Message

From: Davis, Eva [Davis.Eva@epa.gov]
Sent: 7/8/2016 3:56:43 PM
To: d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; Dan Pope [DPope@css-dynamac.com]; Wayne Miller [Miller.Wayne@azdeq.gov]
CC: Henning, Loren [Henning.Loren@epa.gov]; Butler, Thomas [Butler.Thomas@epa.gov]; Levine, Herb [Levine.Herb@epa.gov]; Brasaemle, Karla [KBrasaemle@TechLawInc.com]; ARohrbaugh@TechLawInc.com
Subject: RE: ST12 groundwater plume contours over time

Hi Carolyn –

The benzene contours over time are not the best way to determine if the plume is spreading, as the same wells were not always sampled. A good example of this is the latest contours from Nov 2015 that Amec presented during the last BCT call – those contours did not include data from wells W-11, W-30, and W-37, these wells were not sampled because the wells contain LNAPL, thus they could make it look like the benzene plume in the LSZ is contracting, which it is not. The center of it should be reduced due to SEE, but the benzene in the perimeter wells is not decreasing because these areas were not treated.

Amec presented during the April 20, 2016 BCT call some concentration during time plots for some of the perimeter wells. The latest data points on these plots was data after steam injection was halted, and while extraction continued, and decreased concentrations were shown in all the LSZ wells that had had high dissolved phase concentrations, but at the time of the last sample, the extraction had pulled the plume back toward the center. Now that pumping has ceased, as the natural gradient is re-established, we can expect to see higher concentrations once again in wells W-12, W-34, and W-36. W-30 is upgradient, and contained LNAPL, so we can expect its concentrations to remain high.

U-2 is the only UWBZ for which they provide a concentration versus time plot, because it is one of the few perimeter UWBZ or CZ wells that are close enough to the contaminated area in these zones to contain the plume. This is also why there are so few benzene contours of the UWBZ and CZ – there were few wells actually in the plume that were being monitored routinely. Benzene concentrations in this well had been low until about Sept 2015, when it started to climb, and it was not drawn back by the extraction that was being done. This well we should keep an eye on to determine if the plume is spreading in this zone. Other downgradient UWBZ wells (U-37, U-38, RB-3A) and CZ wells (C-2, C-5) aren't showing benzene yet, but they have low hits of TPH, toluene, and other fuel components, so it is just a matter of time before benzene also reaches these wells. I don't believe that there are any sentry wells that show no signs of fuel contamination, although some of these wells (for example, C-5) is quite a ways down gradient.

In response to your conclusions/questions –

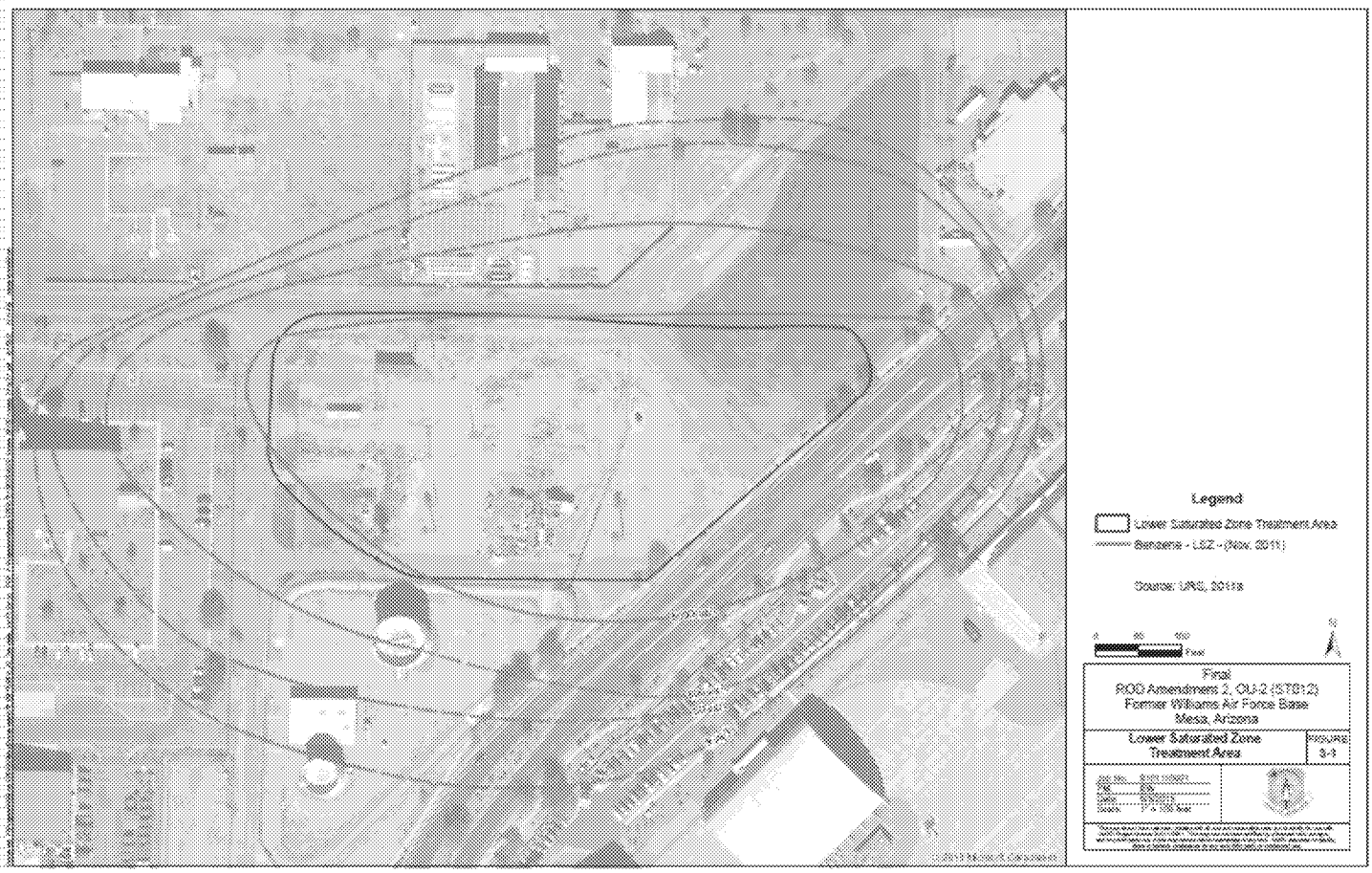
1) I agree that LNAPL and dissolved phase plumes are migrating – I think we have a couple wells in place that would show this with time, but there are also large areas where we don't have wells.
2) Most of the contour figures do not accurately reflect the actual conditions because the most contaminated wells at the center of the spill and around the perimeter were not sampled
3) Contour data for benzene for the most part is not available because most of the wells in these zones are outside of the benzene plume
4) Possibly LNAPL could have been mobilized upward during SEE, but the low permeability zone (LPZ) between the LSZ and UWBZ would have limited the movement
5) The changes in contours are more likely driven by the wells that were sampled (or more importantly, not sampled) rather than actual concentration changes, although the concentration versus time data presented during the April 20, 2016 meeting does show some large concentration changes over time at some wells, for example W-36 and W-34.
6) I can only guess why Amec doesn't want to do the characterization, but seems that it is due to the additional costs that would be involved, and the need to increase the estimates of mass out there, and therefore sodium

