Barker Road to Trent Bridge
Spokane River Segment

Kaiser Trentwood Area Overview
April 2015
Agenda

- Site General Information
- Site Background Groundwater Data
- Casting Area Groundwater Data
- River Area Groundwater Data
- Source and Pathway Actions
- Treatment System Pilot Testing
- Overall Observations
Agenda

- **Site General Information**
- **Site Background Groundwater Data**
- **Casting Area Groundwater Data**
- **River Area Groundwater Data**
- **Source and Pathway Actions**
- **Treatment System Pilot Testing**
- **Overall Observations**
Spokane River Synoptic Survey Scope
Site Status

- **Model Toxics Control Act (MTCA)**
  - Trentwood facility is a MTCA site
  - Kaiser and Ecology formalized all future activity on the site with an Agreed Order (No. 2692) in August 2005
  - Agreed Order scope of activities amended in September 2012
Site Status

- Model Toxics Control Act (MTCA)
  - All data, studies, and work plans are submitted to Ecology
  - All plans and specifications for actions are approved by Ecology
  - During the 2013 and 2014 Interim Actions, excavated ~34,000 cubic yards of soil and capped ~100,000 ft²
Site Groundwater Monitoring

- Monitoring Network
  - 153 monitoring wells on site
  - 129 wells sampled either annually or semi-annually for various parameters
  - Groundwater elevation data collected during all sampling events
    - Groundwater flow direction is generally northeast to southwest
Site Groundwater Flow Direction
Site Groundwater Monitoring

- PCB Data Sets – 2003 to Present
  - ~1,900 samples analyzed for PCB by Method 8082ULL at ALS Global
  - ~200 samples analyzed for PCB by Method 1668 at AXYS
Background Data Collection

- **Data Collection Details (Congeners)**
  - Routine sample collection since 2007
  - Samples collected in accordance with Ecology approved Sampling and Analysis Plan
  - One liter samples collected
  - Samples processed for PCB by EPA Method 1668 (AXYS Analytical)
Background Data Collection

- **Data Processing**
  - **Blank Correction**
    - Blank values subtracted from raw data on congener by congener basis
    - If blank value larger than or equal to raw value, corrected value is set to zero
  - **Non-Detects**
    - “Less than” raw data is set to zero
Background Data Collection

- **Data Processing**
  - **Homologues**
    - Homologues are determined following blank corrections and non-detect corrections
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Background Data Collection

Site Background Groundwater Monitoring

- Five wells screened in the upper aquifer
  - RM-MW-5S, MW-4, MW-11, MW-10, and MW-5
- One water supply well screened at depth
  - North Well
Site Background Monitoring Wells
Site Background Cross Section
Site Background

- PCB concentrations in site background groundwater are significant relative to the synoptic survey unidentified non-point source contribution

- ~80% of total PCB is in the tetra to hepta homologue groups
Background PCB Levels

**RM-MW-5S**

- PCB in pg/L
- Levels range from 0 to 1,000
- Quarterly data from 1Q10 to 4Q14
Background PCB Levels

MW-4

PCB in pg/L

0  200  400  600  800  1,000  1,200

1Q10 2Q10 3Q10 4Q10 1Q11 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 1Q13 2Q13 3Q13 4Q13 1Q14 2Q14 3Q14 4Q14
Background PCB Levels

MW-11

PCB in pg/L

0 100 200 300 400 500 600 700

1Q10 2Q10 3Q10 4Q10 1Q11 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 1Q13 2Q13 3Q13 4Q13 1Q14 2Q14 3Q14 4Q14
Background PCB Levels

MW-5

PCB in pg/L

1Q10  2Q10  3Q10  4Q10  1Q11  2Q11  3Q11  4Q11  1Q12  2Q12  3Q12  4Q12  1Q13  2Q13  3Q13  4Q13  1Q14  2Q14  3Q14  4Q14
Background PCB Levels

North Well

PCB in pg/L

Quarterly Data:
1Q10, 2Q10, 3Q10, 4Q10, 1Q11, 2Q11, 3Q11, 4Q11, 1Q12, 2Q12, 3Q12, 4Q12, 1Q13, 2Q13, 3Q13, 4Q13, 1Q14, 2Q14, 3Q14, 4Q14
Background PCB Levels

The 5,924 pg/L result for MW-10 not included

Q1 and Q3 refer to data quartiles – 50% of data is within the box shown for each location
Background PCB Homologues

![Bar chart showing the percentage distribution of different homologues across various samples.](chart.png)

- **RM-MW-5S**: Mostly Di and Tetra, with minor contributions from Tri and Penta.
- **MW-4**: Dominantly Tri and Penta, with a significant amount of Tetra.
- **MW-11**: Predominantly Di and Tetra, with lesser amounts of Tri, Penta, and Hexa.
- **MW-10**: Predominantly Di, with notable contributions from Tri, Penta, and Hexa.
- **MW-5**: Predominantly Di and Tetra, with minor contributions from Tri and Penta.
- **North Well**: Predominantly Di, with notable contributions from Tri, Penta, and Hexa.

