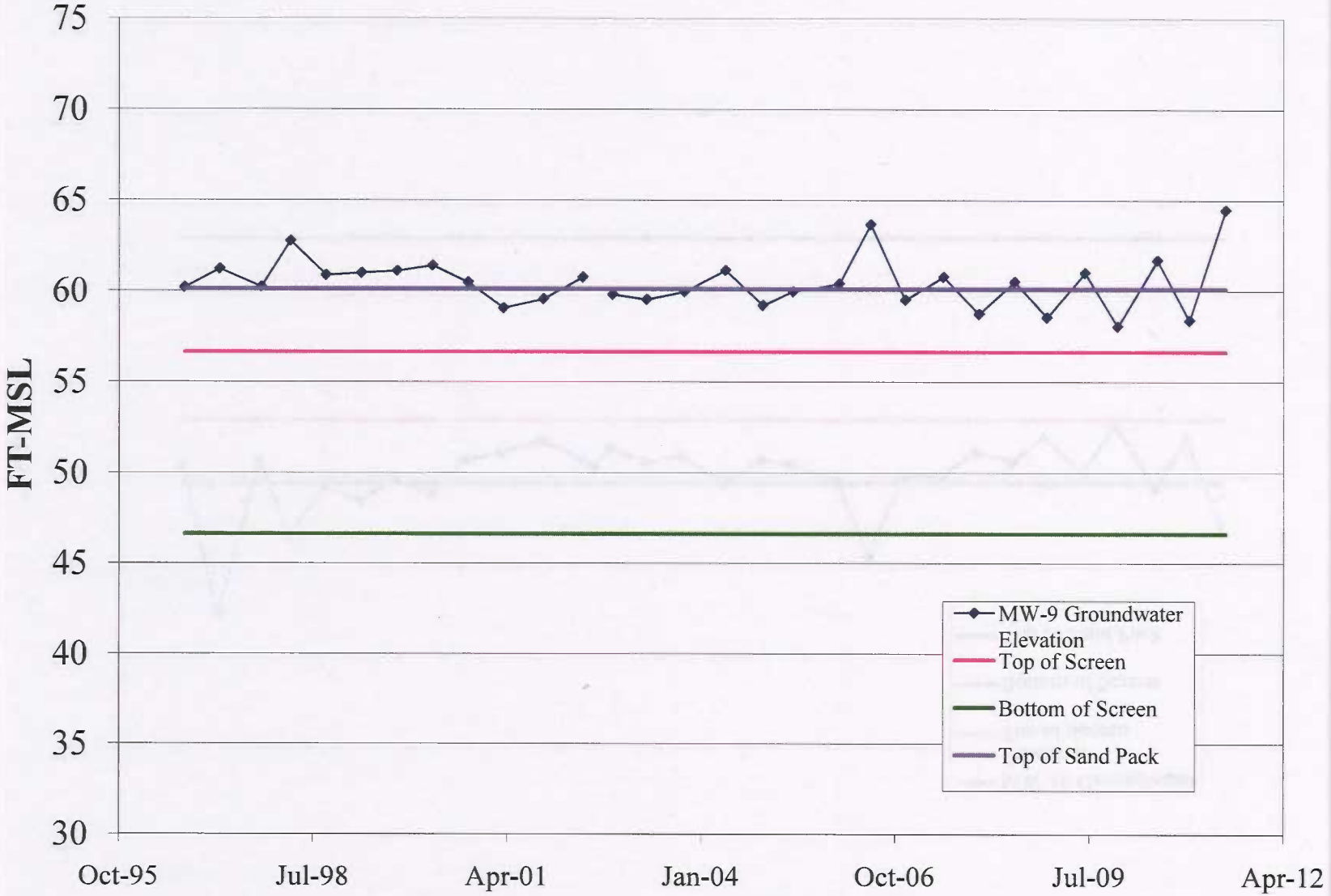
YSDI Monitoring Well MW-7



