Message

From: Bo Stewart [Bo@praxis-enviro.com]
Sent: 5/19/2017 6:41:24 PM
To: d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; Dan Pope [DPope@css-inc.com]; Cosler, Doug [Doug.Cosler@TechLawInc.com]; Davis, Eva [Davis.Eva@epa.gov]
CC: Brasaemle, Karla [Karla.Brasaemle@TechLawInc.com]; Wayne Miller [Miller.Wayne@azdeq.gov]; Jennings, Eleanor [Eleanor.Jennings@parsons.com]; Steve Willis [steve@uxopro.com]
Subject: Re: For the non-techies....
Attachments: Mass Transfer Coefficient.docx

If I could add a little more complication to address Eva's comment on reality, here goes. Attached (for the techies) is the methodology and parameters that reduce the mass transfer coefficient in the LSZ by a factor of 12 by comparing the previous field test conditions with the proposed conditions for EBR. The net result is an increase in the time of remediation in the LSZ by a factor of 4. That means a previous estimate of 10 years becomes 40 years and so on. I can add this to the TOR memo before it goes to the AF but I can't get that to you until Monday.

On the issue of temperature, I already have solubility of the NAPL components as a function of temperature in the model and can, in an hour or two, generate a table of NAPL equilibrium groundwater concentrations at various temperatures. Those concentrations would be appropriate as input to a model of the dissolved plume coming off the heated source zone. I can vary mass transfer in the source zone as indicated in the attachment but I don't think we need to go that far. We can make the point that concentrations moving off the source are significantly higher than before with a table.

Bo

On 5/19/2017 10:51 AM, d'Almeida, Carolyn K. wrote:

> I was thinking there would also be a cover letter from me and Wayne to transmit the degradation model to AF; I could include some of the input below in that with timeframe conclusions.
> 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..."*
>
> **From:** Dan Pope [mailto:DPope@css-inc.com]
> **Sent:** Friday, May 19, 2017 10:05 AM
> **To:** Cosler, Doug <Doug.Cosler@TechLawInc.com>; 'Bo' <bo@praxis-enviro.com>; Davis, Eva <Davis.Eva@epa.gov>
> **Cc:** d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
> **Subject:** For the non-techies....
> All these analyses, models, summaries and discussions are great, and absolutely necessary in order for us to have a solid scientific foundation for our recommendations, but they are not for non-techies.
> I propose that we include a more concise summary for the non-techies. Something like this….

In order to help resolve different understandings of subsurface conditions and processes at the WAFB Site, the regulatory agencies (EPA/AZDEQ) have developed independent analyses and mathematical models (RegModels) of Site conditions and processes.
These EPA/AZDEQ independent analyses and models differ from those developed by AF and its contractors primarily in:
1) permitting a more in-depth, detailed approach to modeling WAFB Site subsurface conditions and processes, and
2) placing a greater reliance and emphasis on using data and parameters that have been measured at the Site, rather than literature values or assumed values.
For example, the RegModels provide for evaluation of a range of rates of dissolution of benzene and other contaminants of concern (COCs) from the gasoline and jet fuel liquids (light non-aqueous phase liquids; LNAPL) into groundwater. Because the rate of dissolution of the COCs from the LNAPL into groundwater is an important parameter that can strongly affect how long the LNAPL continues to supply COCs to groundwater, the ability of the Site microorganisms to degrade the contaminants, and the potential for COC groundwater plume expansion, it is necessary to carefully evaluate how differences in this dissolution rate affect remedy effectiveness and timeliness. The Air Force (AF) analyses and models assume one rate of dissolution of COCS from LNAPL into groundwater, and their assumed rate is essentially the maximum rate possible, leading to a strong bias toward rapid depletion of COCs from the LNAPL, and therefore biasing the AF model results toward rapid remediation timeframes. The RegModels approach of using a range of COC dissolution rates leads to a more realistic evaluation of remedial timeframes.
In addition, the RegModels approach includes use of a modeling approach (Monod modeling) that allows for consideration of the growth and activity of the microbial population responsible for degradation of the COCs, whereas the AF approach generally did not explicitly consider the expected changes in microbial populations, and the effect on COC degradation of these microbial population changes.
Also problematic are the AF approaches to estimating the remaining COC source material (i.e., the mass of LNAPL remaining, and the mass of COCs in the remaining LNAPL) in the Site subsurface. ADEQ has conducted independent mass estimates, using a range of values and Site parameters more representative of the known variability in Site conditions, rather than applying singular parameter values to all areas of the Site as the AF has done. ADEQ's mass estimates, using a range of values and Site parameters, shows clearly how apparently small changes in these values and parameters can markedly affect the estimates of Site remedial timeframes.
Other differences between the AF approach and the RegModels are discussed in detail in the technical appendix. In summary, the ReModels' in-depth analyses results show that numerous Site factors, not considered in-depth in the AF analyses and models, indicate that AF's estimates of remedy effectiveness and remedial timeframes are problematic, subject to high uncertainty, and not well suited to justifying full-scale implementation of the proposed enhanced bioremediation and monitored natural attenuation remedy (EBR/MNA). EPA/AZDEQ recommends that.....

