FACT SHEET

ConocoPhillips Company Billings Refinery

Site Location

The ConocoPhillips Company Billings Refinery is located at 401 South 23rd Street in Billings, Montana and covers approximately 200 acres on the southeastern side of Billings. The legal description of the refinery is Northwest ¼ of Section 2, Township 1 South, Range 26 East in Yellowstone County, Montana.

The ConocoPhillips Refinery began operations in 1949 and is an active petroleum refinery. The refinery currently converts crude oil, condensate, and field butane, by various processes, into liquid petroleum gases, gasolines, jet fuel, diesel oil, fuel oils, and petroleum coke.

The refinery is located on an alluvial terrace deposit associated with the Yellowstone River. The refinery's eastern property boundary is about 1,000 feet west of the Yellowstone River. The natural ground water flow direction is northeast towards the Yellowstone River.

Regulatory History

ConocoPhillips entered into a RCRA Hazardous and Solid Waste Amendment (HSWA) 3008(h) Consent Order with the U.S. Environmental Protection Program (EPA) in October 1990. The Consent Order, effective October 11, 1990, required ConocoPhillips to perform facility-wide corrective action including Interim Measures, a RCRA Facility Investigation, an environmental and human health risk assessment, and a Corrective Measures Study. Corrective action is a process for investigating releases of contamination to the environment and designing remedies to address releases.

ConocoPhillips operated a series of surface impoundments known as the South Oily Sludge Pits (SOSP) from about 1966 to 1982 as a temporary storage area for API Separator Sludge (a hazardous waste) and other refinery waste. The SOSP was closed under interim status requirements of 40 CFR 265. A post-closure permit was required because the SOSP was closed after January 26, 1983 with waste in place. The SOSP is the only regulated unit at the refinery. A regulated unit is a hazardous waste management unit that requires a permit. On May 12, 2002, a Montana Hazardous Waste Permit was issued to ConocoPhillips for post-closure care of the SOSP and facility-wide corrective action. The Montana Hazardous Waste Permit #MTHWP-02-01 replaced the EPA Consent Order.

Regulated Unit

ConocoPhillips operated the regulated unit, the South Oily Sludge Pits (SOSP), from about 1966 to 1982. At the SOSP solid and hazardous waste were stored in unlined pits during the winter months. During the following spring and summer months, the waste was transported to ConocoPhillips' off-site land treatment unit.

In 1982 when ConocoPhillips discontinued waste storage activities at the SOSP, the unit was closed as a landfill and all wastes were removed from the pits and transported off-site to ConocoPhillips' hazardous waste land treatment unit. The pits were then backfilled. Waste residues and the underlying/surrounding waste-impacted soils were left in place. In 1990, ConocoPhillips placed an asphalt cap over the SOSP to minimize long-term migration of surface

water through the SOSP. The Department approved the certification of closure in a letter to ConocoPhillips dated January 11, 1991.

The Department approved a change to the approved closure method of the SOSP in 2006. In 2008 ConocoPhillips implemented a presumptive remedy to remove all vadose-zone soil at the SOSP to a depth of approximately six feet below ground surface. The vadose zone, also called the unsaturated zone, is the portion of soil above the water table. The primary hazardous constituents at the SOSP are volatiles, semi volatiles, and inorganics. Soil was excavated from the SOSP. Excavated soil that contained a hazardous waste was staged on-site and most of the waste has been shipped off-site. The remedy will be completed in 2009. The change in the closure method was necessary to allow ConocoPhillips to use the SOSP location for a new refinery process unit. The proposed process unit is called the New Crude and Vacuum Unit (NCVU).

Site Contamination

ConocoPhillips conducted investigations of the ground water, surface water, and soils between 1991 and 1996 under a RCRA Facility Investigation (RFI) Work Plan. The purpose of the RFI was to fully determine the nature, concentration, rate, and extent of migration of any release of hazardous waste or hazardous constituents at or from the refinery that might pose an unacceptable risk to human health or the environment.

Ground water investigations revealed several light non-aqueous phase liquid (LNAPL) plumes floating on the water table. These LNAPL plumes are primarily mixtures of diesel, gasoline, gas oil, and crude oil. The thickest layers of LNAPL predominately occur in the northern and central portion of the refinery. The sources of this LNAPL are suspected to be historical spills and leaks from tanks, piping, and sewers at various locations in the refinery.

A dense non-aqueous phase liquid (DNAPL) plume was also identified in the southern portion of the refinery. DNAPL is heavier than water. Therefore, the DNAPL rests on bedrock at the bottom of the aquifer.

