National Transportation Safety Board
Washington, D.C. 20594

Report Date: February 2, 2012

Emergency and Environmental Response Group Chairman's Factual Report

A. Accident Identification

Operator:	Enbridge Energy, Limited Partnership
Source:	Pipeline 6B
Location:	Marshall, Michigan
Commodity:	Crude Oil
Date/Time:	July 25, 2010, 5:58 p.m.
NTSB No.:	DCA-10-MP-007

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C. Accident Summary

On the evening of Sunday, July 25 2010, at approximately 5:58 p.m.[1], the Enbridge Energy (Enbridge) control center in Edmonton, Alberta Canada, was in the final stages of executing a scheduled shutdown of their 30-inch diameter crude oil pipeline (Line 6B). As the last pump was stopped, a segment, located approximately ¾ of a mile downstream of the Marshall, Michigan pump station, ruptured. The initial and subsequent alarms associated with the event were not recognized as a line-break through two attempts at start up and over multiple control center shifts. Residents near the rupture site began calling the Marshall City 911 dispatch center to report odors at 9:25 p.m. on Sunday; however, no calls were placed to the Enbridge control center until 11:17 a.m. the following day. Once the Enbridge control center was notified, nearly 17-hours after the initial rupture, remote controlled valves were closed, bracketing the ruptured segment within a three-mile section.

The accident resulted in an Enbridge reported release estimate of 20,082 barrels (843,444 gallons) of crude oil with no injuries or fatalities. The rupture location is in a high consequence area[2] within a mostly rural, wet, and low-lying region. The released oil pooled into a marshy area over the rupture site before flowing 700 feet south into Talmadge creek which ultimately carried it into the Kalamazoo River.

Line 6B was constructed in 1969 as a 293-mile long extension of the Lakehead pipeline system, stretching from Griffith, Indiana to Sarnia, Ontario. The failed segment was a cathodically protected, tape coated pipe manufactured by Italsider s.p.a.[3] per the API 5L X52 specification with 0.25-inch thick wall and a double submerged arc welded (DSAW) longitudinal seam. The maximum operating pressure (MOP) for Line 6B was 624 psig; however, at the time of the accident, this segment was under a 523 psig Enbridge imposed pressure restriction. The maximum-recorded discharge pressure at Marshall, prior to the rupture, was 486 psig.

[1] All times are expressed in local accident time, Eastern Daylight Time.
[2] As defined by PHMSA under 49CFR§195.450.
[3] Societa Per Azioni (Italian). The Italsider pipe was purchased from Siderius Inc. of New York.

D. Site Description

The release of heavy crude oil occurred on Enbridge's Pipeline 6B, just east of mile post 608 in Marshall, Calhoun County, Michigan, in an undeveloped agricultural area south of town approximately 0.4 miles west of US-227 and approximately 0.2 miles south of Division Drive. The majority of the released oil entered a low lying wetland between the breached pipeline and Talmadge Creek. Vegetation in the release area consisted of wetland plants in low lying area, and brush and trees in upland areas. Enbridge estimated that 8,033 barrels of the released crude oil entered Talmadge Creek and a lesser amount then entered the Kalamazoo River where it affected approximately 38-miles of waterway and shoreline downstream to Morrow Lake Dam, in Comstock Township, Kalamazoo County, Michigan.

SEE ATTACHMENTS 1 AND 76

E. Pipeline Information

The Enbridge Liquids Pipeline System in the United States consists of four response zones that include the Chicago Region, Superior Region, Cushing Region, and North Dakota. The Chicago Region consists of eleven pipelines and three terminal lines, including Pipeline 6B, that transport crude oil, natural gas liquids in about 2,108 miles of pipeline with diameters ranging from 12 to 42 inches. Pipeline 6B is a 30-inch 285.9-mle segment that runs from Griffith, Indiana to Sarina, Ontario. Pipeline 6B has a design flow capacity of 300,653 barrels of crude oil per day.

