

Janice K. Brewer
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov



Henry R. Darwin
Director

June 15, 2011
FPU #11-126

Ms. Jenn McCall
Strategic Program Manager
Freescale Semiconductor
2100 East Elliot Road
Tempe, Arizona 85284

Re: Motorola 52nd Street Superfund Site – Operable Unit 1 Effectiveness Report 2010
Operations at 52nd Street Superfund Site, submitted by Clear Creek and Associates, March 2011

Dear Ms. McCall,

The Arizona Department of Environmental Quality (ADEQ) and the Environmental Protection Agency (EPA) has reviewed the above referenced report. It was discovered within the realm of this review that previous comments on the 2009 Effectiveness Report had not been addressed or responded too. Please make sure that ADEQ and EPA received a response to comment for the 2009 report within 30 day of receipt of this letter. Many comments are carried over from those comments.

ADEQ General Comments:

1. Bedrock in the report seems to be viewed as both proof of success and, contradictorily, also as an impediment to success. The report indicates that bedrock is permeable enough west of the OCC so that extraction forces can move groundwater and VOCs successfully from hundreds of feet westerly from the OCC (out to 1000 feet west), and to hundreds of feet deep below the ground surface (between 300 and 400 feet in depth). These indications are used to prove containment and capture. Yet contradictorily, the bedrock is also portrayed as so impermeable (east of the OCC) that VOCs cannot be extricated from those areas closest to the extraction well forces (east between the OCC and the source area, and at the source area).

Please explain what bedrock permeability/lithologic changes occur west of the OCC to create such disparity in removal success and failure. It can be interpreted an inconsistency in bedrock presentation and VOC containment/capture.

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ 85701
(520) 628-6733

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2. A work plan is referenced in the report regarding the increasing TCE concentration in selected wells and an influx of PCE, however there is no estimated time frame when this report will be drafted. These issues are a factor related to the efficiency and capture of the treatment system. ADEQ requests a submittal time frame for the work plan.
3. In accordance with the Arizona Revised Statutes (A.R.S.) section 32-125 and Arizona Administrative Code (A.A.C.) R-4-30-304, final documents must have the seal and signature of an Arizona registrant. If there is a Federal provision which preempts or supersedes this requirement, please provide a citation or copy for ADEQ to review.

ADEQ Specific Comments:

1. Page 2-1, Section 2.0, 2nd complete paragraph on page; line 2 thru line 5: The text reads that five (5) onsite extraction wells located within the Courtyard of the 52nd Street facility consist of DM301 through DM304. However this is only four. The text then references the newly-installed extraction well located at the northwestern part of the facility (DM314) but this is not within the courtyard. Please update the text.
2. Page 2-3, Section 2.0, 1st complete paragraph on page; lines 6 and 7: The weight of DNPL recovery does not seem correct when looking at the 2009 effectiveness report and the 2010 effectiveness report. The 4.2 pounds recovered seems to fit more with 2009 numbers for gallons of water (as is in the 2009 report) than 2010 reported gallons of water removed. This needs to be confirmed and corrected. Please also see EPA specific comment 1.
3. Page 3-5, Section 3.3, 1st complete paragraph on page; line 16: Well MP-11D TCE concentration range referred to in the text does not match the results in Table 11. The range is actually 3.9 to 88 µg/l.
4. Page 4-6, Section 4.3, line 3: Confirm the "6" active extraction wells
5. Page 4-11, Last full paragraph: Remove "new" from the sentence. Since these wells were installed over three years ago new is not an accurate description.
6. Page 4-12, 2nd paragraph: The report comments that Well DM306 shows some variability related to the weak structural issues. Is it being suggested that well be replaced or rehabbed? What is the reasoning for such a comment and what is the action that will come of it?
7. Page 5-1, Bedrock Report: The date for the Bedrock submittal has been pushed back to later in the year 2011. The report should reflect a more accurate date for submittal throughout this section.

8. Page 5-2, last paragraph: The figures reference is incorrect for the plan view concentration, Figure 33. Either update the figure or change the reference throughout this section.