The above is just a collection of ideas about what we might say in the nontech summary. Not carved in stone, but just some suggestions. Note that I didn't include several items that probably should be included.

From: Cosler, Doug [mailto:Doug.Cosler@TechLawInc.com]
Sent: Friday, May 19, 2017 11:08 AM
To: 'Bo'; Davis, Eva
Cc: Dan Pope; d'Almeida, Carolyn K.; Henning, Loren; Brasaemle, Karla; Wayne Miller;

Jennings, Eleanor; Steve Willis
Subject: RE: ST12 response
Bo's memorandum table 7 shows that reducing the LSZ mass transfer rate from 0.05 1/days (used for Table 10 Monod estimates) to 0.005 increases the TOR by almost a factor of 3. Note that Table 7 results are for the first-order biodegradation model and a high bio rate (0.0125 1/days). The current version of the Executive Summary talks about this, and how TOR's are more sensitive to the mass transfer rate when the bio rate is on the order of 0.01 1/days.
In Bo's volume averaged model the way to address heterogeneities is to look closely at using a low mass transfer rate (e.g., 0.005 1/days, or lower), as the Summary talks about, to account for low-permeability areas not encountered during Bo's field mass transfer test. At least the volume-averaged model has this capability; AMEC ignored this in their modeling. Bo is looking into this.
The Table 10 values are based on max. hydrocarbon utilization rates that are more than 10x smaller than 0.01 1/days. Bo is looking into what the effect of a lower LSZ mass transfer rate, if defendable, would be on the Table 10 values (Monod kinetics). Recall that with the Monod model bio rates proportional to biomass conc. and max. utilization rate when sulfate and hydrocarbon concentrations are much greater than the half-saturation constants. The Summary tries to explain the difference between Monod and first-order models (in response to good questions from Eva and Dan). I know it's complicated, and the length of the summary has grown.

From: Bo [mailto:bo@praxis-enviro.com]
Sent: Friday, May 19, 2017 11:32 AM
To: Davis, Eva <Davis.Eva@epa.gov>
Cc: Cosler, Doug <Doug.Cosler@TechLawInc.com>; Dan Pope <DPope@css-inc.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
Subject: Re: ST12 response
Hi Eva,
We talked a week or so ago about substantiating the mass transfer coefficient to values other than that measured during the mass transfer test. I gave that some thought and we can justify a lower value that will be closer to reality. I'll get back to you a little later today on time of remediation estimates in the LSZ with a lower mass transfer coefficient and I how I came up with it.
Bo

Sent from my iPhone

On May 19, 2017, at 7:10 AM, Davis, Eva <Davis.Eva@epa.gov> wrote:

> This is getting longer than requested, and really even for me difficult to follow. In the second line, the definition of NAPL should be nonaqueous phase liquid.
> On page 3 near the top it states that even with the more comprehensive Monod kinetics the TOR for the LSZ is 8 to 23 years. Really? That could be taken to mean that other remediation options (SEE) only needs to be considered in the UWBZ. Later on in the paragraph it talks some about how the box model assumes well mixed, ideal conditions that will not occur in the field, in particular this field situation that is far from being homogeneous and well mixed. Is there any way to estimate the TOR for the more realistic situation in the field?
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> ---
>
> **From:** Bo Stewart [mailto:Bo@praxis-enviro.com]
> **Sent:** Thursday, May 18, 2017 6:36 PM

To: Cosler, Doug <Doug.Cosler@TechLawInc.com>; 'Dan Pope' <DPope@css-inc.com>; Davis, Eva <Davis.Eva@epa.gov>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
Subject: Re: ST12 response

This all looks good to me, Doug did a great job sharpening the focus. I made a couple of minor edits (highlighted) and responded to some of the comments.