SEE ATTACHMENT 2

F. Hazardous Materials Information

Cold Lake Blend and Western Canadian Select crudes are a type of crude oil condensate mix that is regulated by the Department of Transportation as a Class 3 flammable hazardous material. Heavy crude is typically a mixture of crude oil (50-70 percent) and hydrocarbon diluent (30-50 percent). The material contains 20 to 30 percent volatiles by volume. Heavy crude oil/diluent mix is used as feedstock in the production of fuels and lubricants.

The product is a brown or black liquid with hydrocarbon odor. Toxic constituents of concern include benzene (0.03 – 0.3 percent), and hydrogen sulfide (less than 0.5 percent). The mixture is lighter than water with a specific gravity of 0.65 to 0.75. The product exhibits a flashpoint of -35 degrees C. The vapor is heavier than air, with a lower explosive limit of 0.8 percent and an upper explosive limit of 8 percent vapor concentration in air.

Potential acute health effects of exposure to heavy crude oil include irritation to eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and dermatitis. Contact of liquid with eyes may cause severe irritation or burns. The crude

oil contained between 0.03 and 0.3 percent benzene. Breathing benzene can cause drowsiness, dizziness, and unconsciousness. Long-term exposure to benzene causes effects on the bone marrow and can cause anemia and leukemia. Hydrogen sulfide that may be contained in the crude oil is a colorless gas with a strong odor of rotten eggs. Sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of hydrogen sulfide. Short-term exposure to high concentrations of hydrogen sulfide can cause headache, dizziness, suffocation, internal bleeding, heart disorders, brain damage, coma and death. Long-term exposures may aggravate existing medical conditions, and may cause sleep disorders, headache, lung congestion, and nervous system disorders.

Effective oil spill removal strategies are largely dependent on the density of the crude oil diluents mixture, and its tendency to float or sink in fresh water. Once the crude oil mixture entered the environment, weathering, volatility, and physical agitation affected the composition of the oil mixture (oil and diluents), which allowed some of the oil to sink and incorporate into river sediments and collect on the river bottom. NOAA reported that by August 4, it expected that most of the volatile oil condensate fraction would have evaporated and or dissolved into the water column.

Microscopic plants and animals, marsh and aquatic vegetation, fish, amphibians, reptiles, birds and mammals are all subject to acute and chronic effects that may result from the physical, chemical and toxicological properties of spilled crude oil. Oil is most toxic to fish and wildlife during the early phases of a release, before the lighter components have dissipated. These more toxic light-end components usually have greater water solubility, thus putting aquatic species at risk. After light ends have dissipated, the heavier oil sinks and may impact fish spawning areas or limit the ability of plants to germinate.

SEE ATTACHMENTS 3, 55 AND 77

G. Local Emergency Response

At 9:25 p.m. on July 25, 2010, the first call to the 911 dispatch center was received.[4] The caller stated:

> *"I was just at the airport in Marshall and drove south on Old 27 and drove back north again and there's a very, very, very strong odor, either natural gas or maybe crude oil or something, and because the wind's coming out of the north, you can smell it all the way up to the tanks, right across from where the airport's at, and then you can't smell it anymore."*

The Marshall Fire Department was dispatched at 9:32 p.m. The dispatcher stated, "I have an outdoor odor investigation…a bad smell of natural gas" near Brooks Field Airport. Marshall Fire Department personnel responded to the area near the airport, reported that the odor seemed to originate in Marshall Township, and asked if the Marshall Township

[4] The Calhoun county Consolidated Dispatch Authority operates 911 services

Fire Department was notified. Marshall Township Fire Department was dispatched at 9:51 p.m.

During this time, at 9:34 p.m., a caller located on Division Drive to 911 reported that there was a strong gas odor near the airport. The dispatcher told the caller that the fire department was already in that area investigating the odor complaint. This caller called again at 9:56 p.m. The caller was told that the fire department was investigating.