EPA General Comments

1. The title of the report calls the site "52nd Street Superfund Site." The name on the NPL is the "Motorola 52nd Street Superfund Site." The proper name should be used for the title of the report. There is a possibility that there may be another 52nd Street site that currently exists or will be identified in the future in another State.
2. The report provides several lines of evidence to support the capture evaluation. We continue to have concerns with the approaches used to determine the extent of capture depicted in the report, particularly near the northern end of the Old Crosscut Canal (OCC) extraction wells. Numerous wells are continuing an increasing TCE concentration trend. We recommend an alternate line of evidence be explored rather than the simplistic one well calculation of the capture zone width. We are also concerned that the 10-foot saturated zone is not representative. These were issued commented on in the 2009 Effectiveness Report. Please review 2009 Effectiveness Report General Comment No. 2.
3. There are references to the End Use Alternatives Report in several locations in the report. We agree that this topic should be discussed in the Effectiveness Report. But the tone of the discussions gives the appearance that a final alternative has been selected and approved by the regulatory agencies. For example, the sentence in the Summary and Conclusions states "Freescale and Clear Creek will continue working on the *selected* alternative end use..." It would be more accurate to use the word "**proposed**" rather than "**selected**" in this sentence. Please review any references to the End Use Alternatives and revise it to make it clear that no final decision has been made.

EPA Specific Comments

1. Page ES-1, second paragraph fourth and fifth sentences: The fourth sentence states that an estimated 8.7 pounds (lbs) (0.53 gallons [gal]) of volatile organic compounds (VOCs) were recovered as (dense non-aqueous phase liquid) DNAPL and as groundwater with high VOC concentrations. The fifth sentence states that 21,178 lbs (1,739 gal) of VOCs were recovered. The VOCs in the first sentence would have a density of about 16.4 lbs/gal and the VOCs in the second would have a density of about 12.2 lbs/gal. Please review the calculations and revise as necessary for consistency.
2. Page 2-1, first paragraph: The paragraph states that Figure 4 provides the process flow diagram for the IGWTP. The figure shows pairs of GAC vessels in series, 4 units' total, for the liquid-phase treatment. The third sentence needs to be corrected to state that groundwater treatment is provided by 4 liquid phase treatment vessels connected as pairs in series, to be consistent with the figure.

3. Page 2-2, Section 2.0, second paragraph: This paragraph states that an estimated 793 lbs (65 gal at an assume specific gravity of 1.46) of VOCs were removed, and goes on to state the amounts removed from the well groups. The basis for the specific gravity assumption for the DNAPL, possibly referencing laboratory analytical results, should be mentioned here.
4. Page 3-1, Section 3.1: We suggest updating the section for example, some of the “new wells” discussed were installed in 2005 and others in 2007 and not “new”.
5. Page 4-4, Section 4.2, third paragraph: This paragraph compares Figures 10 and 12; however, a comparison is difficult because seven additional deeper wells have been added to Figure 12, which changes the interpretation. A better comparison would be to show the same wells on the cross section for 1992 and 2010 and contour data from the same intervals to more clearly show the changes over time.
6. Page 4-4, Section 4.2, fourth paragraph, second sentence. These two sentences states that water level data show that the extraction system creates a zone of capture to depths about 400 feet below ground surface. The basis for this assertion is not clear. Well DM502, which is outside the zone of influence of groundwater extraction, indicates an upward vertical gradient. The transmissivity of the bedrock could be up to four orders of magnitude lower than the overlying alluvium (Section 3.2), which is confirmed by the low production rate of well 314 [averaging 0.7 gallons per minute (gpm), page 5-2]. It is not intuitive that extraction at the bedrock/alluvium interface would have a measurable effect hundreds of feet below the base of the extraction well fields. As we commented last year, it would be beneficial to obtain water levels in the deeper wells under non-pumping conditions during the next extended period of well field shutdown to help prove the existence of upward vertical gradients in the deeper intervals resulting from pumping.
7. Page 4-5, Section 4.2, sixth sentence: The sentence states, “The uniform responses of these wells to OUI pumping at depths up to 370 feet indicate that all three wells respond similarly at depth as at the water table, demonstrating that the effects of pumping at the extraction wells extend deep into bedrock.” While wells DM603 and DM605 show the effect of pumping (water levels have decreased about 30 to 34 feet), well DM606 only shows that the water level have decreased over the same period about 18 to 21 feet, which is similar to DM-119 located well beyond the estimated capture zone. If DM606 is removed from the evaluation, then the response is at a maximum depth of 290 feet.
8. Page 4-7, Section 4.3, Estimated Flow Rate Calculation, fourth full sentence: Figure 16 shows flow rates ranging from 68 gpm to 682 gpm, not 68 gpm to 477 gpm as listed in this sentence.