Several ground water plumes of dissolved hazardous constituents were discovered during the investigations. The plumes are separated into five categories and include 1) BTEX (benzene, toluene, ethylbenzene, and xylene), 2) total chlorinated hydrocarbons, 3) total PAHs (polynuclear aromatic hydrocarbons), 4) phenols, and 5) metals. The dissolved constituents plumes tend to correspond with the locations of the LNAPL plumes. The LNAPL is the primary source suspected of causing the dissolved constituents plumes with the exception of chlorinated hydrocarbons and metals.

The chlorinated hydrocarbon plume is likely caused by the DNAPL plume. Arsenic is the primary metal of concern. The source of arsenic may be due to the widespread use of arsenic base insecticides (the site's prior use was agricultural) in addition to refining activities. In addition, arsenic is naturally occurring in the area.

No hazardous constituents were found in the surface water at the facility. A ground water interceptor system (GWIS) was installed to prevent the discharge of ground water to surface water.

Both surface and subsurface soil at some of the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) were found to be contaminated with hazardous wastes or hazardous

constituents. Some of the contamination has a potential to leach from the soil to ground water. Due to the detected ground water and soil contamination, ConocoPhillips was required to conduct further facility-wide corrective action including remediation activities.

Corrective Action History

The EPA Consent Order's objectives were the following:

1. Perform Interim Measures (IM);
2. Perform a RCRA Facility Investigation (RFI);
3. Perform an environmental and human health risk assessment on the results of the RFI; and
4. Plan and perform a Corrective Measures Study (CMS).

The Consent Order identified the following Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) to be included in the RFI.

Solid Waste Management Units

Area 3 Landfarm
Area 4 Landfill
South Oily Sludge Pit (SOSP)
API Separator
Process Area Diversion Pond
Boiler House Blowdown/ No. 3 Biopond
Area 1 Landfill
Area 2 Alky Landfill
Truck and Tank Car Loading Area

Areas of Concern

Northeast Pit and Trenches
Former Flare Pit Impoundment
Refinery Sewer System

Interim Measures

Ground water investigations revealed chemicals of interest (COI) dissolved in the ground water and LNAPL migrating off-site along the northern and eastern boundaries of the refinery. The dissolved COI identified during the investigation were believed to originate from the LNAPL present at the water table. A trench along the northern boundary was installed in 1984 to recover LNAPL. In 1993 a Groundwater Interceptor System (GWIS) was installed under Interim Measures to control all off-site ground water migration. The GWIS consists of 13 ground water recovery wells along the northern and eastern refinery boundaries that were installed to provide hydraulic capture of ground water beneath the refinery. Recovered ground water is treated in the refinery's wastewater treatment system and discharged into the Yegen Drain.

RCRA Facility Investigation (RFI) and Risk Assessment

The purpose of the RFI was to fully determine the nature, concentration, rate, and extent of migration of any release of hazardous waste or hazardous constituents at or from the refinery

that might pose an unacceptable risk to human health or the environment. EPA approved the RFI Report and Risk Assessment on October 13, 1997.

ConocoPhillips conducted the RFI investigations on the ground water, surface water, and soils between 1991 and 1996. Ground water investigations revealed several LNAPL plumes floating on the water table. These LNAPL plumes are primarily mixtures of diesel, gasoline, gas oil, and crude oil. The thickest layers of LNAPL predominately occur in the northern and central portion of the refinery. The sources of this LNAPL are suspected to be historical spills and leaks from tanks, piping, and sewers at various locations in the refinery.

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No hazardous constituents were found in the surface water at the facility. The GWIS was installed to prevent the discharge of ground water to surface water.

Both surface and subsurface soil at some of the SWMUs or AOCs were found to be contaminated with hazardous wastes or hazardous constituents. Some of the contamination has a potential to leach from the soil to ground water.

The final risk assessment was submitted in July 1997. The objective of the risk assessment was to identify potential human health and ecological effects that would be associated with the site if no remedial actions were taken. The general assumptions used in the risk assessment included:

- The site was evaluated as an industrial site as its current and reasonably expected future use;
- The GWIS would operate continuously to actively control ground water; and
- Institutional controls were in place to control exposure pathways for ground water use on-site.

Site-related COI were evaluated in the risk assessment. The COI were determined based on a review of the analytical data collected during the RFI.

The risk assessment addressed the potential health risk to on-site industrial and construction workers as well as off-site workers and residents, as appropriate. Because the site is an active refinery surrounded by industrial facilities and future land use of the site is likely industrial or

commercial, conditions in the current and future land use scenarios do not provide desirable habitat for ecological receptors on-site.

The primary off-site location for potential impacts is the Yegen Drain. The Yegen Drain flows into the Yellowstone River one mile north of the refinery. An ecological concern with the Yellowstone River is the transport of COI from ground water to the Yegen Drain.

The COI concentrations in soils and ground water were used to determine the risks. The risk assessment concluded there was no unacceptable risk to human or ecological receptors under current use. Risks at some areas of the facility, due to contamination of soils and ground water, are not acceptable for residential uses.

