

APPENDIX F
BIOCHLOR MODELING APPROACH

DRAFT REMEDIAL INVESTIGATION WORK PLAN
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

Farallon PN: 457-004

July 6, 2008

Mr. Ed Jones, Environmental Engineer
Washington State Department of Ecology
Hazardous Waste and Toxics Reduction Program
3190 160th Avenue SE
Bellevue WA 98008-5452

RE: **Appendix to Remedial Investigation Work Plan
Proposed BIOCHLOR Model Inputs
Art Brass Plating, Blaser Die Casting, and Capital Industries Sites**

Dear Mr. Jones:

As discussed in the EPA BIOCHLOR model has been proposed to evaluate fate and transport of dissolved contaminants in groundwater at the Capital Industries (Capital), Art Brass Plating (Art Brass), and Blaser Die Casting (Blaser) facilities. The BIOCHLOR model may also be used to support the evaluation of cleanup actions at the sites. The BIOCHLOR model was described in detail in the RIWP.

It is our understanding that the Capital Industries (Capital), Blaser Die Casting (Blaser), and Art Brass Plating (Art Brass) facilities are planning to use the BIOCHLOR model for similar purposes. The consultants for Capital, Blaser and Art Brass have begun developing a common list of BIOCHLOR model inputs. This approach was suggested by Ecology to provide a consistent model approach and to develop a model that can be applied, to the extent feasible, across all three sites. The consultants intend to continue to work together in developing a common BIOCHLOR modeling framework through their Remedial Investigations.

Aspect Consulting (Aspect), the consultant for Art Brass Plating, presented a proposed list of BIOCHLOR inputs in the Draft Remedial Investigation Work Plan dated February 28, 2008. They also provided a rationale for selecting each BIOCHLOR input parameter (e.g. site specific vs. literature values). The consultants for the three sites generally agree with the input parameters and rationale outlined in the Draft Art Brass Plating Remedial Investigation Work Plan (Aspect, 2008). The attached table provides a summary of key BIOCHLOR input parameters, and the rationale and method for selection. Several key model inputs and issues are further discussed below.

Biodegradation Rates

As noted in the EPA Users Manual for BIOCHLOR, site-specific biodegradation rates should be applied if possible. If not, literature values may be used or the model may be calibrated to field data (EPA, 2000). The use of site-specific rates should therefore be calculated and applied if feasible. Literature values may be adopted if field-calculated rates cannot be

estimated. Calculated degradation rates will be compared to literature values in any case to ensure that realistic rates are applied.

Commingled Plumes

In areas where commingled plumes exist, each of the three parties (Capital, Blaser and Art Brass) has agreed in principal to use uniform BIOCHLOR inputs. These inputs will be based as much as possible on field data obtained from each site. Where inputs vary from site to site (e.g. hydraulic conductivity or gradient) an average value (or other method) will be selected to develop a model representative of the area as a whole.

Model Uses and Purpose

The three parties (Capital, Blaser and Art Brass) appear to agree that the BIOCHLOR model will be used to evaluate fate and transport processes and to help establish cleanup goals and actions. While each party may also use the model for additional purposes, we agree that a uniform approach to developing BIOCHLOR model inputs and creating a common model will be the most productive strategy.

In the event that parties disagree over model inputs or use of the BIOCHLOR model, the deliverable process outlined in the West of Fourth Project Management Plan (PGG, et al., 2007) will be used as a framework for resolution.

We look forward to discussing the fate and transport evaluation and BIOCHLOR modeling with Ecology. Please contact me if you have any questions.

Sincerely,

Doug Hillman
Aspect Consulting

Peter Jewett
Farallon Consulting, LLC

Janet Knox
Pacific Groundwater Group

Enclosure

cc:

Table 1. BIOCHLOR Input Parameters

Capital Industries, Art Brass Plating, and Blaser Die Casting, Seattle, Washington

Model Parameter	Units	Data Source	Preliminary Value	Site Specific
Hydraulic Gradient	ft/ft	Remedial Investigation (groundwater contour maps)	0.004 to 0.007	Y
Hydraulic Conductivity	cm/s	Remedial Investigation (slug test or aquifer tests)	3×10^{-2} to 2×10^{-1}	Y
Effective Porosity	--	Common Conservative Value	0.25	N
Dispersivity	--	Xu and Eckstein or similar method	scale dependent	Y
Soil Bulk Density	kg/L	Soil Measurements	1.5	Y
Soil Fraction Organic Carbon (foc)	--	Soil Measurements	0.0016	Y
<i>K_{oc}</i>				
PCE	L/kg	CLARC tables	270	N
TCE	L/kg	CLARC tables	94	N
cis-1,2 DCE	L/kg	CLARC tables	65	N
VC	L/kg	CLARC tables	19	N
Source Area Dimensions				
Width	m	Remedial Investigation	~ 15	Y
Height	m	Remedial Investigation	~ 1.5	Y
<i>Biodegradation Rates*</i>				
PCE	1/yr	Field Data/ Literature Check	0.58	Y
TCE	1/yr	Field Data/ Literature Check	0.23	Y
cis-1,2 DCE	1/yr	Field Data/ Literature Check	1.10	Y
VC	1/yr	Field Data/ Literature Check	0.85	Y
<i>Source Area Concentration</i>				
Fate and Transport	ug/L	Site Groundwater Concentrations	0 to 2000	Y
Remediation Level	ug/L	BIOCHLOR	TBD	Y
<i>Simulation Time</i>				
Fate and Transport	years	Remedial Investigation / Site History	0 to 100	Y
Remediation Level	years	Adequate to ensure plume steady state	1,000	N

Note: Expected value ranges are provided for items with Remedial Investigation listed as the data source based on literature values and previous experience.

* Biodegradation rates to be calculated from site-specific data if feasible; if not, literature values will be used.