9. Page 4-7, Section 4.3, Estimated Flow Rate Calculation, sixth full sentence: The sentence states, "This (average saturated thickness of 10 feet) is reasonable because the majority of the alluvium in the area up gradient of the extraction wells is mostly dry." On page 4-6, however it states the thickness at the extractions wells is up to 50 feet under pumping conditions and is estimated to be a maximum of 75 feet under non pumping conditions. Based on these data, the use of 10 feet of saturated thickness appears to overly weigh the influence of the unsaturated areas. Using the average of the saturated alluvial thicknesses posted on Figure 8 for pumping wells DM-305 through DM-310 results in an average saturated thickness of about 19 feet under pumping conditions (saturated thickness 0 at DM-305 and DM-308).
10. Page 4-7, Section 4.3, Calculation of Capture Zone Width, seventh sentence: The sentence states, "A saturated thickness of 10 feet better approximates the conditions observed in the OU1 Area." See discussion in Specific Comment No. 9.
11. Pages 4-12 to 4-14, Section 4.5, Source Area Wells/Wells Inside the Capture Zone/Down gradient Wells: The discussions presented in these sections are very specific and detailed and provide strong trend discussions. However, the graphs on Figure 30 do not provide sufficient clarity to substantiate the trend discussion. The size of these graphs should be reviewed (as well as other in the report) to provide sufficient resolution for data collected in the past 5 to 10 years. We suggest either showing "blown up" graphs elsewhere or plotting the more recent data with a scale that is meaningful to the current conditions.
12. Page 4-13, Section 4.5, Wells Inside the Capture Zone: This section should also include discussions of wells DM602 and EW18 as they are within the capture zone.
13. Page 5-1, Section 5.0, second paragraph, third sentence: The sentence indicates that Figure 34 presents a graph for the bedrock wells "closest" to DM314. This statement appears to be in error because wells DM614 and DM615 are the closest bedrock wells to DM314. Please revise. Please also provide an explanation as to why DM614 and DM615 are not graphed on Figure 34.
14. Page 5-1, Section 5.0, second paragraph, sixth sentence: The sentence states that "Large downward spikes...were cause by purging for sampling events in those wells." It would be helpful if Figure 34 were annotated to show which spikes were the result of the sampling.
15. Page 5-2, Section 5.0, third paragraph, fourth sentence: The sentence indicates that the most significant change is the "reduction observed in MP36-C from 350,000 micrograms per liter ($\mu\text{g/L}$) in 2009 to 150,000 $\mu\text{g/L}$ in 2010." The latter concentration appears to be a typographical error and should be 151,000 $\mu\text{g/L}$ (September 2010).

EPA Table Comments

1. Table 5: The notes provided for this table lack the detail necessary to follow the calculations. There should be specific notes for each of the columns of data.
 - a. The note for Column 2, "Product Recovered (ml)," should state that the volumes provided are actual quantities of free product DNAPL recovered from the specified well during the referenced period provided in Column 1, "Year."
 - b. The note for Column 3 should state that this is a simple conversion of the volume provided in Column 2 from milliliters to gallons.
 - c. The note for Column 4, "Groundwater Extracted (Gallons)," should state that the volumes provided are actual quantities of water extracted from the specified well during the referenced period provided in Column 1. The three existing notes provided all apply to Column 5, "VOCs Removed as TCE (pounds), and should be revised for clarity. The note should read as follows: "The VOCs Removed as TCE quantities provided represent a summation of the free product DNAPL recovered (Column 2) assuming a TCE density of 1.46 (gram per liter) g/L (12.17 lbs/gal) at 20 degrees Celsius (°C) and the groundwater extracted (Column 4) assuming dissolved TCE concentrations at the solubility limit of 1,100,000 µg/L at 20°C. VOCs Removed as TCE (lbs) = {Product Recovered (milliliter) [Column 2] * TCE Density at 20°C (g/mL) * 2.205e-3 lb/g} + {Groundwater Extracted (gallons) [Column 4] * TCE Solubility in Water at 20°C (µg/L) * 1e-6 g/µg * 2.205e-3 lb/g * 3.78 L/gal}."
2. Table 6: The notes provided for this table also lack the detail necessary to follow the calculations. Notes need to be provided for Columns 2 and 3 as to whether these are calculated, field measurements, or a combination. Note 2 seem to refer to the calculation to determine quantities in Column 4, "VOCs Removed as TCE (pounds)." This calculation is not correct, and should be replaced as follows: VOCs Removed as TCE (lbs) = VOCs Removed as TCE (gal) [Column 3] * 3.78 L/gal * 1000 mL/L * TCE Density at 20°C (g/ml) * 2.205e-3 lb/g."
3. Table 7: A column providing the average flow rate over the operating days needs to be added to the table for the calculation of "Effluent VOCs (lbs/day)," in Column 15, to be verified.
4. Table 8: This table needs a note to explain the meaning of the value in bold typeface.
5. Table 10: It should be noted why the December 2010 data was listed for MP36-C and MP36-D, when September 2010 data are available.
6. Table 11:

- a. The first quarter 2009 data for the bedrock pilot study wells should be on this table.
- b. We suggest adding the following note: Maximum concentration is posted for quarters where more than one sampling event was conducted.