EPA stated in a December 2, 1997 letter that the risk assessment did not address potential risks associated with residential use of the facility or the ground water. The risk assessment also did not address risks off-site if the GWIS was shut off. EPA stated that ConocoPhillips did not demonstrate the long-term reliability of the GWIS or its ability to reduce the volume of the LNAPL. The RFI Reports and risk assessment alone did not provide EPA with the information needed to determine the most effective final remedy for the site. EPA was also concerned about aquifer restoration, compliance with state water quality standards, and source control.

Consequently, EPA required ConocoPhillips to conduct a Corrective Measures Study (CMS). EPA required in an October 13, 1997 letter that the CMS address the following SWMUs and AOCs.

SWMU or AOC	Problem To Be Addressed in CMS
Area 3 Landfarm	Soils are leachable to ground water.
Former Flare Pit Impoundment	Soils are leachable to ground water.
Truck and Tank Car Loading Area	Soils are leachable to ground water.
Tank Farm Area	Soils are leachable to ground water.
Northeast Pit Area	Soils are leachable to ground water.
Trenches Area of Concern	Soils are leachable to ground water.
Area 1 Landfill	Leach testing was inconclusive because samples used for testing did not represent the most contaminated part of the unit.
Process Area Diversion Pond	Expansion joint integrity is questionable; the unit may therefore pose a threat to ground water.
Boiler House Blowdown Pond	Cracks in the unit may pose a threat to ground water; soils are leachable to ground water.
Oily Water Process Sewer System	Leaking lines pose a threat to soil and ground water.

Product on Ground Water	Product is releasing contamination to ground water; soil gas may accumulate and migrate.
Contaminated Ground Water	Ground water exceeds residential ingestion standards.
Contaminated Soil	Soil contamination exceeds residential risk-based concentrations for direct contact exposure.

The CMS Work Plan was required to address soils leachable to ground water, dissolved constituents in ground water, poor integrity of waste management units, and concentrations exceeding residential risk-based concentrations of hazardous constituents in ground water and soils. EPA determined that the Area 4 Landfill, API Separator, and Area 2 Alky Landfill did not pose a risk; therefore, they were not required to be included in the CMS.

Corrective Measures Study (CMS)

On August 31, 1999, ConocoPhillips submitted the draft CMS report. The CMS Report included:

- A description of the current site conditions;
- A site LNAPL evaluation;
- SWMU/AOC evaluation and ranking;
- Natural attenuation evaluation;
- Site wide source prioritization
- Technology descriptions;
- Corrective measures evaluation; and
- Effective monitoring and performance metrics.

The LNAPL evaluation was conducted to: evaluate the current LNAPL volume, distribution, and recoverability of LNAPL existing under and adjacent to the refinery; evaluate the GWIS; and develop an optimization approach to enhance LNAPL recovery. The results of the LNAPL evaluation are presented in detail in the CMS Report. The report documented that the GWIS was functioning to control off-site contamination.

ConocoPhillips prioritized on a site-wide basis, relative to their source contribution, the SWMUs and AOCs at the refinery. ConocoPhillips proposed to evaluate corrective measures for the high and the moderate problems to keep the focus on the areas of the facility that represent the greatest potential risk and impact to human health and the environment. The product on the ground water was given a high site-wide priority since it is the largest source of COI in the refinery.

ConocoPhillips evaluated natural attenuation in the CMS. Natural attenuation relies on natural processes including physical, chemical, and biological to clean up pollution in soil and ground water. The right conditions must exist underground to clean sites properly. The monitoring or testing of these conditions is essential to determine if natural attenuation is occurring – this process is called monitored natural attenuation. The biological component of natural attenuation is often referred to as intrinsic biodegradation and is typically the most important mechanism of the natural attenuation process since it can result in the actual destruction and removal of organic contaminants from the environment.

ConocoPhillips collected ground water samples from 32 monitoring wells in March 1999 as part of its evaluation of natural attenuation. ConocoPhillips concluded that the natural attenuation monitoring and evaluation provided evidence that intrinsic biodegradation is a significant mechanism resulting in the attenuation of dissolved organic constituents at the site.

The CMS Report evaluated numerous technologies to develop the Corrective Measures Alternatives. The technologies were grouped into source removal, boundary control, and exposure control categories. Some technologies were not considered because they would not be effective at the site or the technology was infeasible due to refinery operations disruptions.

Source removal technologies would remove LNAPL and COI from impacted media or directly remove the media from the site. Source removal technologies considered included:

- Wells, trenches, and culverts;
- Soil excavation;
- Sewer rehabilitation; and
- Monitored natural attenuation.

Boundary controls prevent COI from migrating from contaminated media further off-site and prevent contamination already off-site from migrating any further. Boundary controls considered in the alternatives include hydraulic containment using the GWIS.