sulfate required, etc – opens up a big can of worms to have data showing that the problem is even bigger than they want to admit

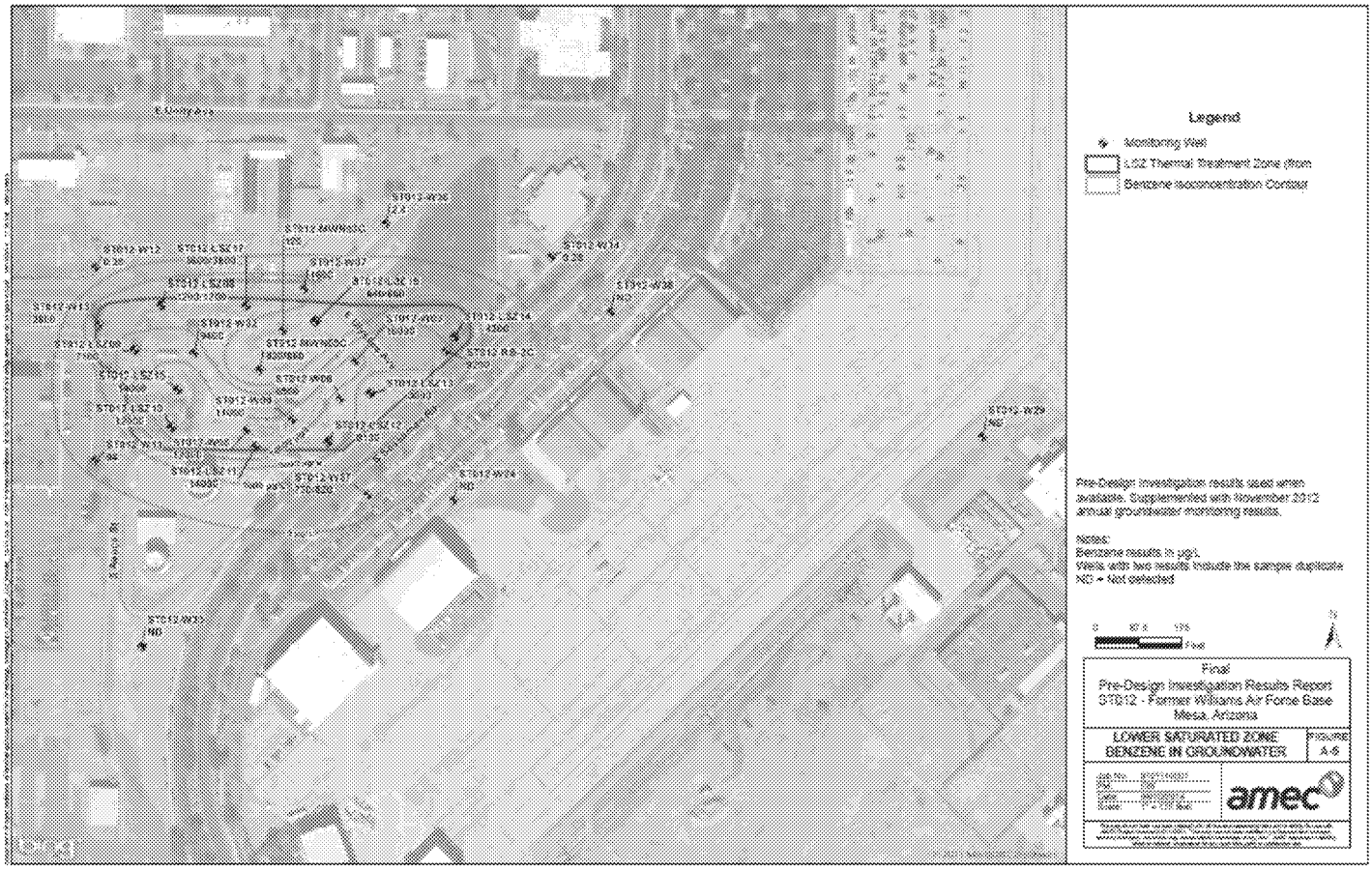
7) Meaningful milestones can't be set without the baseline data – perhaps another reason why Amec doesn't want to get the data
8) I don't know if not having milestones constitutes remedy failure, but I think the approach Amec is taking on implementing their EBR is an admission that they have no confidence in it either

From: d'Almeida, Carolyn K.
Sent: Thursday, July 07, 2016 1:19 PM
To: Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-dynamac.com>; Wayne Miller <Miller.Wayne@azdeq.gov>
Cc: Henning, Loren <Henning.Loren@epa.gov>; Butler, Thomas <Butler.Thomas@epa.gov>; Levine, Herb <Levine.Herb@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; ARohrbaugh@TechLawInc.com
Subject: ST12 groundwater plume contours over time