EPA Figure Comments

1. Figures 2, 3, 14, 22, 23, 24, and 25: Above each projected well on figures using Cross Sections A-A' and B-B', the distance and direction of the projection should be noted.
2. Figures 2 and 15: The groundwater elevation shown for extraction well DM307 is too deep at approximately 1084 feet; it should be at 1094.34 as presented in Table 9 and Figure 11.
3. Figures 3 and 26: The groundwater elevations shown for extraction wells DM310, DM309, DM308, DM307 and DM305 are all deeper than the corrected elevations presented in Table 9 and Figure 11.
4. Figures 11 and 13: The gray-shaded B-B' line is not the same as the B-B' line depicted on Figure 1.
5. Figures 10 and 12: Wells MP 03 and MP 09 are depicted differently on the two figures.
6. Figure 12: Please revise the water table on this figure, it should be higher in the vicinity of wells DM120, DM607 and DM603, the elevation of the water depicted in extraction DM307 is about 40 feet lower than the listed elevation. The water table surface should mirror the contours depicted on Figure 11 along the cross section line.
7. Figure 16: As commented for the 2009 Effectiveness Report, the units of Q on this figure should be gpm, not ft³/day.
8. Figure 17: As commented for the 2009 Effectiveness Report, the first equation should read (EPA 2008):

$$x = \frac{-y}{\tan\left(\frac{2\pi Ti}{Q} y\right)}$$

In the Range of Results table, X (ft) should be changed to X_o (ft).

9. Figure 25: The 5 µg/L contour should be much closer to well DM607 on both sides. The 100 and 1,000 µg/L contours at the base of well DM606 should be drawn lower in the well toward the 53.8 µg/L data point. The entire lowest screened interval of well DM601 should be encompassed by the 10,000 µg/L contour. The 1,000 µg/L contour should encompass the entire screened interval of DM612.
10. Figure 26: It appears that well DM603 is not used in contouring, so it should be noted that it is not used. Figure 26 shows a different interpretation as compared to the baseline Figure 24. It appears this may reflect the suspected separate source of contamination for well EW-18. We recommend query marks as the contours could easily be drawn similarly to those presented on the baseline figure (Figure 24).
11. Figure 30: As discussed in Specific Comment 11, the size of the graphs and the high concentrations in some of the intervals tends to mask the later data trends. Separate figures for different intervals might be appropriate. This figure should include a graph for DM602.
12. Figures 35 and 35: We suggest posting the cross section line for Figures 36 and 38 on these figures.
13. Figure 35: Wells DM303 and DM304 have no concentration data posted on this figure; however, concentration data is posted for these wells on Figure 36. The data posted on this figure for MP09-D does not match the data posted on Figure 36.
14. Figures 36 and 38: We suggest using a different colored font for the concentrations next to the wells; the current color makes it difficult to read.
15. Figure 37: Wells DM303, DM304, MP11-B and MP-30A do not have concentration data posted on this figure; however, concentration data is posted for these wells on Figure 38. The data posted on this figure for MP11-C and MP36-D does not match the data posted on Figure 38.

EPA Comments on Appendix B

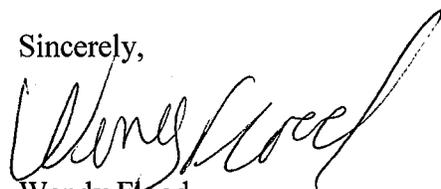
1. Appendix B, first page, first paragraph, seventh sentence: The year should be 2010 rather than 2009.
2. Appendix B, first page, second paragraph, fourth sentence: This sentence states, "*The efficiencies for the wells were calculated for a range of pumping rates and since water levels at the site have not changed significantly since 2002, a need to retest the wells in the foreseeable future is not anticipated.*" Please define what a "significant" water level change is. Review of the time series graphs indicates water levels in many wells have declined by over 5 feet since 2002, further, the water levels in pumping wells DM307, and DM308 have declined over 40 feet, DM309 over 20 feet and DM310 over 10 feet.

Jenn McCall
June 15, 2011
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These changes appear to be significant and two of the wells' listed efficiencies seem anomalous.

Please feel free to contact me via e-mail, flood.wendy@azdeq.gov, or by phone, (602) 771-4410 if you wish to discuss these comments further.

Sincerely,



Wendy Flood
ADEQ Project Manager
Federal Projects Unit

Enclosure

Cc: Wayne Miller, ADEQ (electronic)
Martin Zeleznik, EPA
Sue Kramer, Shaw Group
Project file