A captain and firefighter with Marshall Township Fire Department responded to the dispatch and drove east on Division Drive from 16 Mile Road to examine the area near two natural gas pipeline facilities. (See Figure 1 for an overview of this area.) On Division Drive, the captain could smell an odor, but the odor did not smell like natural gas. Near the pipeline facilities, the odor was not strong. He stated that the odor had a petroleum odor.

Figure 1: A satellite photo of the intersection of Division Drive and 17 Mile Road.

The captain stated, "Because our normal procedures are is if it's coming from [a pipeline facility] that…we get the phone number off the fence, call the pipeline company, have them come out and check things out. But we determined it was neither one of those two stations."

After examining the two pipeline facilities, they continued east on Division Drive to an industrial and business area at Division Drive and 17 Mile Road (also known as Old 27). The Captain stated that there was a strong odor near 17 Mile Road, but the odor decreased away from the road toward a business building (Walters-Dimmick Petroleum,

Inc.). They next drove to another pipeline facility located on 17 Mile Road. The captain said that there was no odor at this location.

The captain and firefighter then drove to a business building (Bostik, Inc.) on Oliver Drive. The captain said that the odor was strong in this area. At this time, the captain called Marshall Fire Department for information about wind speed and direction to try to determine the origin of the odor. He was told the winds were calm. The captain and firefighter then drove on Pratt Avenue, Woolley Drive, and Oliver Drive to try to find the source of the odor. When they returned to Oliver Drive, the odor was no longer perceptible near the Bostik building. They then found that the odor was strong near another business building (McElroy Metal) on Oliver Drive.

After checking these areas, the Marshall Township Fire Department personnel thought the origin of the odor might be in Marshall (city). Marshall Fire Department personnel returned to this area. A city fire department lieutenant met with the township fire department captain and firefighter near the McElroy Metals building.

While the fire department personnel were checking this area, an employee of Michigan Gas Utilities pulled into the parking lot at the McElroy Metal building and told them he was coming from a call from south of town. The captain stated:

> *"He pulled up. Got out of his truck. Said that he was also investigating an odor and he said he thought it was coming from across the road where the little trucking company is right on that corner of Division and Old 27 which would be the northwest corner."*

Near the McElroy Metals building and near a business building on Brooks Drive (Marshall Building Components), the city fire department lieutenant used a combustible gas indicator to try to locate the origin of the odor. No combustibles were detected. The Marshall Township captain stated:

> *"At that point is when we, you know, we talked about we weren't finding any flammables, we were unable to pinpoint the source, you know, because one minute we'd have real strong smell and we'd come back to the same spot and it would be gone."*

According to a computer-aided dispatch report, fire department personnel departed the scene at 10:54 p.m.

At 11:33 p.m., a worker at Walters-Dimmick Petroleum, Inc. called 911 and reported a strong odor of gas outside. The dispatcher told the caller:

> *"Both fire departments, Marshall City and Marshall Township have went out and checked, and they can't find where the odor was coming from, but it wasn't registering on their meters as being dangerous. So it has been checked."*

The fire department was not dispatched in response to this call.

On July 26, 2010, at 11:37 a.m., an employee with Consumers Energy called 911 and reported that there was a crude oil leak in a creek near Division Road. The caller said that he found a pipeline marker for Enbridge. The Fredonia Township Fire Department was dispatched at 11:39 a.m.

SEE ATTACHMENTS 56 - 63

H. Overview of the Oil Spill Response

At about 1:33 p.m. on July 26, 2010, the Enbridge Chicago Region supervisor, regional engineering notified the National Response Center that about 19,500 barrels of crude oil spilled from a 30-inch diameter pipeline. He reported that the release entered a creek that leads into the Kalamazoo River. Between 1:47 p.m. and 1:49 p.m., the National Response Center made 16 notifications to Federal and State of Michigan agencies, including the Environmental Protection Agency, United States Coast Guard, Pipeline and Hazardous Materials Safety Administration, Michigan Department of Environmental Quality, Michigan Intelligence Operations Center, and the Michigan Department of Community Health.