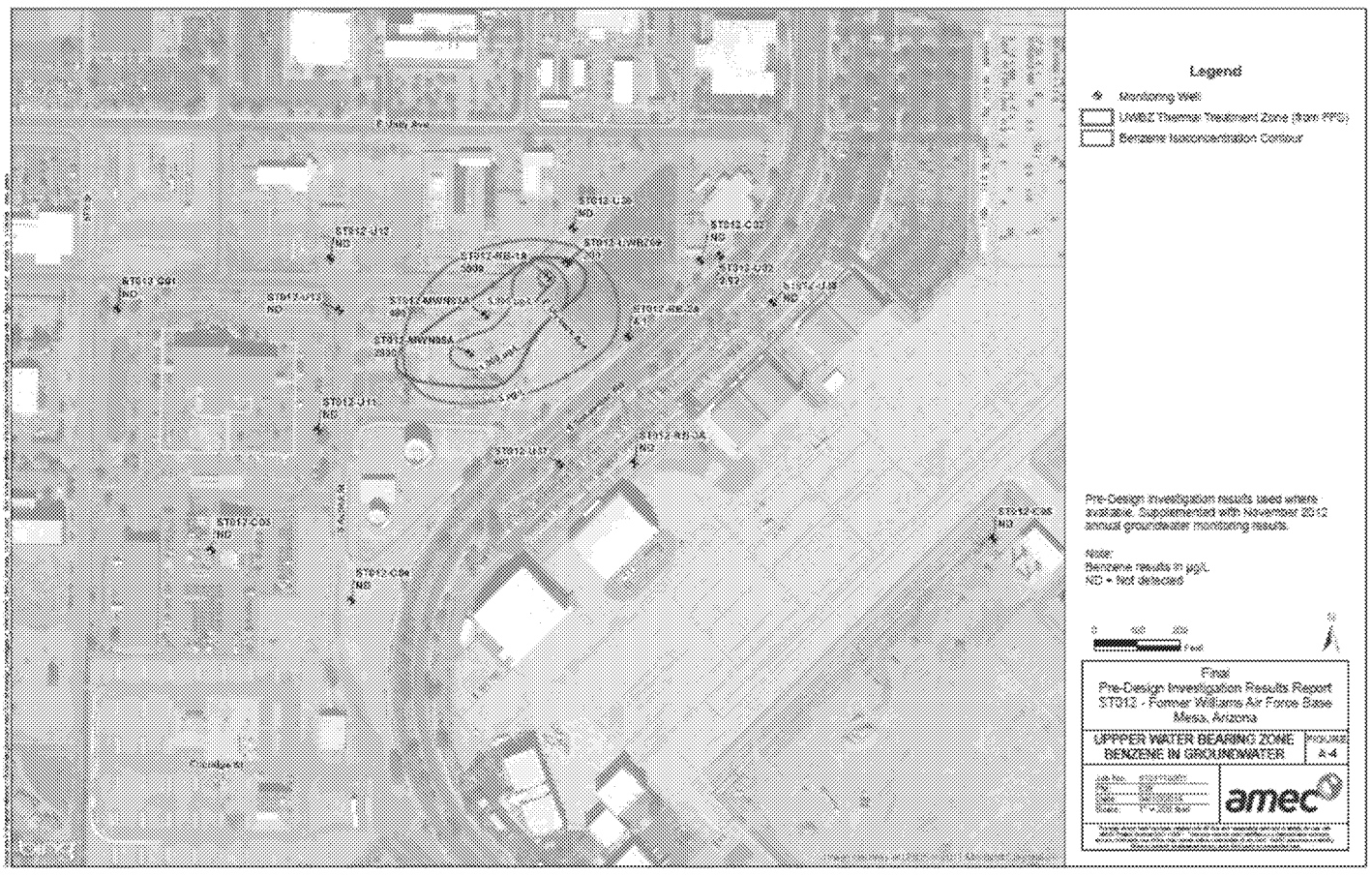
This figure below is from the 2013 ROD amendment - note the extent of the 5000 ppb contour line



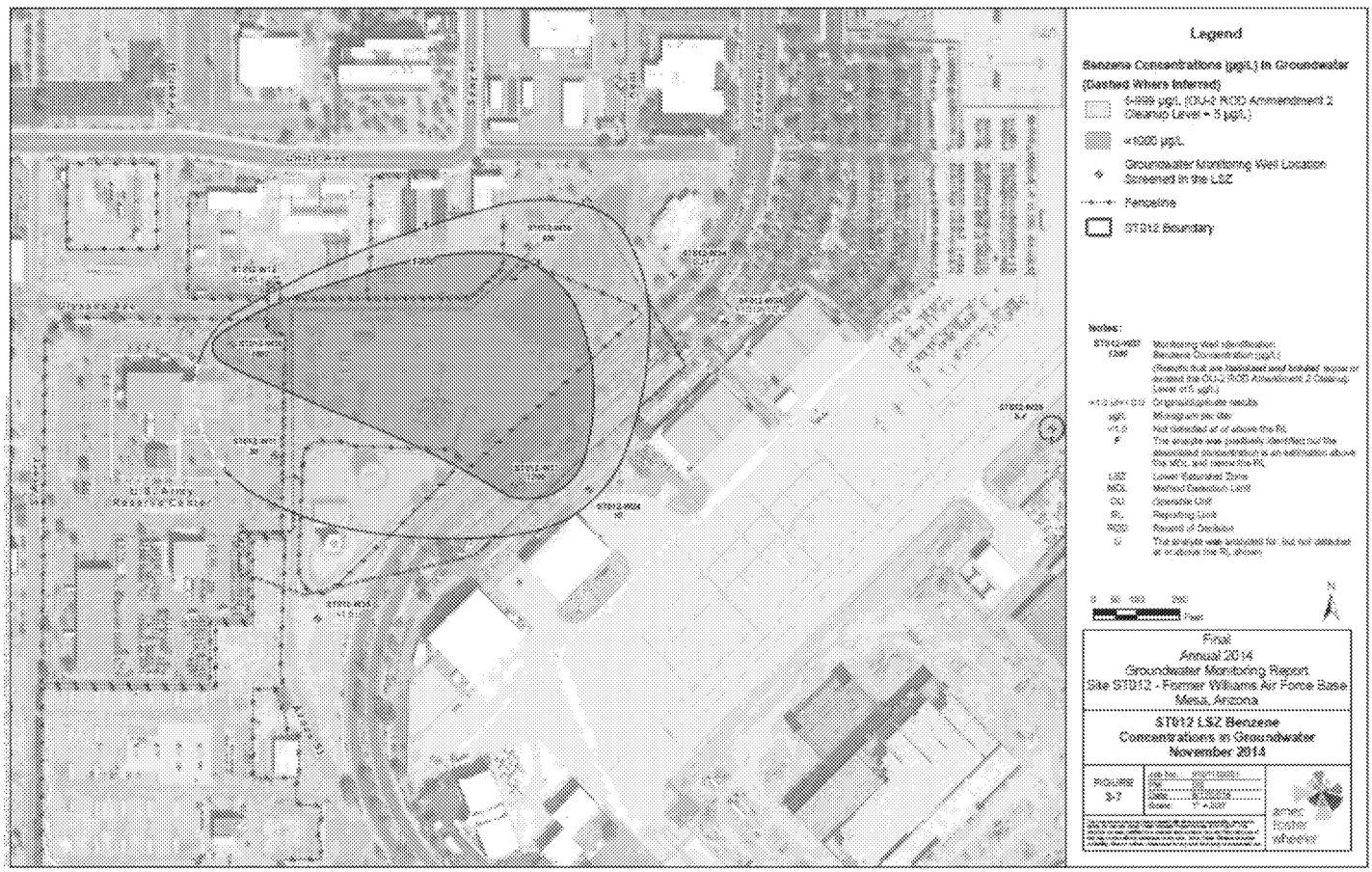
From the RDRA workplan: Note concentrations over 10,000 ppb present – believe this refers to soil cores, not dissolved in groundwater



