United States Environmental Protection Agency
Region VIII
POLLUTION REPORT

Date: Wednesday, May 28, 2008
From: Kerry Guy

Subject: Progress POLREP
Billings PCE
715 Central Avenue (origin), Billings, MT
Latitude: 45.7700000
Longitude: -108.5333000

POLREP No.:	2	**Site #:**	08-ME
Reporting Period:	12/07/2007 - May 2008	**D.O. #:**	
Start Date:	10/12/2007	**Response Authority:**	CERCLA
Mob Date:	10/2/2007	**Response Type:**	Time-Critical
Demob Date:		**NPL Status:**	Non NPL
Completion Date:		**Incident Category:**	Removal Action
CERCLIS ID #:		**Contract #**	
RCRIS ID #:			

Site Description

1.1 Site Background & Description

The Billings PCE Site consists of a PCE contaminant plume in shallow groundwater, extending from a source area at 715 Central Avenue, east-northeast, through a residential neighborhood, into downtown Billings, MT. The contaminant plume likely results from historic PCE (a dense, non-aqueous phase liquid or 'DNAPL') releases from the old dry cleaning facility at 715 Central Avenue. The contaminant plume (defined by the 100 ug/l PCE isopleth), extends approximately 8,000 feet from the source area to the distal end, spreads, in one area, to a width of 1,000 feet, and underlies 298 residential, 8 condominium, and 179 commercial properties.

The underlying aquifer primarily consists of saturated Pleistocene alluvial material that was observed to be about 28 to 32 feet thick. The aquifer overlies shale bedrock that is reported by the MBMG to be greater than 250 feet thick. Core samples show 9-16 feet of finer-grained silt, sand, and clay overlying sandy gravel and silty-sandy gravel. The depth to groundwater is approximately 12-14 feet. Groundwater flows east-northeast through the Site.

The Montana Department of Environmental Quality (MDEQ) completed a Preliminary Assessment (PA) of the Site in 1992-1993. Although subsurface contamination was identified at the time, MDEQ concluded the PA with a "no further action" determination since the affected aquifer was not then being used as a drinking water source by anyone in the area. Subsequently (1999-2001), MDEQ completed a (CERCLA) Site Investigation (SI) and determined that indoor air contaminant concentrations, within structures overlying the plume, may exceed levels promoting adverse health affects for building occupants. Since July 2006, the OSC has continued documenting plume characteristics and evaluating direct-exposure health risks due to vapor intrusion into structures overlying the plume.

1.2 Site evaluation

1.2.1 Subsurface

The groundwater investigation included the identification of and sampling from 30 existing wells in the plume area as well as the installation of and sampling from 65 new groundwater monitoring wells. Analytical results from samples collected were used to map and characterize the plume. Subsurface core samples, collected during the well installation, were also used to examine subsurface lithology and determine various groundwater contours. In addition, 24 locations were sampled with a membrane interface probe (MIP) so as to investigate the amount of volatile organic compounds (VOC) or 'soil gas') in various subsurface locations. A July 2007 soil gas survey along the storm sewer line, in the same general vicinity as the MIP survey, revealed that the highest PCE concentrations were

near the junction of the 715 Central Avenue drain pipe and the storm sewer, with the concentrations decreasing east ('downstream') of the junction.

(Data collected during the MIP investigation revealed the highest VOC levels are under and adjacent to a pipe connecting a floor drain in the building at 715 Central Avenue to the adjacent city storm sewer. A liquid sample collected from underneath the pipe had a PCE concentration of 316 ppm, indicating the probable presence of 'free' product in the vicinity. The contamination interval extended from approximately six feet below ground surface (bgs) (below the drain pipe) to 16 feet bgs (at the fine-grained sand-gravel interface).)

The results of these various studies indicated the aerial extent of the plume, within the 100ug/l isopleth 'footprint', is approximately 140 acres.

1.2.2 Surface Structures

Analyses of the relationship between indoor air and sub-slab or groundwater PCE concentrations were used to estimate the area likely to be impacted by detrimental vapor intrusion. These analyses suggested that groundwater PCE concentrations above 100ug/l isopleth, especially where sands and gravels underlie the buildings, or sub-slab VOC concentrations exceeding 10,000 ug/m3, may result in indoor air PCE concentrations above EPA's target level of 41ug/m3. There are 298 residential, 8 condominium, and 179 commercial properties overlying groundwater concentrations above 100ug/l.