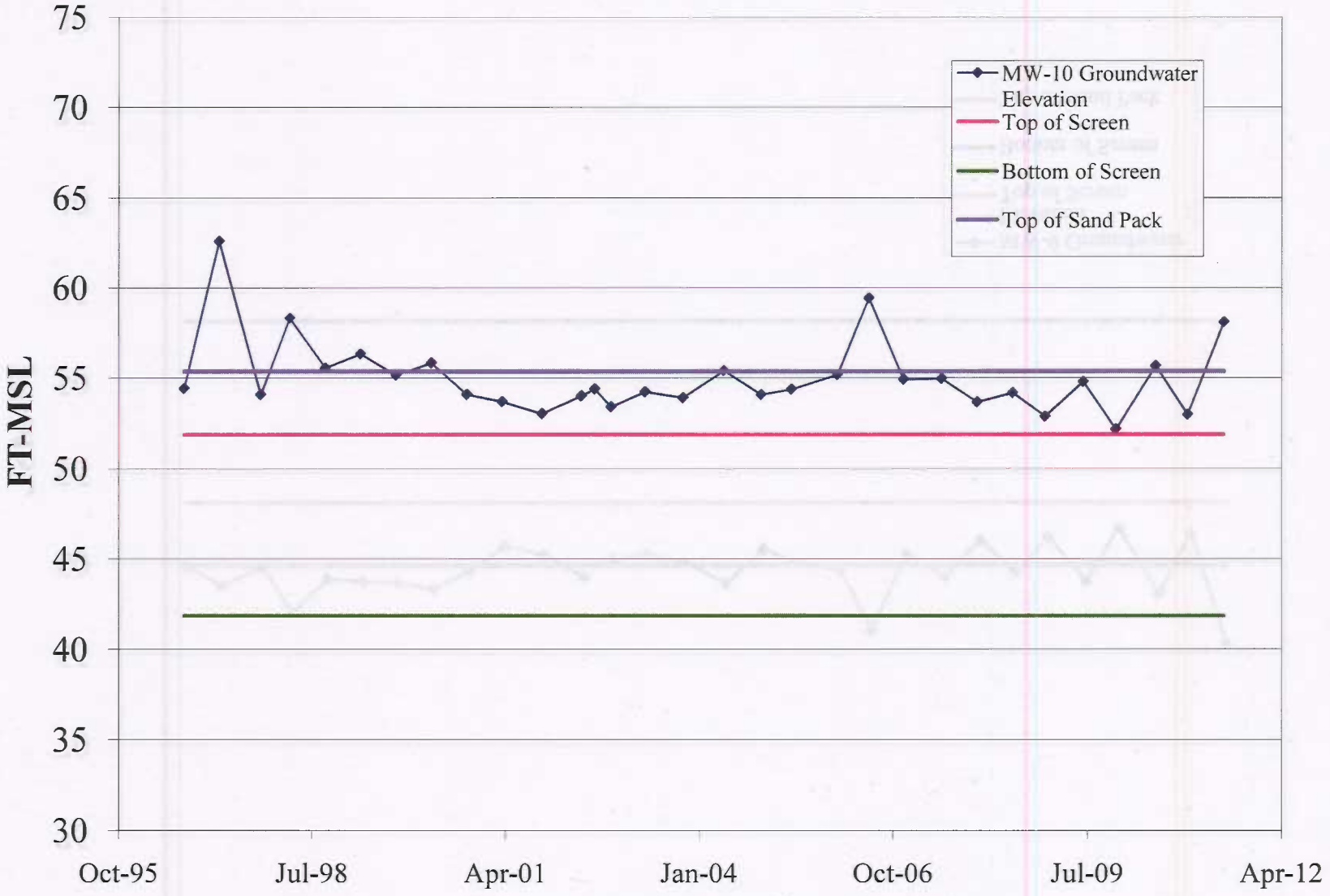
YSDI Monitoring Well MW-8



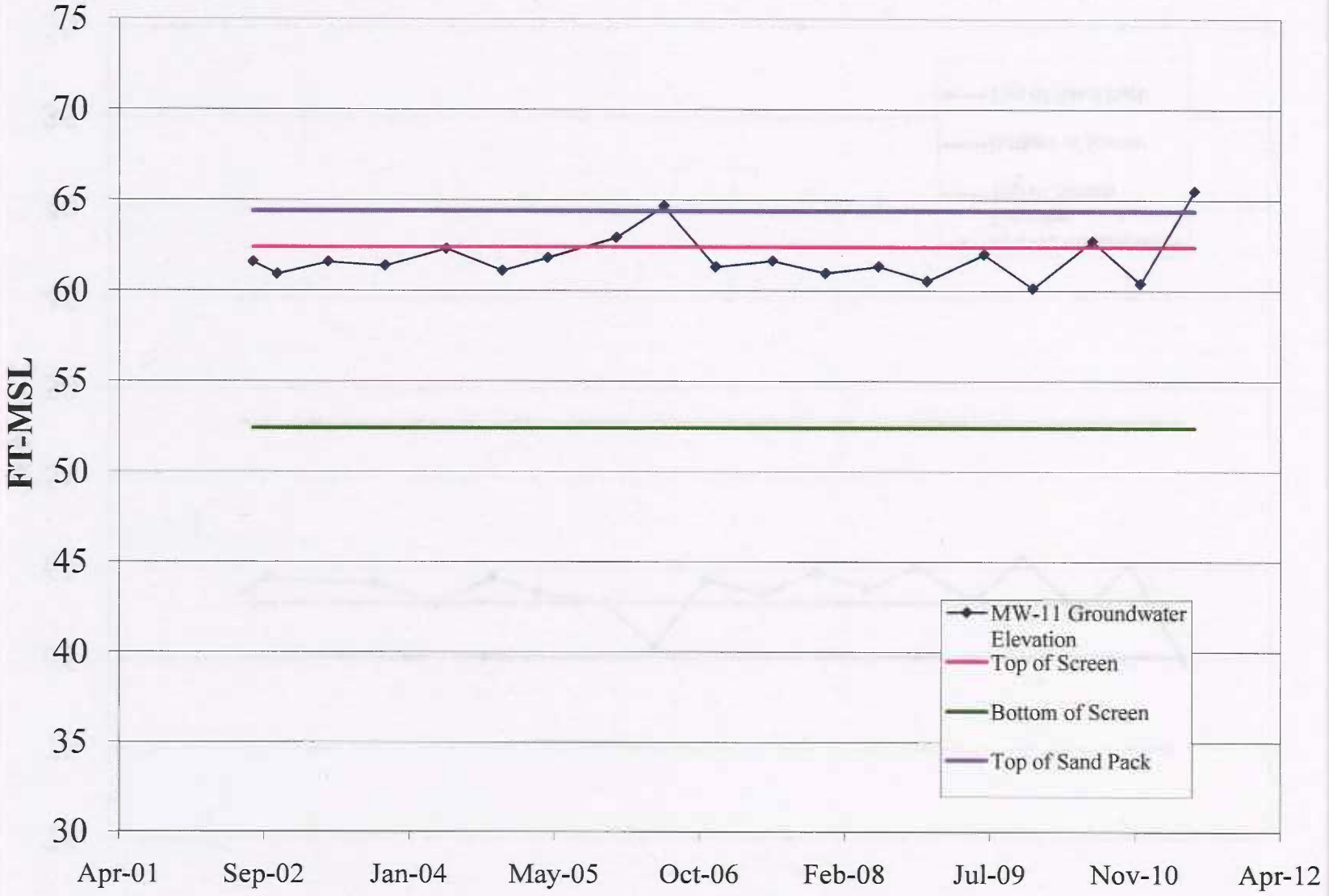