Here is Upper Water bearing zone contours; basis of design for SEE in the Upper Water Bearing Zone

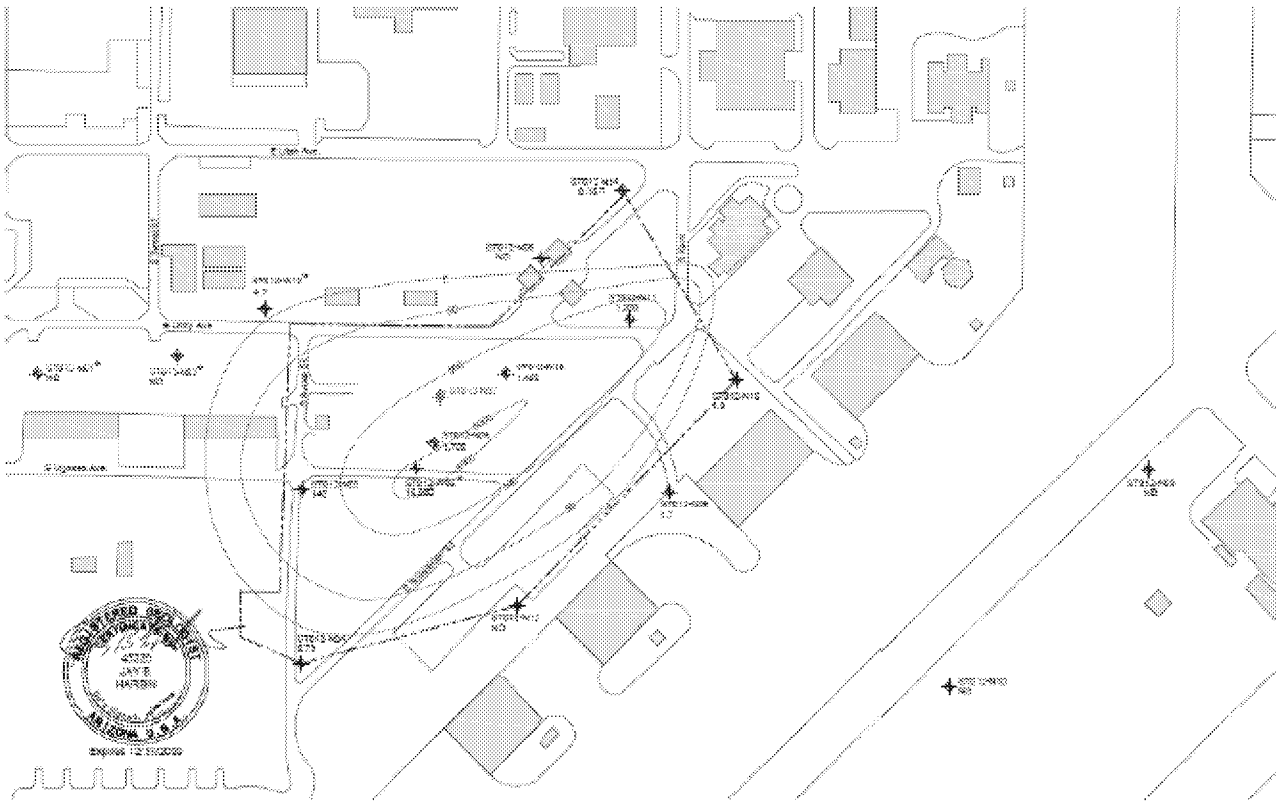


2014 Annual groundwater monitoring report – November 2014 1 month after initiation of SEE - note where 5000 ppb benzene concentration was is now 1000 ppb benzene concentration. Where did all of the benzene go ? Is it volatilizing?



Presented at the June 2016 BCT meeting : 5000 ppb contour is very small area of the site as of Jan 2008 AF has always described the plume as "stable": Did it spread just with the rising water table, or was this an underrepresentation of the actual site conditons? This is dissolved phase benzene before TEE Pilot operation began:

LSZ Benzene Concentrations Jan 2008



Pilot operation schedule:

Step 1: Pre Steam Groundwater/NAPL Extraction 8/11/08 - 10/28/08

Step 2: Mass Transfer Testing (LSZ) 8/26 – 10/27/08; (UWBZ) 8/26 – 8/23/09

Step 3: Steam injection (LSZ) 10/28/-1/26/08; (UWBZ) 11/10 – 2/17 2009

Step 4: Co Steam/Air Injection (LSZ) 1/26 -3/23/09 (UWBZ) 2/17 – 4/8/09 2009

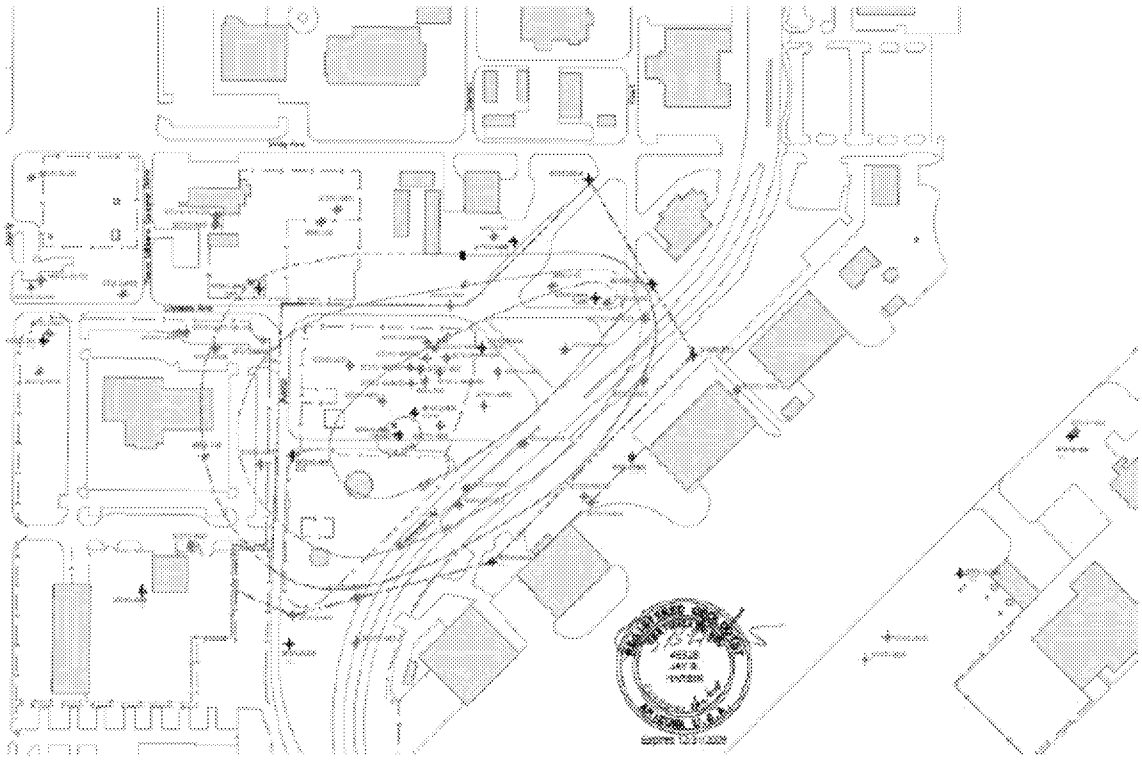
Step 4: Air/ Water Injection (LSZ) 3/24- 5/20/09 (UWBZ) 4/8 -5/20/09

---

11 Weeks of pre- steam pump and treat & mass transfer tests
17 Weeks of steam injection 13 weeks in LSZ, 14 weeks in UWBZ
10 Weeks of steam and air, 8 weeks in LSZ, 7 weeks in UWBZ
10 weeks of cooling and flooding

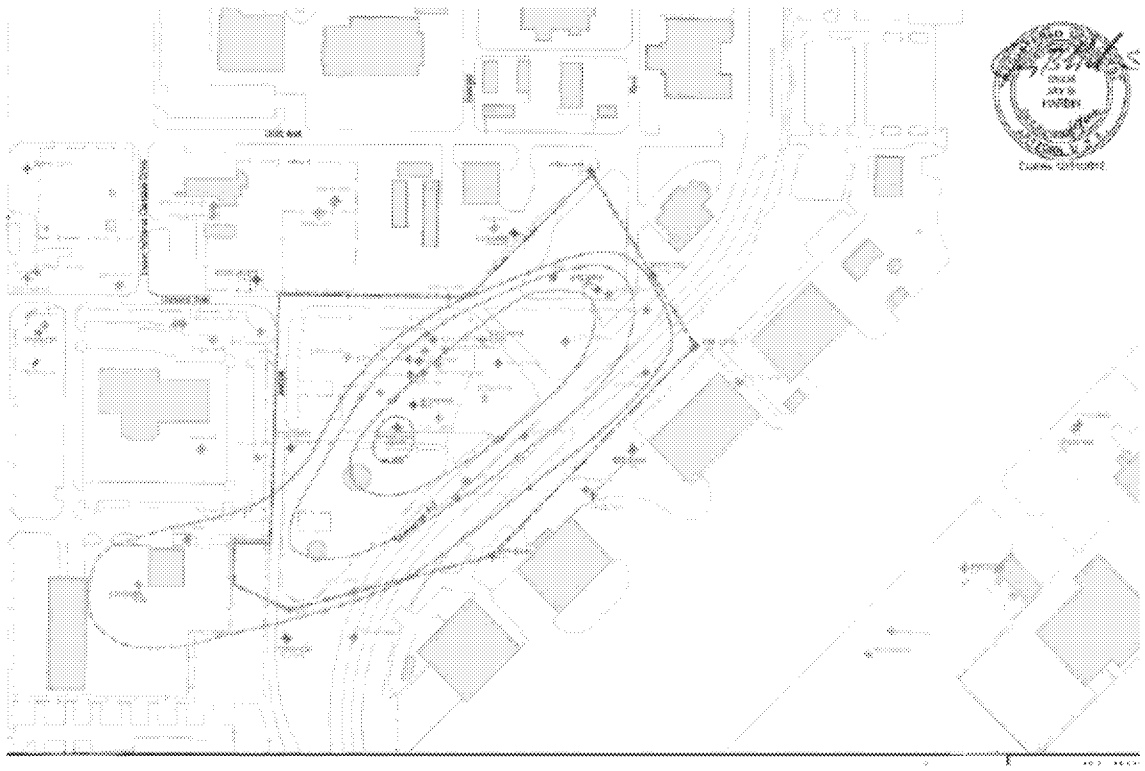
As of Nov 2008 – beginning of steam injection for TEE pilot:

LSZ Benzene Concentrations Nov 2008



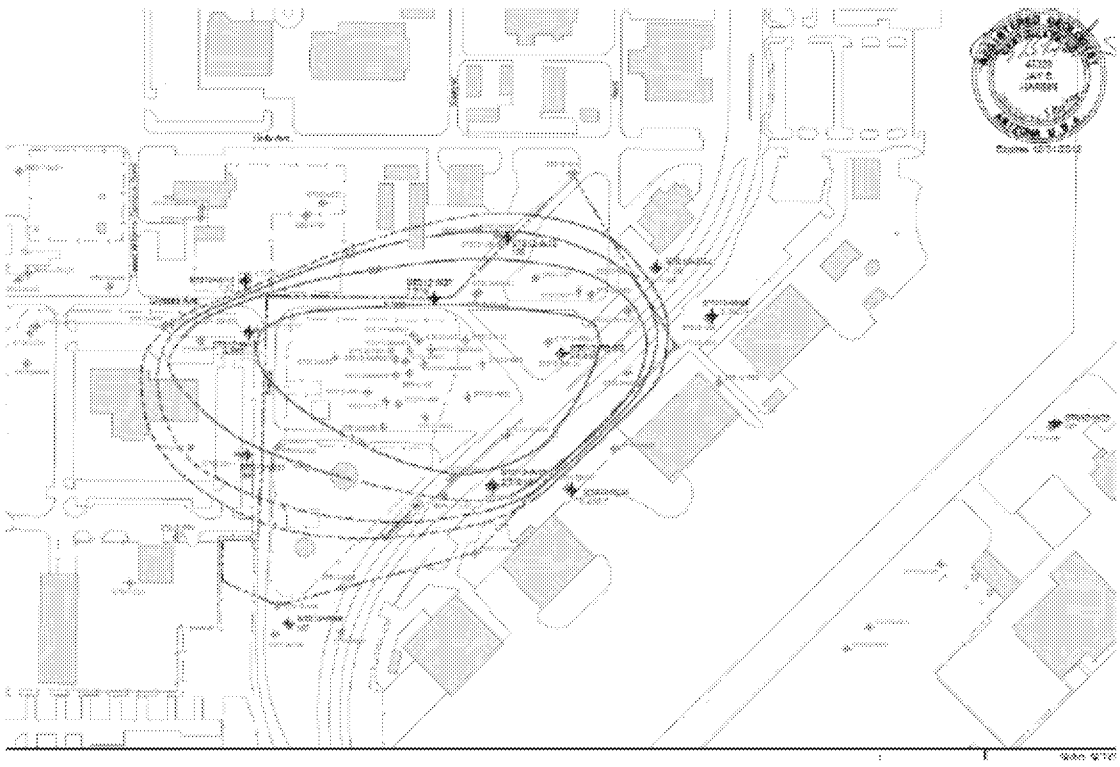
This is the beginning of steam injection into the LSZ just after startup of TEE pilot – note dramatic change in contours

LSZ Benzene Concentrations Nov 2009



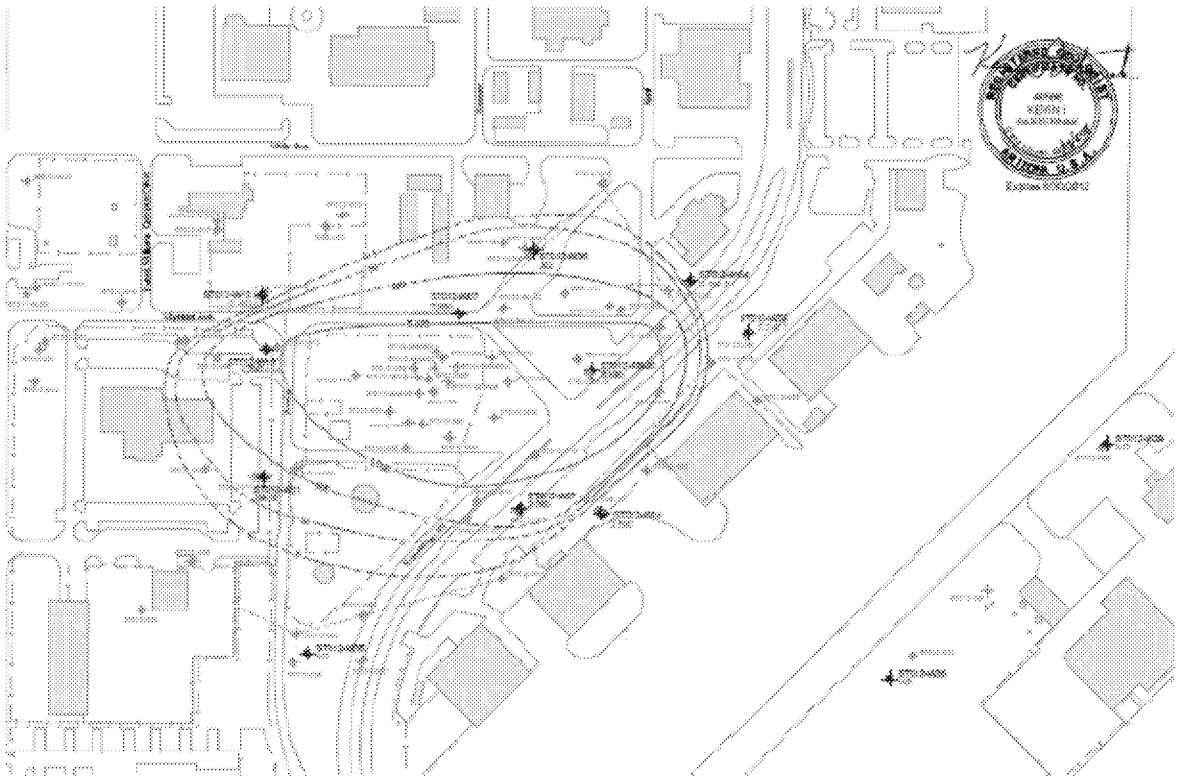
After TEE Pilot: Loss of containment was a concern during TEE because extraction pumps kept going down and werent repaired/replaced while pilot was operating; steam injection operating without full containment.