An Enbridge crossing coordinator confirmed the presence of a pipeline leak when he viewed the oil-contaminated marsh near the rupture location at 11:45 a.m. on July 26. Less than one hour later, Enbridge personnel had installed oil sorbent boom ahead of the oil discharge at four locations about 1 to 1 ½ miles downstream of the rupture site on Talmadge Creek (See Figure 2). The sorbent boom did not prevent all of the released oil from flowing further downstream in the rainfall swollen creek.

The pipeline break occurred beneath a scrub-shrub wetland. Crude oil was forced from the pipeline under pressure into the surrounding soils and emerged onto the ground surface. The released oil flowed over land following the natural topography downhill and into Talmadge Creek. Once the crude oil entered Talmadge Creek it flowed downstream towards the confluence with the Kalamazoo River. From July 22 to July 25, the town of Ceresco received 5.70 inches of rain (about 5 miles west of the leak site) and the town of Albion received 5.65 inches of rain (about 10 miles east of the leak site). The rain swollen waterways and high current presented a challenge for oil containment efforts and sped dispersal of the released oil. High water carried the oil slick over stream banks in many areas, thus affecting floodplain on both sides of the waterways.

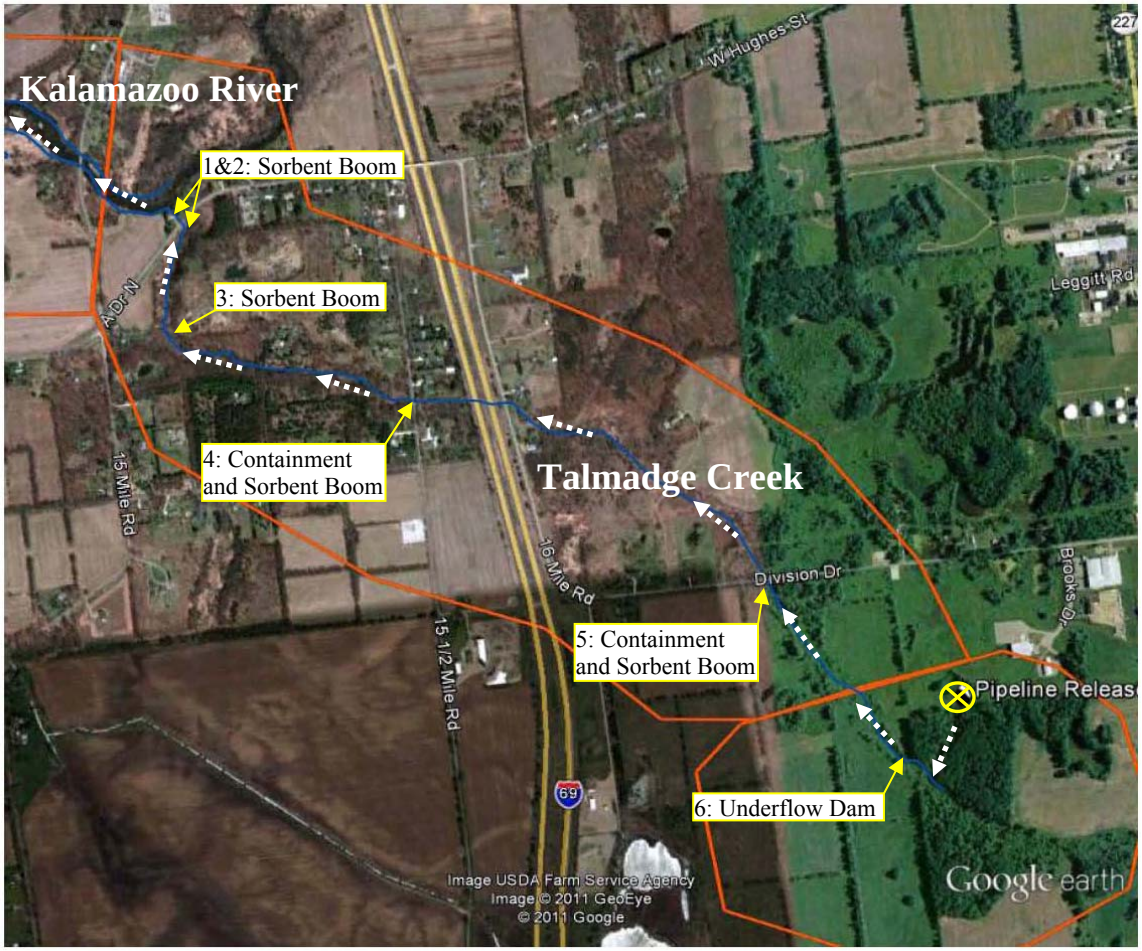

Figure 2: First responder oil spill containment locations on Talmadge Creek listed in order of deployment in Divisions A&B, July 26, 2010.

The Marshall PLM first responders were assisted during the first day of the response by contractors and regional personnel. The first responders constructed an underflow dam[5] in the marsh near the source area, installed additional strands of oil absorbent and containment boom in the Kalamazoo River at the Calhoun County Historic Bridge Park (referred to as Heritage Park) about 8.9 miles downstream of the release site, and at Linear Park in Battle Creek, approximately 14.8 miles downstream. On July 26, Enbridge also deployed at least 12 vacuum trucks to begin recovering oil from the source area underflow dam, Talmadge Creek stream crossings on Division Drive and 15 ½ Mile Road, and from the Kalamazoo River at Heritage Park.[6]