YSDI Monitoring Well MW-9



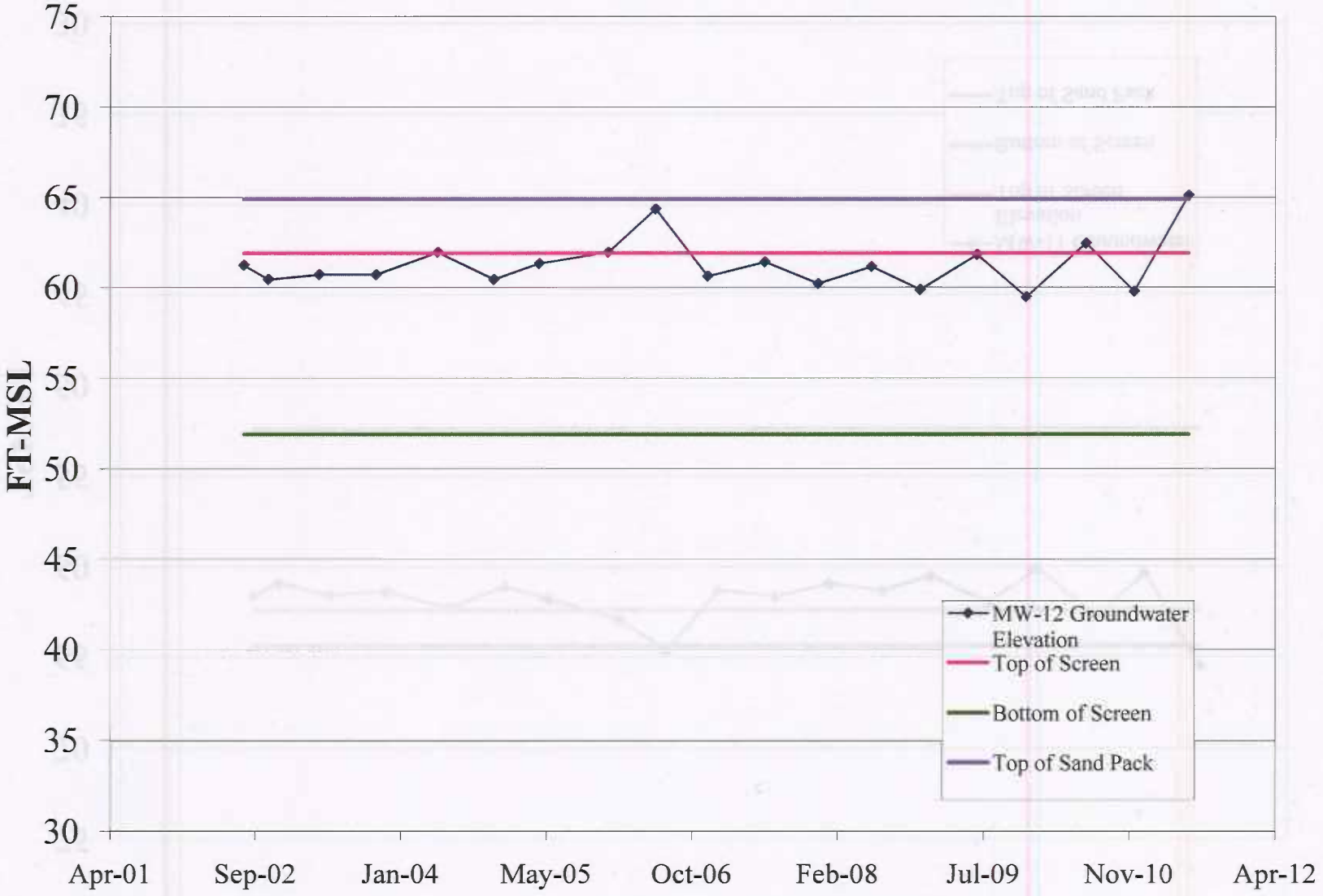