LSZ Benzene Concentrations Nov 2010



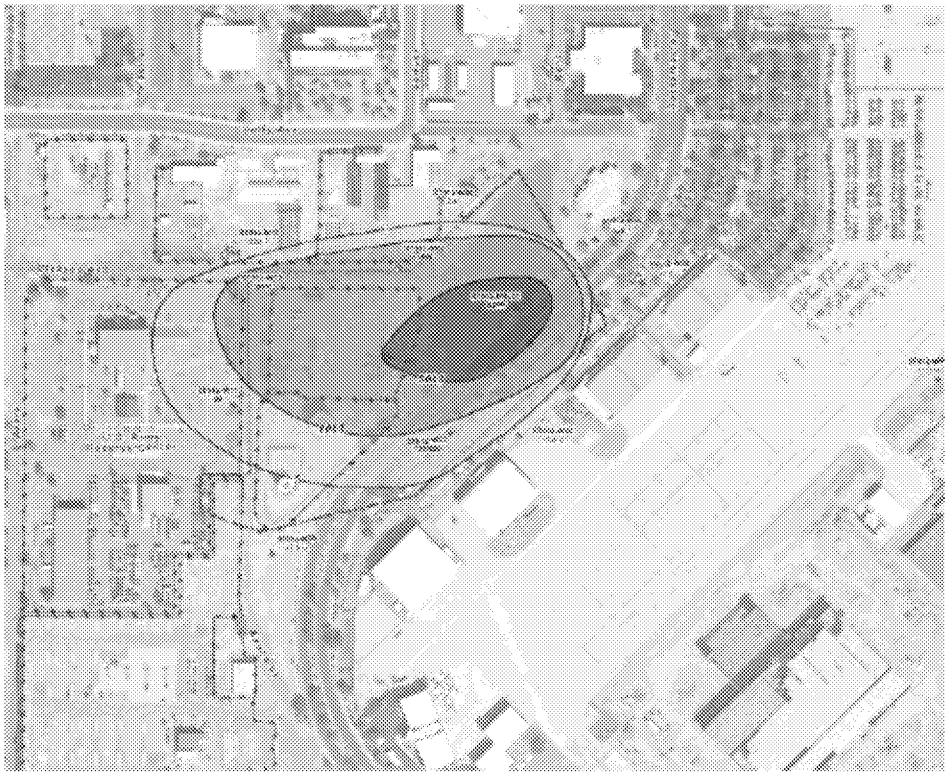
Plume continues to spread – water table now up in highly transmissve cobble zone

LSZ Benzene Concentrations Nov 2011



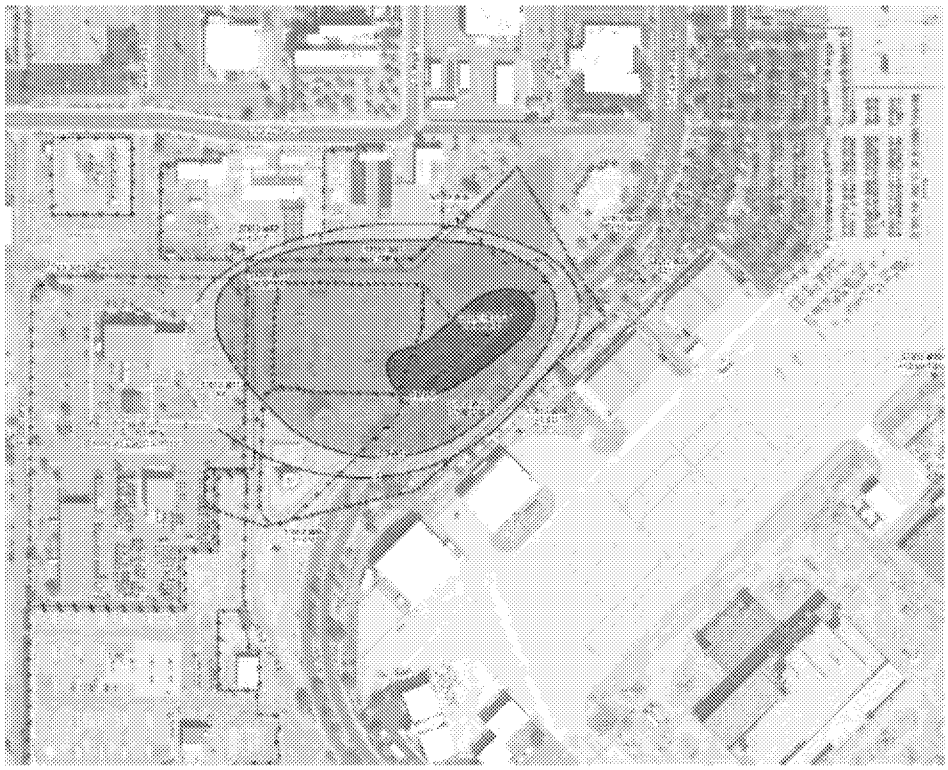
This appears to indicate that the dissolved phase benzene may have moved east of the area treated by SEE, before SEE system was designed. At this time AF was pumping TEE pilot wells for containment:

LSZ Benzene Concentrations Nov 2012



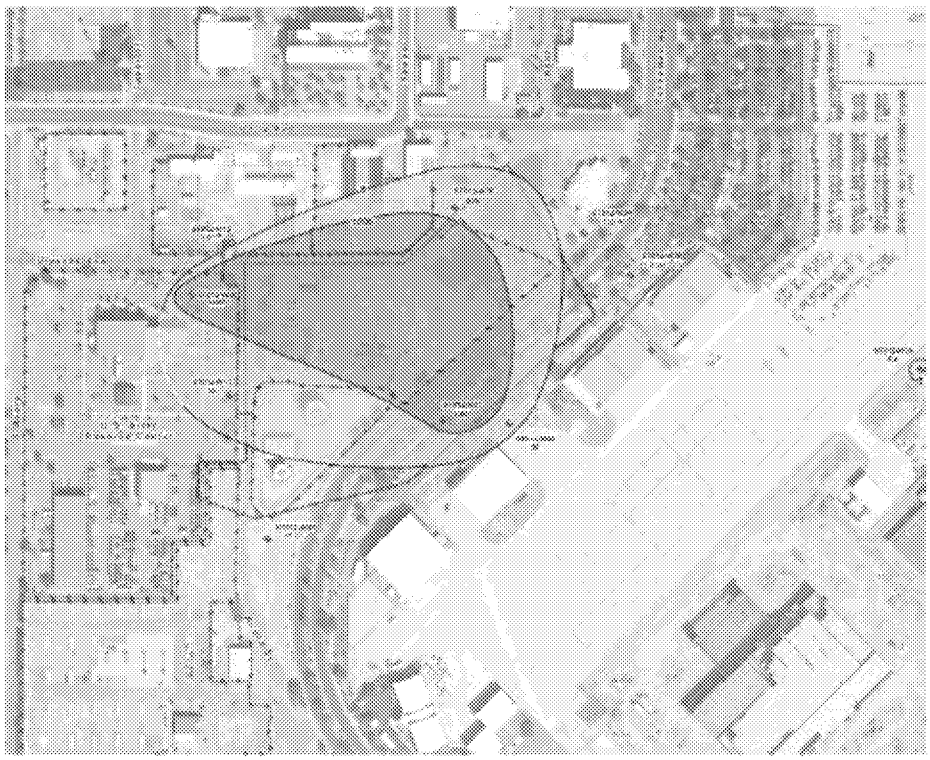
Dissolved phase Benzene as of RODA Signature: These contours are inconsistent with the figure from the RODA (first figure a the top of the page): The 5000 ppb contour below is shown in dark pink Why is dissolved phase plume smaller?

