

United States Environmental Protection Agency
Region V
POLLUTION REPORT

Date: Wednesday, August 25, 2010
From: Steven Renninger, On-Scene Coordinator

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Subject: Initial and Final POLREP
Chevron Cincinnati Facility Site - Vapor Intrusion Investigation
Hooven, OH
Latitude: 39.1765784
Longitude: -84.7605254

POLREP No.: 1	Site #:
Reporting Period: February 2008 through June 2010	D.O. #:
Start Date: 3/25/2008	Response Authority: CERCLA
Mob Date: 2/26/2008	Response Type: Time-Critical
Demob Date:	NPL Status: NPL
Completion Date: 6/29/2010	Incident Category: Removal Assessment
CERCLIS ID #:	Contract #
RCRIS ID #:	

Site Description
SITE LOCATION

The Site is located in a mixed residential and commercial area in the Village of Hooven, Hamilton County, Ohio. The primary area of concern (AOC) is the eastern perimeter of Hooven. The primary AOC overlies a mixed gasoline and diesel-contaminated groundwater plume originating from the former Chevron Cincinnati Facility located north of the intersection of State Route 128 and U.S. Highway 50. The facility operated from 1931 to 1986 and was a fuel and asphalt petroleum refinery. In 2008, U.S. EPA and the Ohio Department of Health (ODH) Health Assessment Section (HAS) were concerned that vapor intrusion was occurring in the eastern portion of the Village of Hooven from the contaminated groundwater plume. Nearby residents are potentially at risk of exposure to volatile organic compounds (VOCs) through vapor intrusion from soil gas migrating to indoor air.

The site is currently an LCD project operating under EPA Order's Operations, Maintenance and Monitoring (OMM) Plan. US EPA LCD Chris Black's is the project manager.

SITE HISTORY

The Potentially Responsible Party (PRP), Chevron, has conducted several investigations in Hooven since hydrocarbons were first identified on the groundwater beneath the town in 1996. These investigations culminated in submittal of a human health risk assessment (HHRA) in May 2000. The HHRA contained an evaluation which determined that the vapor intrusion pathway was incomplete. The latest Chevron

investigation was conducted to re-evaluate the vapor intrusion pathway in response to a request by U.S. EPA Region V, in a correspondence dated January 7, 2004. U.S. EPA attributed the additional review and request to updates in toxicity data for benzene and ethylbenzene and to heightened concerns surrounding vapor intrusion issues.

In the fall of 2003, the Hamilton County General Health District asked ODH to review the available environmental data and determine if the former Chevron refinery site poses a public health threat to the community who live in the Village of Hooven, Ohio.

In May 2004, the first Public Health Consultation for the residents of Hooven - The Former Chevron Refinery was determined to be an Intermediate Public Health Hazard. The Intermediate Public Health Hazard category is made at sites where conclusions about public health hazard cannot be made because the current data are lacking or insufficient.

During March through May 2005, Chevron conducted a comprehensive investigation of the potential for migration of vapors from the Light Aqueous Phase Liquid (LNAPL)/dissolved contaminant plume to indoor air. One focus of the sampling effort was to characterize the vapor source area, and the potential migration pathway from the impacted groundwater/LNAPL (approximately 55 feet below ground surface[ft-bgs]). This effort included collection of samples of LNAPL, groundwater, and vertically nested vapor samples. The vertically nested vapor samples were collected both inside and outside the areas of the LNAPL/dissolved contaminant plume. A total of 75 sub-slab samples were collected inside (42 samples) and outside the plume area (33 samples). A total of 79 near-slab samples were collected inside (49 samples) and outside the plume area (30 samples). Samples were collected beneath homes with full concrete and combination concrete/dirt basements, and /or crawlspaces. Constituents commonly found in gasoline were detected in sub-slab and near-slab samples at low concentrations.

Individual constituents commonly found in gasoline that were identified in the LNAPL are also found in the associated dissolved contaminant plume and in deep soil vapor samples collected from immediately above the water table, 55-60 ft-bgs. Chevron concluded that concentrations of these constituents attenuated rapidly with distance above the groundwater table. Chevron concluded that none of the constituents commonly found in gasoline were detected in soil-gas at concentrations exceeding semi-site specific screening levels provided in the OSWER Draft VI Guidance at depths between 20 and 60 ft-bgs in any of the five nested vapor probes located within the footprint of the LNAPL or dissolved contaminant plume. Chevron stated that in accordance with the OSWER Draft VI Guidance document and consistent with previous risk assessments conducted for the site, the vapor intrusion pathway was incomplete and vapors from the plume do not migrate to indoor air in residences in Hooven.