Four (seasonal) rounds of indoor air sampling for VOCs were conducted in 2006-2007. Of the structures overlying or immediately adjacent to the plume footprint (more than 400 residential and commercial), 45 (approximately 10%) were sampled so as to determine indoor air VOC concentrations. Sampling locations included 36 single-family residences, one two-family dwelling, one motel (with long-term residents), two apartment buildings, a school, and a commercial office building. Of the residences sampled, 4 residences had indoor air PCE concentrations exceeding 41ug/m3, and the commercial building had indoor air PCE concentrations ranging from 42 to 130ug/m3.

Sub-slab or crawlspace samples were also collected from most of the properties from which indoor air samples were collected. The highest sub-slab PCE concentration was 1,800,000 ug/m3, and the highest residential sub-slab sample concentration was 160,000 ug/m3. Analytical results from sub-slab samples collected just outside the plume footprint to the northeast indicate some residential structures peripheral to the 100ug/l isopleth may also be adversely impacted by vapor intrusion.

1.3 Threat Determination

PCE and its daughter products, TCE, DCE, and vinyl chloride (chlorinated ethylenes) are hazardous substances as defined by 104(14) of CERCLA. Chlorinated ethylenes, DNAPLs, have low solubility and are heavier than water. Accordingly, when DNAPLs are released into the subsurface, they move downwards to, and collect in fissures and pockets in, bedrock underlying the area. If the DNAPLs encounter an underlying aquifer or saturated layer above the bedrock, contaminant fractions will dissolve into the water column and be carried downstream with the aquifer flow. In addition, DNAPLs collected on the bedrock will serve as source material for continuing downstream, dissolved-phase contamination.

There have been no previous Removal Actions at this Site. The ACTION MEMORANDUM for this Removal was approved on October 12, 2007.

Current Activities

2. Current Activities

2.1 Operations

Other than the removal assessment and associated sampling activities discussed in this document, there are no Removal actions currently underway at this Site. EPA has requested technical assistance from ATSDR.

The EPA/Emergency Response Team (ERT) and Response Engineering and Analytical Contract (REAC) developed a flow and contaminant transport model for the Site to simulate various groundwater remediation alternatives. The software MODFLOW - rev 4.2 was used to construct the flow model, and the software package MT3D was used to construct the contaminant transport model. (The groundwater flow model simulates steady-state flow in 50,600 acres of the Billings Basin, which includes the 140-acre Site plume footprint). Groundwater flow and contaminant transport simulations were completed for

ambient conditions. Model results show that if contamination from the source area is stopped via source-area contaminant removal (i.e., excavation/treatment/containment), and a down-gradient permeable reactive barrier is installed approximately 2,000 feet down-gradient (along 5th Street West), the resultant, downstream plume concentrations of less than 100ug/l could be reached within 5 years.

2.1.1 BOS 100 Pilot test

A pilot test was conducted at the site from December 2007 through March 2008 with BOS 100 by Remediation Products, Inc. The test was conducted to evaluate BOS 100 for treating groundwater at the site. BOS 100 was being considered for remediation of the dissolved phase plume at 7th Street West and at 5th Street West. BOS 100 is a granular carbon/iron product that was designed for treating groundwater contaminated with chlorinated compounds. The activated carbon component of BOS 100 is designed to absorb/trap the contaminant and the iron component enables reductive dechlorination of the trapped contaminant (http://www.trapandtreat.com/bos100.asp).

The test involved injecting 4250 pounds (dry weight) of the product into the aquifer. The 25 foot x 15 foot test area was located near the southeast corner of the 711 Central Avenue property. The BOS 100 injection points were spaced five feet apart for injection across the entire saturated interval. The BOS 100 was injected into a second series of points to place a larger quantity into the upper, more-contaminated interval of the aquifer.

Six wells (three pairs of shallow and deep wells) were installed for the test. Three pre-existing wells were also incorporated into the test. The test included periodic sampling of the test wells and analysis for VOCs, chloride, and dissolved iron. Samples were collected from the pilot test wells prior to the BOS 100 installation on 12/10 – 12/11/07. The wells were sampled immediately after the BOS 100 was injected on 12/18/07, and four additional times through 3/1/08. A focused sampling event was conducted on 2/7 – 2/10/08 that included the collection of 29 samples from 10 temporary locations in the BOS 100 grid and just down gradient of the grid. During the February event, the samples were collected from different depth intervals.