Exposure control technologies are designed to manage potential COI exposure pathways present both on- and off-site and include engineering controls, management plans, and institutional controls. The engineering controls currently in place at the site are:

- Controlled site access;
- Perimeter fencing;
- Environmental monitoring systems;
- Site worker training; and
- Soil cover.

Management plans are written to prevent potential future on-site releases and exposure associated with facility operations. Institutional controls are legal tools implemented to control exposure pathways from contaminated on- and off-site ground water and soil. Institutional controls considered included a Controlled Ground Water Use Area, mixing zone permit(s), and deed restrictions.

ConocoPhillips evaluated three alternatives that included the technologies mentioned above. The criteria for evaluating the criteria were technical performance, environmental concerns, human health concerns, institutional feasibility, and cost. The most significant differences in the alternatives are the remediation time frames, disruption to the refinery operation, and safety.

The CMS Report discusses monitoring to evaluate the effectiveness of the chosen alternative to ensure progress toward compliance with standards. The report states that semi-annual ground water quality monitoring will continue. The data will be used to evaluate the progress of natural attenuation in ground water, monitor leaching of COI from soils, and demonstrate ground water migration control.

In 2001 Department and EPA prepared a document called the Statement of Basis to propose a remedy based on the information presented in the RFI and CMS Report. The Statement of Basis was included in the Montana Hazardous Waste Permit that was presented for public comment. After considering all public comments, a remedy was selected. The Department required in a May 16, 2002 letter that ConocoPhillips submit a Corrective Measures Implementation (CMI) Plan.

Approved Remedy

The approved remedy was designed to recover LNAPL, prevent migration of dissolved constituent in ground water, and remove some areas of soil contamination. Many of the SWMUs and AOCs are located in the widespread LNAPL contamination making it difficult to determine the impact of a SWMU or AOC. The corrective measures the Department and EPA chose considered the presence of widespread LNAPL across the site.

The approved remedy includes the following components:

- Maintain environmental staff for project management and coordination;
- Maintain engineering controls to control exposure of contaminants and to protect human health (i.e., fencing, security, soil cover, personal protective equipment);
- Maintain management plans (i.e., no underground storage tanks, utilize above ground storage tanks, pipeline and sewer inspections, turnarounds, soil/waste management programs);
- Continue employee-training program;
- Continue to investigate oily water process sewers and repair leaks as a major source reduction effort;
- Continue to conduct ground water quality monitoring;
- Conduct monitored natural attenuation;
- Continue to operate and optimize the GWIS and product recovery at select wells;
- Inspect and repair, if necessary, the expansion joints in the Process Area Diversion Pond;
- Implement institutional controls to address potential exposure pathways related to contaminated ground water and to restrict future land use at the refinery;
- Monitor potential leaching of COI from SWMU soils via the natural attenuation ground water monitoring program;
- Address site-wide residual contamination when all practicably recoverable LNAPL is removed; and
- Conduct additional interplume product recovery on-site and off-site;

Corrective Measures Implementation (CMI) Work Plan

ConocoPhillips submitted a draft CMI Work Plan on August 28, 2002. The Department and ConocoPhillips worked cooperatively and the Facility-Wide CMI Work Plan was approved in a March 9, 2005 letter. A separate Work Plan had been submitted for the Area 3 Landfarm; this Work Plan was also approved on March 9, 2005.

The approved CMI Work Plan covers corrective measures for the first five years of the selected remedy. The Department required that ConocoPhillips submit the next work plan by January 1, 2010. ConocoPhillips and the Department will evaluate the corrective action activities performed from 2005 through most of 2009.

Although the CMI Work Plan only covers five years of activities, ConocoPhillips was required to provide financial assurance for activities projected for the next 20 years. Although ConocoPhillips is approaching the CMI process in a phased approach, the approved remedy in the *Final Corrective Measures Study Report* includes implementation times and cost estimates for various components of the selected remedy over a 20 years period.

SWMUs and AOCs Not Included in the Approved Remedy

There are several SWMUs and AOCs that were not included in the approved remedy. Some of these SWMUs and AOCs were identified after a significant portion of the corrective action process discussed above had been completed.

One of these units is the South 40 DNAPL Area. On December 4, 2000, EPA approved the DNAPL Investigation Report and required ConocoPhillips to submit a Corrective Measures Study (CMS) Work Plan. The CMS Work Plan was submitted on April 3, 2001 and approved by the Department and EPA on May 31, 2001. A remedy has not been selected yet for the DNAPL contamination in the southern portion of the facility (near the SOSP).

Other AOCs not included in the corrective action process discussed above include the Butane Release Area and the Crude Oil Release In Glacier Pipe Line Manifold Area.

For More Information

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