On December 13, 2006, ODH participated in a public meeting in the Village of Hooven. ODH pointed out the need for additional vapor intrusion sampling based on its review of the historical sampling data that had been collected to date in a Public Health Consultation document that was released by ATSDR in November 2006.

In the fall of 2007, citizens of the Hooven community submitted written complaints to Ohio Congressman Chabot's office. The citizens requested additional sampling to be conducted at the Site to ensure its health and safety and to request assistance to determine if vapor intrusion was occurring.

On December 11, 2007, Ohio Congressman Chabot's office issued a letter to U.S. EPA's Region V Regional Administrator requesting assistance. In January 2008, U.S. EPA Region V's Emergency Response Branch initiated a vapor intrusion investigation at the Site, working with Ohio Department of Health and the Ohio EPA.

In January 2008, U.S. EPA On-Scene Coordinator Steve Renninger met with ODH and Ohio EPA to organize a vapor intrusion sampling investigation. ODH established the following sub-slab and indoor air screening levels for 19 chemicals of concern (COC) at the Site.

Chemical of Concern	Sub-Slab Screening Level	Indoor Air Screening Level
1,2-Dichloroethane	23	2.3
1,3-Butadiene	10	1.0
2,2,4-Trimethylpentane	750	75
2-Butanone (MEK)	3,400	340
Benzene	30	3
n-Butane	500	50
Butylbenzene	260	26

Chloroform	22	2.2
Ethylbenzene	510	51
Ethylene dibromide (EDB) (aka 1,2-Dibromoethane)	10	1.0
Hexane	570	57
Isopentane	400	40
Methylcyclohexane	7,500	750
Naphthalene	5.7	0.57
Perchloroethylene (PCE)	120	12
Toluene	800	80
Trichloroethylene (TCE)	4	0.4
Trimethylbenzene (total)	12	1.2
Xylenes (total)	500	50

Current Activities

ODH recommended to U.S. EPA that four quarters (or rounds) of vapor intrusion sampling was needed to determine if vapor intrusion was occurring at the Site. The vapor intrusion investigation would include sub-slab and indoor air sampling from Hooven Elementary School, sub-slab sampling (and possibly indoor air sampling) from residential and commercial properties in the Village of Hooven and soil gas sampling.

A sub-slab sample is an air sample that is collected from a stainless steel probe which is installed in the foundation of a property. A sample of the air that is accumulating beneath the property is pulled through the probe into a stainless-steel SUMMA canister and analyzed using EPA Method TO-15.

During the time of the vapor intrusion investigation, U.S. EPA required Chevron to turn off its Horizontal Soil Vapor Extraction (HSVE) system. U.S. EPA placed a lock on the HSVE system to ensure that it could not be operated during the investigation.

Quarter #1 - March and April 2008 -- Groundwater at 477 feet-mean sea level (ft-msl)

Hooven Elementary School -- From March 25 through April 14, 2008, U.S. EPA collected two sub-slab samples and four indoor air samples. Results from the sampling did not show Site chemicals of concern (COCs) exceeding the sub-slab or indoor air screening levels established by ODH.

Residential/Commercial -- From April 7 through April 14, 2008, U.S. EPA collected 21 sub-slab samples from residential and commercial properties. Results from the sampling did not show COCs exceeding the sub-slab screening levels established by ODH.

Soil Gas Samples - Ohio EPA installed 7 soil gas probes (GP-1 through GP-7). Each probe was set up to collect a soil gas sample from two to three depths. U.S. EPA collected soil gas grab air samples from each probe location. Each sample was collected in a SUMMA canister. A total of 17 soil gas samples were collected. The identified detections of Site-related COCs were compared to the COCs detected in the sub-slab samples.