LSZ Benzene Concentrations Nov 2013



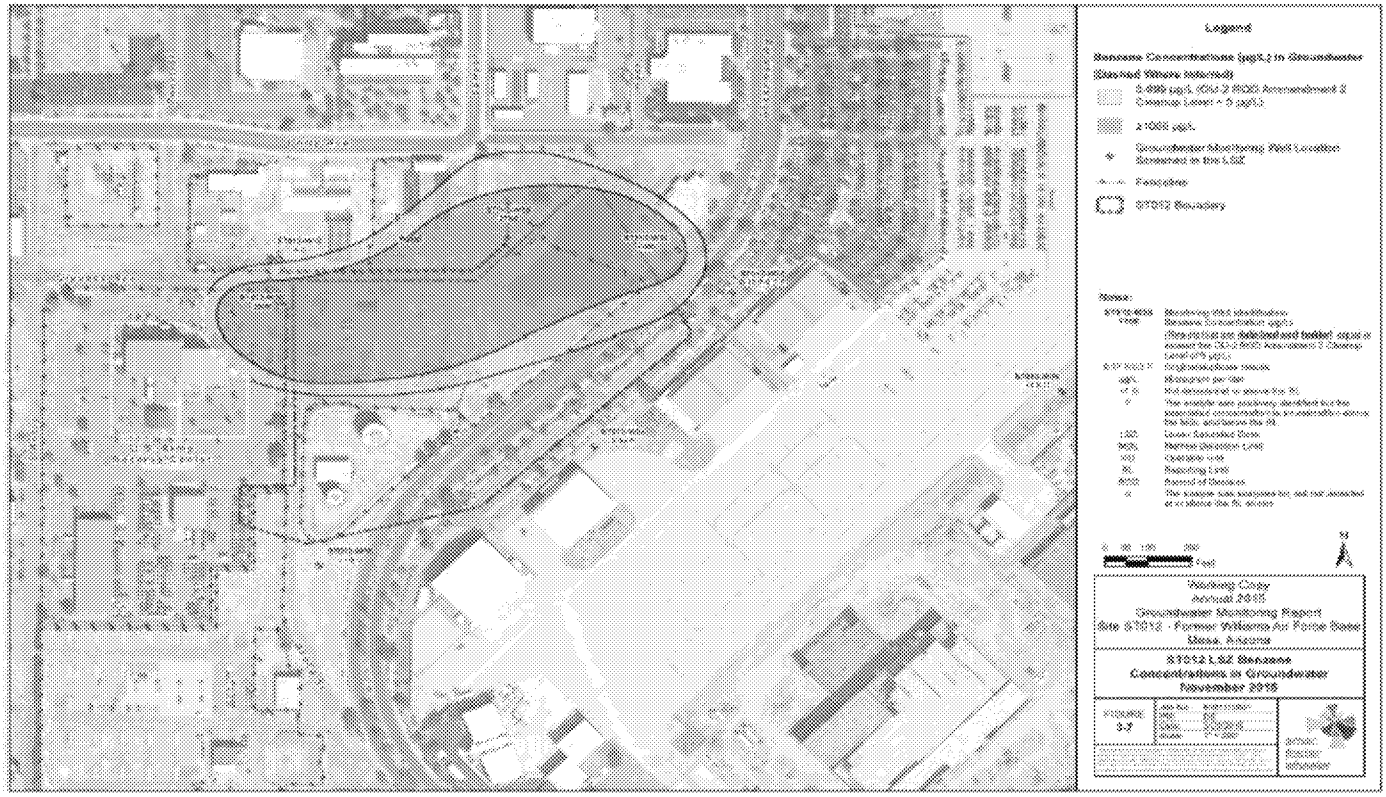
About 6 weeks after startup of SEE, site not even at steam temps yet dark pink is 1000 ppb contour line. Where did 5000 ppb contour line go?

LSZ Benzene Concentrations Nov 2014



Why have dissolved benzene concentrations moved north during SEE operations ? Is this representation realistic when there is LNAPL documented as present in wells outside of these contours?

LSZ Benzene Concentrations Nov 2015



Conclusions / Questions

1) LNAPL and dissolved phase plumes are not stable, but probably moving.
2) Do these figures accurately reflect actual conditions?
3) Focus has been on the LSZ rather than the UWBZ and cobble zone, where contaminants are most likely to be mobilized off site – why isn't Amec presenting the UWBZ/ Cobble Zone data?
4) Could LNAPLor dissolved phase BTEX have been mobilized upward from the LSZ into the UWBZ/ Cobble Zone during thermal treatment?
5) Benzene concentrations between different figures range from over 10000 ppb to less than 5 ppb within the same locations over time, even in areas that were not directly treated with steam. Does this make sense?
6) Why isnt AF/Amec willing to characterize baseline conditions (extent of LNAPL and, benzene concentrations in soil cores post SEE) before initiating EBR?
7) Without knowing baseline conditions, how can milestones be established for meeting the RAO of achieving MCLs within 20 years?
8) If milestones for meeting RAOs cannot be established; do we have grounds already for declaring remedy failure?

Carolyn d'Almeida
Remedial Project Manager
Federal Facilites Branch (SFD 8-1)
US EPA Region 9
(415) 972-3150

"Because a waste is a terrible thing to mind…"