[5] An underflow dam provides a barrier to floating pollutants in situations where there is too much water flow to allow for a complete blockage of a drainage or stream channel. The dam is built of earth and uses inclined pipes that are submerged on the upstream side, thus moving water downstream while leaving the floating oil contained behind the dam.

[6] The two initial EPA on-scene coordinators noted that only 5 vacuum trucks were operating on July 26, while 7 additional vacuum trucks that were ordered did not arrive on-site until July 27.

At midnight on July 26, Enbridge briefed the unified command on its resources deployed as listed in Table 1.

Location	Resources Deployed	Personnel
Leak Site	(1) Underflow dam, vacuum trucks*	7 Enbridge
15 ½ Mile Road	(1) skimmer, 30ft. oil boom, (3) vacuum trucks	4 Enbridge
Division Drive	(2) 50 ft. oil boom, (2) vacuum trucks	14 Enbridge 10 Contractor (est.)
A Drive	(1) 50 ft. oil boom, (1) vacuum truck	
Heritage Park	600 ft. oil boom, (2) vacuum trucks	
Linear Park	400 ft. oil boom, (1) vacuum truck	
*The numbers of vacuum trucks servicing the underflow dam was not tracked on the first day of the response, although Enbridge reports as many as three trucks were pumping at the same time.		

Table 1: Enbridge Resources Deployed By the End of the First Response Day on July 26.

During the first incident briefing on July 26, Enbridge decided that it would conduct 24-hour spill response operations. During the first week of the incident response, from July 26 through August 1, Enbridge devoted between 29 and 36 day shift workers and 22 to 26 night shift workers to on-river oil containment operations. These workers were supplemented with as many as 356 day shift and 160 night shift contracted oil spill response organization personnel.

In days following the accident, Enbridge and its contractors established approximately 33 oil spill containment and control points extending from the release site to the west end of Morrow Lake in Kalamazoo County, covering approximately 38 miles of river. The control points consisted of a variety of oil containment strategies, including underflow dam structures, oil booming sites, absorbent booming sites. Oil was removed at these control points using vacuum trucks working with oil skimmers.

By July 29, the third day of operations, 51,090 feet of oil boom had been deployed and 647 field personnel were on-site.[7] The peak deployment of 2,011 personnel occurred on August 17, while the greatest amount of oil boom deployed in the affected waterways was 176,124 feet on August 20, (See Figure 3).