Water Samples - Ohio EPA collect water samples from five soil gas probe locations prior to setting up the soil gas sample depth intervals. U.S. EPA analyzed the water samples and observed benzene concentrations in each of the five soil gas probes at the following concentrations:

Benzene concentrations

GP-1 (at 35.8-ft bgs) -- 11 parts per billion (ppb)

GP-2 (at 53.6-ft bgs) -- 0.47 ppb

GP-4 (at 54.6-ft bgs) -- 150 ppb

GP-5 (at 52-ft bgs) -- 47 ppb

GP-7 (at 29.4-ft bgs) -- 20 ppb

Quarter #2 - August and September 2008 -- Groundwater at 465 ft-msl

Hooven Elementary School -- From August 19 through September 1, 2008, U.S. EPA collected six sub-slab and two indoor air samples. Results from the sampling did not show COCs exceeding the sub-slab screening levels established by ODH. U.S. EPA observed one indoor air sample showing trimethylbenzene at 1.53 parts per billion by volume (ppbv), which exceeds the trimethylbenzene indoor

air screening level of 1.2 ppbv. Trimethylbenzene was not observed in any sub-slab samples exceeding its respective sub-slab screening level, therefore, U.S. EPA and ODH cannot link the indoor air exceedance to vapor intrusion. U.S. EPA also observed naphthalene in a sub-slab air sample at 29 ppbv, which exceeded the naphthalene indoor air screening level of 5.7 ppbv. Naphthalene was not detected in any indoor air samples.

Residential/Commercial -- From August 18 through September 4, 2008, U.S. EPA collected 24 sub-slab samples and two indoor air samples from residential and commercial properties. Results from the sampling did not show COCs exceeding the sub-slab or indoor air screening levels established by ODH.

Soil Gas Samples - U.S. EPA collected soil gas samples from GP-1 through GP-7 and from VW-129. A total of 20 soil gas samples were collected. The identified detections of Site-related COCs were compared to the COCs detected in the sub-slab samples.

Quarter #3 - November and December 2008 -- Groundwater at 464.85 ft-msl

Hooven Elementary School -- On November 11, 2008, U.S. EPA collected five indoor air samples. Results from the sampling did not show COCs exceeding the indoor air screening levels established by ODH.

Residential/Commercial -- From November 18 through December 3, 2008, U.S. EPA collected 21 sub-slab samples from residential and commercial properties. Results from the sampling did not show COCs exceeding the sub-slab screening levels established by ODH.

Soil Gas Samples - U.S. EPA collected soil gas samples from GP-5, VW-96, VW-99, VW-128 and VW-130. A total of 16 soil gas samples were collected. The identified detections of Site-related COCs were compared to the COCs detected in the sub-slab samples.

Quarter #4 - September through October 2009 -- Groundwater at 460.6 ft-msl

The timing of Quarter #4 sampling was tied to the depth of the groundwater in groundwater monitoring well (MW)-96S. ODH requested that U.S. EPA conduct sampling when groundwater was measured in MW-96S at less than 463 ft-msl.

When the groundwater level in MW-96S shows less than 463 ft-msl, the "smear zone", which is the area underground that is smeared with petroleum contamination, is more exposed and the likelihood of vapors migrating from the "smear zone" increases. U.S. EPA initiated the Quarter #4 sampling when the groundwater was measured in MW-96S at 460.46 ft-msl. This indicated an exposed "smear zone" of about 2.5 feet.

U.S. EPA and ODH agreed that the conditions for Quarter #4 sampling indicated the "worst-case" scenario for vapor intrusion if it was to occur, due to low groundwater levels.

Hooven Elementary School -- On September 16, 2009, U.S. EPA collected four sub-slab samples and three indoor air samples. Results from the sampling did not show COCs exceeding the sub-slab or indoor air screening levels established by ODH.

Residential/Commercial -- From September 14 through October 27, 2009, U.S. EPA collected 18 sub-slab samples from residential and commercial properties, including Krogers. Results from the sampling did not show COCs exceeding the sub-slab air screening levels established by ODH.

Soil Gas Samples - U.S. EPA collected soil gas samples from GP-7, VW-96, VW-99, VW-127, VW-128, VW-129 and VW-130. A total of 20 soil gas samples were collected. The identified detections of Site-related COCs were compared to the COCs detected in the sub-slab samples.

Summary of Quarterly Sampling - Hooven Elementary School

From March 2008 through September 2009, U.S. EPA collected 12 sub-slab samples and 14 indoor air samples. ODH concluded that the results from the sub-slab and indoor air sampling from each quarter did not indicate that vapor intrusion was occurring in the Village of Hooven at the time of the investigation.

Summary of Quarterly Sampling - Residential and Commercial Locations

From April 2008 through October 2009, U.S. EPA collected 84 sub-slab samples and 2 indoor air samples. ODH concluded that the results from the sub-slab and indoor air sampling from each quarter did

not indicate that vapor intrusion was occurring at the time of the investigation.