On 5/18/2017 4:11 PM, Cosler, Doug wrote:

> Per Eleanor's suggestion I went ahead and created a "revision 2" copy of Bo's summary by "accepting" the changes in my edited version from earlier today. In the rev 2 copy I also added a few more changes in blue text. I believe I've addressed (or attempted to) the main comments of Eva and Dan from the main text of the memo. I didn't, however, do anything with their comments/questions in the last "study topics" section.
> Doug
>
> **From:** Dan Pope [mailto:DPope@css-inc.com]
> **Sent:** Thursday, May 18, 2017 11:31 AM
> **To:** Cosler, Doug <Doug.Cosler@TechLawInc.com>; 'Davis, Eva' <Davis.Eva@epa.gov>; Bo Stewart <Bo@praxis-enviro.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
> **Subject:** RE: ST12 response
> A couple of comments, most of which are not actionable, added to Eva's comments.
>
> **From:** Cosler, Doug [mailto:Doug.Cosler@TechLawInc.com]
> **Sent:** Thursday, May 18, 2017 8:56 AM
> **To:** 'Davis, Eva'; Bo Stewart; d'Almeida, Carolyn K.; Henning, Loren; Dan Pope; Brasaemle, Karla; Wayne Miller; Jennings, Eleanor; Steve Willis
> **Subject:** RE: ST12 response
> I'm looking at this summary again this morning and will try to address as many of Eva's comments as I can.
> Doug
>
> **From:** Davis, Eva [mailto:Davis.Eva@epa.gov]
> **Sent:** Wednesday, May 17, 2017 5:02 PM
> **To:** Bo Stewart <Bo@praxis-enviro.com>; d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; 'Dan Pope' <DPope@css-inc.com>; Brasaemle, Karla <Karla.Brasaemle@TechLawInc.com>; Cosler, Doug <Doug.Cosler@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor

<Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
Subject: RE: ST12 response
A few comments inserted in the document -

From: Bo Stewart [mailto:Bo@praxis-enviro.com]
Sent: Wednesday, May 17, 2017 2:48 PM
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Henning, Loren <Henning.Loren@epa.gov>; Davis, Eva <Davis.Eva@epa.gov>; 'Dan Pope' <DPope@css-inc.com>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Cosler, Doug <Doug.Cosler@TechLawInc.com>; Wayne Miller <Miller.Wayne@azdeq.gov>; Jennings, Eleanor <Eleanor.Jennings@parsons.com>; Steve Willis <steve@uxopro.com>
Subject: Re: ST12 response

Hi All,

Attached is the summary that Doug and I came up with. I also added an outline and made some edits to make the memo a little more readable. That is also attached. Please comment on/edit the summary to make it more understandable. We added some interpretative language that does not appear in the memo to get the point across although held back adding that these time estimates are still optimistic as they assume the degradation goes flawlessly.

Bo

On 5/11/2017 3:48 PM, d'Almeida, Carolyn K. wrote:

d'Almeida, Carolyn K. has invited you to ST12 response

Title:	ST12 response
Location:	Dial-In Number(s): (866) 299-3188 4159722020
When:	Tuesday, May 16, 2017 10:30 AM
Organizer:	d'Almeida, Carolyn K. <dAlmeida
Description:	Dial-In Number(s): (866) 299-3188 4159722020
Comment:	
Attendees:	Henning, Loren <Henning.Loren@ Davis, Eva <Davis.Eva@epa.gov> 'Dan Pope' <DPope@css-inc.com> Brasaemle, Karla <KBrasaemle@ Cosler, Doug <Doug.Cosler@Tec

Wayne Miller <Miller.Wayne@az
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