An evaluation of the BOS 100 pilot test and summary of the results will be presented in a separate report. In general, the BOS 100 did not effectively reduce PCE concentrations in the pilot test area. As of the March 2008, there were no significant reductions in PCE concentrations in the samples collected from the two shallow down gradient wells (BPGP04 and BPGP64). The samples collected during the focused event in February revealed large variations in PCE concentrations within the injection area.

2.1.2 Soil Oxygen Demand Test

A soil sample was collected from a location adjacent to well BPGP08 to test for soil oxygen demand (SOD). The sample was collected on March 7, 2008 with the Geoprobe. Soil cores from the 13 – 14 foot and 16 – 18 foot depth intervals were submitted for analysis. The sample was sent to Spectrum Analytical Laboratory for grain size, pH, total organic carbon (TOC), and soil oxygen demand with potassium permanganate. The results of the testing and analyses are in the Laboratory Report and the Soil Oxygen Demand for Potassium Permanganate Report. The soil had low oxygen demand in the tests, indicating favorable conditions for application of potassium permanganate.

2.1.3 Installation of Radon Type Mitigation Systems

Radon type venting/mitigation systems were installed at three properties in February 2008. Samples previously collected from the properties had PCE concentrations greater than the 41 ug/m3 action level. The indoor air was sampled after the systems were installed and PCE concentrations were below the action level.

2.1.4 Central Avenue Groundwater and Soil Investigation

Samples were collected along Central Avenue between Big Sky Linen and 6th Street West to determine the extent and magnitude of contamination that was released from the storm sewer. Nine groundwater samples were collected from temporary sample locations from December 15 – 17, 2007. Thirty Five additional groundwater samples were collected from March 1 – 6, 2008. Free-phase PCE was collected in one sample and other samples had PCE concentrations greater than 100,000 ug/l. The highest concentrations were in samples collected near the junction of the pipeline from Big Sky Linen and the Storm Sewer.

Forty seven soil samples were collected from locations along Central Avenue in March 2008 to log the

lithology and determine the extent of PCE contamination for planning removal activities. The soil cores and samples revealed that high concentrations of PCE are in an area where a thicker interval of fine grained soils (and deeper gravel contact) is present. The fine grained soils that are below the water table are contaminated with high concentrations of PCE. The groundwater samples with free-phase PCE and elevated PCE concentrations were collected in this area.

2.1.5 Groundwater Plume and Water Table Investigation

Groundwater samples were collected and water elevations were measured at selected wells in March 2008, to map the extent and magnitude of PCE contamination across the plume. The sample results and water elevations were used to map the plume and groundwater flow.

2.1.6 Indoor Air and Sub-slab Sampling

Thirty-two indoor air, twenty-seven sub-slab, and eight crawl-space samples (including duplicates) were collected and analyzed from 31 separate properties during the December 2007 sampling event. Seventeen indoor air samples, six crawl-space air samples and eleven sub-slab samples were collected from 17 properties during the March 2008 sampling event.

In summary, from July 2006 through May 2008;

o 80 wells (9 deep and 71 shallow) were installed with the EPA Geoprobe or by subcontractors using a Geoprobe,
o 5 wells were installed by a subcontractor using a CME 75 hollow stem auger rig,
o 16 groundwater samples were collected from pre-existing wells,
o 185 groundwater samples were collected from Geoprobe and other wells installed for the investigation,
o 57 Groundwater samples were collected from temporary PVC screens and from Geoprobe screen point samplers,
o 39 soil gas samples were collected with the Geoprobe,
o 127 soil samples were collected from temporary boreholes and well locations,
o 106 indoor air, 21 crawl space, and 122 subslab air samples were collected from 97 residential and commercial properties.

Planned Removal Actions

2.2 Plans

The Removal currently anticipated for the Site consists of several steps intended to remediate PCE plume concentrations to below 100ug/l within 3-5 years. These anticipated steps include:

• Source area removal, in the vicinity of 7th Street West, with excavation and removal of PCE-contaminated soils in the 'dry' zone
• Contaminant removal from the unsaturated zone below two commercial buildings adjacent to the main source area using a soil vapor vacuum
• In-situ chemical oxidation of source area in the saturated zone below the excavated area.
• Source area containment and downstream plume remediation by construction of up to three 0-valent iron permeable reactive barriers
• Direct contaminant extraction.

Next Steps

2.3 Project Schedule

Sub-slab venting of from 1 to 4 residents may be initiated in November-December 2007. Source area containment, to be initiated as early as February 2008, will be completed by April 2008. Source area excavation is targeted for Spring-Summer 2008. Placement of the first in-situ Chemical Oxidation device is targeted for Summer-Fall 2008.