The vapor probes for all of the sub-slab air samples were installed and the samples collected in accordance with the "Standard Operating Procedures for the Construction and Installation of Permanent Sub-Slab Soil Gas Wells, #2082," dated March 29, 2007, under the U.S. EPA Response Engineering and Analytical Contract.

The sub-slab vapor probes were installed in residences and/or commercial facilities having basements or foundations with concrete slab floors. All sub-slab and indoor air samples were collected using pre-cleaned, laboratory-supplied, 6-liter SUMMA canisters. The SUMMA canisters were fitted with flow regulators to allow sample collection over a 24-hour period and were connected to the stainless steel probes with Teflon tubing. All of the air samples were analyzed by a commercial laboratory for Method TO-15 analysis.

The soil gas samples were collected using pre-cleaned, laboratory-supplied, 6-liter SUMMA canisters. The SUMMA canisters were fitted with filters and a grab sample was collected using Teflon tubing. All of the soil gas samples were analyzed by a commercial laboratory for Method TO-15 analysis.

Vapor Well (VW)-96 Soil Gas Sampling

On September 15, 2009, while the HSVE system was "off" and the groundwater level in MW-96S was less than 463 ft-msl, U.S. EPA collected soil gas samples from VW-96 at 4 different depths (10-ft, 20-ft, 30-ft and 40-ft below ground surface (bgs)). U.S. EPA observed the following concentrations of 2,2,4-Trimethylpentane:

10-ft -- 160,000 ppbv
20-ft -- 110,000 ppbv
30-ft -- 300,000 ppbv
40-ft -- 320,000 ppbv

On October 2, 2009, Chevron collected soil gas samples from VW-96 at 12 different depths (5 feet to 60 feet bgs). Chevron observed the following 2,2,4-Trimethylpentane concentrations:

5-ft -- 140,000 ppbv
10-ft -- 160,000 ppbv
15-ft -- 140,000 ppbv
20-ft -- 160,000 ppbv
25-ft -- 270,000 ppbv
30-ft -- 270,000 ppbv
35-ft -- 300,000 ppbv
40-ft -- 310,000 ppbv
45-ft -- 360,000 ppbv
50-ft -- 260,000 ppbv
55-ft -- 310,000 ppbv
60-ft -- 480,000 ppbv

ODH concluded that the data proved that when the HSVE system is turned 'off' and there is low groundwater, a completed vapor intrusion pathway was met.

On October 15, 2009, U.S. EPA requested Chevron to turn 'on' on the HSVE system. U.S. EPA then sampled VW-96 at three depth intervals (10-ft, 20-ft and 30-ft bgs) at 1-week, 2-weeks and 3-weeks following the start-up of the HSVE system.

2,2,4-Trimethylpentane Concentrations - October 23, 2009 (1-week)

10-ft -- 27 ppbv
20-ft -- 26,000 ppbv
30-ft -- 12,000 ppbv

2,2,4-Trimethylpentane Concentrations - October 30, 2009 (2-weeks)

10-ft -- 4.8 ppbv
20-ft -- 86 ppbv
30-ft -- 600 ppbv

2,2,4-Trimethylpentane Concentrations - November 9, 2009 (3-weeks)

10-ft -- 23 ppbv

20-ft -- 50 ppbv
30-ft -- 190 ppbv

Analytical data showed that when the HSVE system was turned 'on', the concentrations of 2,2,4-Trimethylpentane dramatically reduced over the 3 weeks of sampling. 2,2,4-Trimethylpentane was observed to have been reduced to 23 ppbv at the 10-ft depth approximately 3 weeks after the HSVE system was turned back 'on'.

Planned Removal Actions

None. See Next Steps.

Next Steps

Chevron will continue to follow the EPA Order's Operations, Maintenance and Monitoring (OMM) Plan, under US EPA LCD Chris Black's direction.

Chevron will also conduct the following sample plan as a result of the US EPA Vapor Intrusion Investigation:

- 1) Chevron will continue to operate the HSVE system.
- 2) The groundwater level in MW-96S will be measured on a weekly basis. Once the groundwater level in MW-96S is observed at 465 ft-msl or below, Chevron will collect soil gas samples from VW-96 and VW-99 at the 10-ft, 20-ft, 30-ft and 40-ft depths. The soil gas samples will be collected in SUMMA canisters and analyzed for the Site COCs. Once the soil gas samples are collected, the HSVE system will be turned 'on'.
- 3) The soil gas samples at each of the four depths in VW-96 and VW-99 will be collected on a monthly basis.
- 4) The groundwater depth in MW-96S will continue to be measured on a weekly basis. Once the groundwater depth is observed greater than 465 ft-msl, soil gas sampling will discontinue and the HSVE system will be turned 'off'.
- 5) Chevron to continue weekly groundwater level monitoring in MW-96S.