Legend:
- **Mono**: Red
- **Di**: Sky blue
- **Tri**: Light gray
- **Tetra**: Green
- **Penta**: Pink
- **Hexa**: Brown
- **Hepta**: Light green
- **Octa**: Light yellow
- **Nona**: Blue
- **Deca**: Gray
Site Background Overview
Background Area Observations

- Background wells have variable PCB levels
- Homologue fingerprint is fairly stable
- Tetra through hepta homologue groups represent about 80% of the total PCB
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Casting Area Data Collection

- Casting Area Groundwater Monitoring
  - Approximately 35 wells screened mainly in the upper aquifer
  - Four upper aquifer wells are tracked as “centerline” wells
Casting Area Monitoring Wells
Casting Area Centerline Monitoring Wells
Casting Area PCB Contours
Casting Area PCB Contours
Casting Area

- Relative to site background, there is a significant difference in homologue patterns
  - ~94% of total PCB is in the tri and tetra homologue groups
Casting Area PCB Levels

HL-MW-29S

PCB in pg/L

0 100,000 200,000 300,000 400,000 500,000 600,000 700,000 800,000

4Q07 2Q08 2Q10 4Q10 1Q12 3Q12 4Q12
Casting Area PCB Levels

HL-MW-25S

PCB in pg/L

4Q07
2Q08
2Q10
4Q10
1Q12
3Q12
4Q12
Casting Area PCB Levels

HL-MW-14S

PCB in pg/L

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<th>2Q10</th>
<th>4Q10</th>
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<td>300,000</td>
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Bar chart showing PCB levels in pg/L from 4Q07 to 4Q12.
Casting Area PCB Levels

HL-MW-30S

PCB in pg/L

<table>
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<td>80,000</td>
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<td>1Q12</td>
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Casting Area PCB Levels

Q1 and Q3 refer to data quartiles – 50% of data is within the box shown for each location.
Casting Area Overview
Casting Area Observations

- PCB homologue profile is very stable in “centerline” monitoring wells
- PCB profile in “centerline” monitoring wells is dominated by Tri and Tetra homologue groups and represents about 94% of the total PCB
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River Area Data Collection

River Area Groundwater Monitoring

- 8 wells screened in the upper aquifer
- 13 additional wells are located at the western edge of the site running north and south
River Area Monitoring Wells
River Area Groundwater

The relationships between groundwater elevation, flow direction, and PCB levels in the vicinity of the river are complicated
River Area Groundwater Flow

- From September 2009 to January 2011 a pressure sensor network operated in 9 wells and in 2 locations in the river to collect water elevation data to better understand groundwater flow directions near the river.
Sensor data showed that groundwater flow direction changes significantly when river elevation increases.
River Area Groundwater Flow

Video Clip
River Area Groundwater Flow

Sensor data shows that these flow direction changes are frequent and variable in duration

- May 2010 – 6 events (2 to 72 hours)
- June 2010 – 10 events (1 to 91 hours)
- December 2010 – 2 events (2 to 16 hours)
- January 2011 – 2 events (2 to 37 hours)
River Area PCB Levels

MW-17S

PCB in pg/L

0 2,000 4,000 6,000 8,000 10,000 12,000

4Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

HL-MW-32S

PCB in pg/L

0 5,000 10,000 15,000 20,000 25,000 30,000

4Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

HL-MW-23S

PCB in pg/L

4Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

MW-12A

PCB in pg/L

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

4Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

MW-28S

PCB in pg/L

0 2,000 4,000 6,000 8,000 10,000 12,000

Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

MW-15

PCB in pg/L

0  50  100  150  200  250  300  350  400

4Q07 2Q08 2Q10 4Q10 2Q11 3Q11 4Q11 1Q12 2Q12 3Q12 4Q12 2Q13 3Q13 4Q13 2Q14 4Q14
River Area PCB Levels

Q1 and Q3 refer to data quartiles – 50% of data is within the box shown for each location.
River Area PCB Levels

EPA Method 8082 – Detection Limit ~ 10 ng/L

Q1 and Q3 refer to data quartiles – 50% of data is within the box shown for each location
MW-12A Groundwater Elevation and PCB Concentration History

Groundwater Elevation in feet

PCB in ng/L

Elevation

PCB
River Area Overview
River Area PCB Observations

- The relationships between groundwater elevation, flow direction, and PCB levels in the vicinity of the river are complicated
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Source and Pathway Actions

- **Hydraulic Systems in Casting**
  - Soybean oil derivative (Bio-Syn)
  - Double containment system for embedded hydraulic system piping

- **Water Systems in Casting**
  - Cooling water supply line relocation
  - Casting pit integrity
  - Sewer system relining
Source and Pathway Actions

- **Soil Removal**
  - West Discharge Ravine
    - Lower/Lower Area
- **Soil Removal and Capping**
  - West Discharge Ravine
    - Upper/Lower Area
    - Upper Area
Source and Pathway Actions

- Capping and Drainage Modifications
  - Casting Area
    - Capping of Suspect Area
    - Elimination of Dry Wells Over Impacted Area
Source and Pathway Actions
Casting Area
West Discharge Ravine Area
West Discharge Ravine Area

Seasonal High Groundwater Elevation

Approximate clean overburden soil to be stockpiled for reuse to backfill above OWH line.

Existing Grade
Agenda

- Site General Information
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- Treatment System Pilot Testing
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Treatment System Pilot Testing

- Groundwater Extraction
  - Vicinity of HL-MW-29S

- Pilot System
  - 50 gpm walnut shell filtration unit
  - Pretreatment with castor oil and coagulants
  - Upgradient infiltration of treated discharge
  - Storage of system backwash
Pilot Testing Layout
Agenda

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Overall Observations

- Site background data indicates PCB is present in groundwater over at least a mile wide arc at significant levels relative to the PCB increase in river calculated from the synoptic sampling event
Questions?