YSDI Monitoring Well MW-10



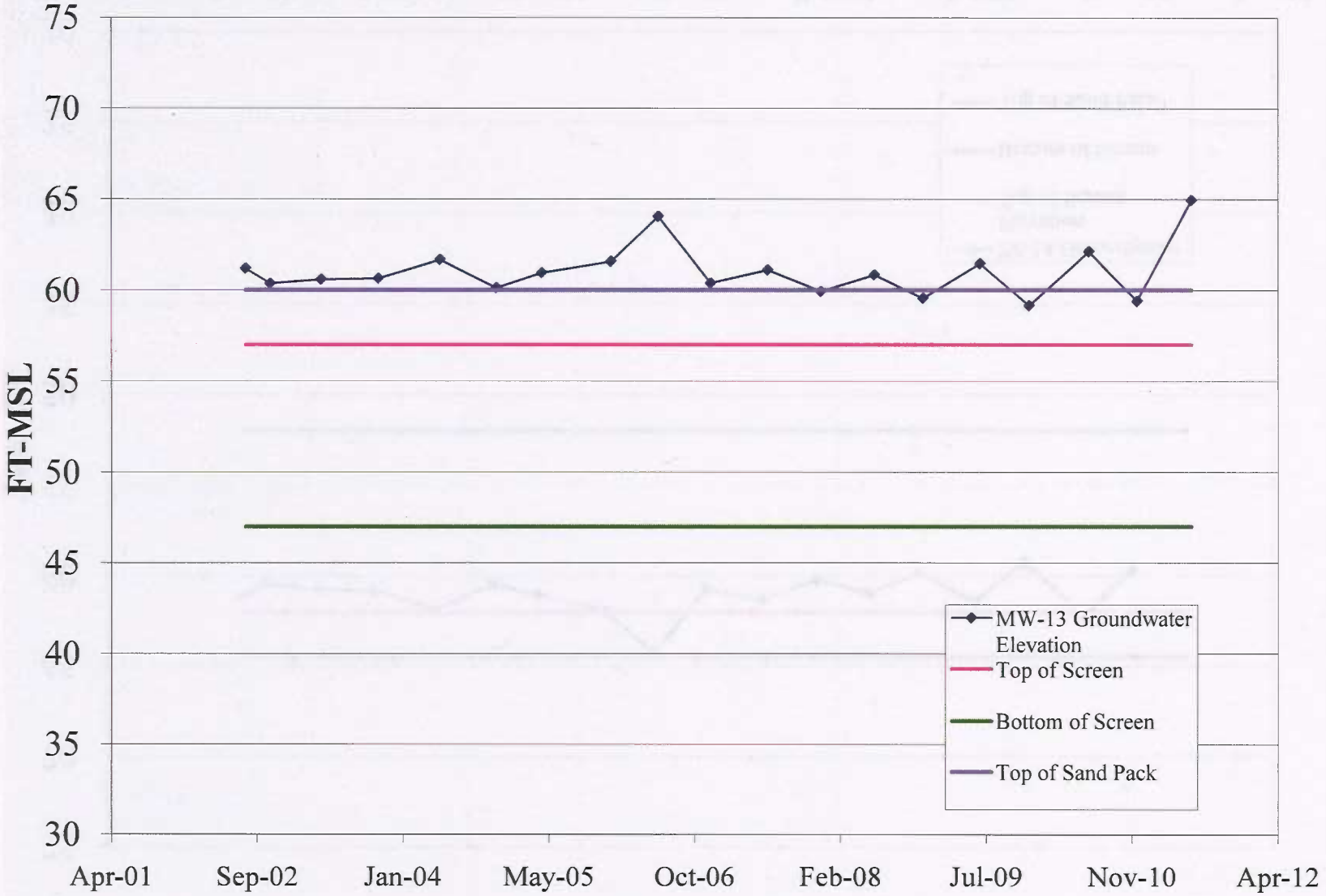
YSDI Monitoring Well MW-11



YSDI Monitoring Well MW-12



YSDI Monitoring Well MW-13



YSDI Monitoring Well PZ-14