Key Issues

A public meeting was conducted on February 26, 2008 at Hooven Elementary School.

A public meeting with US EPA and ODH was conducted on June 29, 2010 at Hooven Elementary School. A copy of the power-point presentation shown at the public meeting is posted in the "Documents" Section of the Site EPA Website.

The 4 quarters of sampling was designed to capture the seasonal changes and differences in barometric pressure, rainfall and groundwater levels, exposure to the "smear zone", surface freezing, etc. The investigation was designed to evaluate the worst-case scenario including low groundwater conditions, when the "smear zone" was exposed and vapor production would be increased.

Summary of Quarterly Sampling - Hooven Elementary School

From March 2008 through September 2009, U.S. EPA collected 12 sub-slab samples and 14 indoor air samples. ODH concluded that the results from the sub-slab and indoor air sampling from each quarter did not indicate that vapor intrusion was occurring at the time of the air sampling.

Summary of Quarterly Sampling - Residential and Commercial Locations

From April 2008 through October 2009, U.S. EPA collected 84 sub-slab samples and 2 indoor air samples. ODH concluded that the results from the sub-slab and indoor air sampling from each quarter did not indicate that vapor intrusion was occurring at the time of the sampling.

At the June 29, 2010 public meeting, ODH (Dr. Bob Frey) explained that ODH had drafted a 2010 Health Consultation, and the following conclusions were made:

- 1) The levels of chemical vapors detected in the indoor air of area homes and in Hooven Elementary School currently do not pose a public health hazard to the residents, the students or the staff.

The levels of chemical vapors detected in the sub-slab soil gas samples collected under area homes and under the Hooven Elementary School, with several isolated exceptions, did not exceed health-based sub-slab screening values.

2) Soil vapor results for monitoring wells VW-96 and VW-99 collected by the U.S. EPA during low-water table conditions (September 2009) indicated the presence of site-related vapor-phase hydrocarbons extending upward through the entire thickness of soils under the northeastern corner of the Village of Hooven.

Low-levels of a number of these same site-related vapor-phase hydrocarbons were detected in sub-slab soil gas samples in a number of homes immediately adjacent to wells VW-96 and VW-99.

Low-levels of a number of these same site-related vapor-phase hydrocarbons were detected in indoor air samples in homes adjacent to wells VW-96 and VW-99.

Summary:

The soil-gas, sub-slab and indoor air data collectively indicate that under the right set of hydrogeologic conditions, that site-related vapor-phase hydrocarbons form a completed vapor intrusion pathway from the groundwater plume (and related smear zone) to the basements of area homes.

Dr. Bob Frey also stated the following Important Public Message from ODH

Residents breathing indoor air contaminated with petroleum hydrocarbons at the levels detected during the U.S. EPA vapor intrusion investigation WOULD NOT be expected to have an increased risk of developing certain types of cancer or developing other adverse health affects.

ODH also provided the following recommendations:

- 1) Operate the HSVE system
- 2) The soil gas in the area of Hooven overlying the plume continue to be closely monitored to ensure the operation of the HSVE system remains protective of the village residents, students and staff at the school.
- 3) Any new construction in the area be equipped with a vapor barrier or some type of vapor mitigation system.
- 4) Groundwater and soil gas in the Southwestern Quadrant should continue to be closely monitored to ensure the safety of workers and residents in this area.

Estimated Costs *

	Budgeted	Total To Date	Remaining	% Remaining
Extramural Costs				
START	\$139,500.00	\$128,320.00	\$11,180.00	8.01%
Intramural Costs				
USEPA - Direct	\$50,000.00	\$35,000.00	\$15,000.00	30.00%
Total Site Costs	\$189,500.00	\$163,320.00	\$26,180.00	13.82%

* The above accounting of expenditures is an estimate based on figures known to the OSC at the time this report was written. The OSC does not necessarily receive specific figures on final payments made to any contractor(s). Other financial data which the OSC must rely upon may not be entirely up-to-date. The cost accounting provided in this report does not necessarily represent an exact monetary figure which the government may include in any claim for cost recovery.

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