[7] These totals include both Enbridge and EPA personnel and contracted resources.

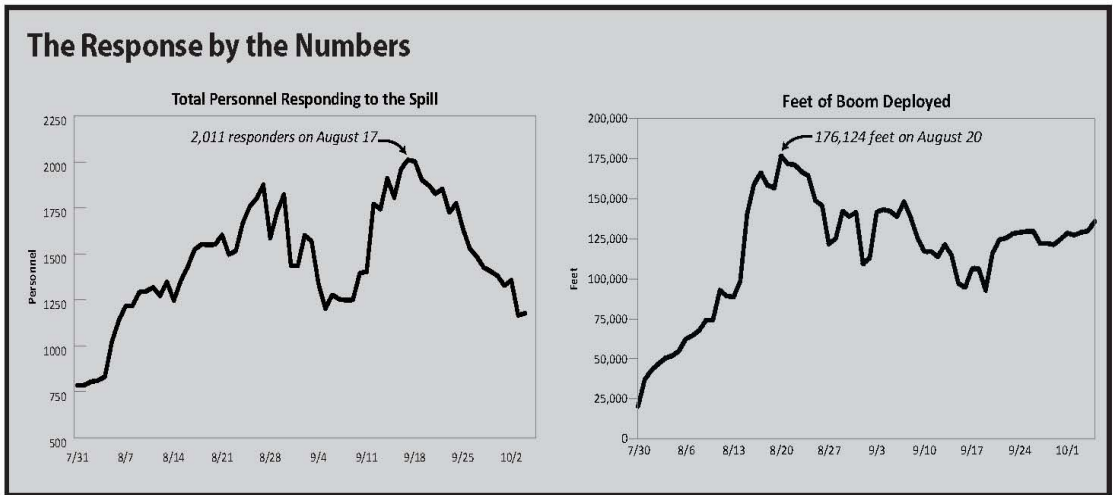

Figure 3: Enbridge Response Resources Utilized Between July 31, 2010 and October 2, 2010, Source: EPA.

As of November 14, 2011, over 15,700,000 gallons of oil/water liquid waste had been collected, from which an estimated 1,140,339 gallons of oil had been recovered by the spill response contractors.[8] In addition, about 155,000 cubic yards of hazardous and non-hazardous soil and debris disposed, including river dredge spoils.

Unified Command

The Region 5 Area Contingency Plan/Regional Contingency Plan requires emergency response actions to be conducted in accordance with the National Incident Management System.[9] According to EPA's incident timeline and response documentation, at about 9:00 p.m. on July 26, a unified command was established with the EPA, Enbridge, and the Michigan Department of Natural Resources and Environment.

The Enbridge approved Oil Recovery and Containment Plan that was developed on July 29 states that the company in tandem with the unified incident command organization has developed objectives for the containment and recovery of the oil. However, the Enbridge senior compliance specialist and the manager of pipeline services told NTSB investigators that a unified command was not formed until July 31. Until that time, Enbridge operated a company-managed incident command system with EPA in an oversight role. Enbridge conducted twice daily internal incident briefings, and developed its own incident action plans and other incident command system documents. Although

[8] The volume that is reported to have been recovered exceeds Enbridge's revised release amount of 843,444 gallons. EPA SITREP 124 indicates this figure includes waste streams identified as "oily water" as well as estimates of oil contained in saturated soils. According to Enbridge, there are a number of conservative factors involved in calculating this number that Enbridge believes contribute to an overestimation of the total amount, including the product released from Line 6B, non-petroleum organic materials, and other potential petroleum-based products in the river.

[9] The National Incident Management System developed by FEMA provides a systematic approach to guide agencies at all levels of government, nongovernmental organizations, and the private sector to work together to respond to, recover from, and mitigate the effects of incidents.

the Enbridge incident action plans were not provided to the EPA for review or approval, Enbridge provided briefings to the EPA every three hours beginning on July 26 at about 6:00 p.m.

The Chicago Region general manager served as the incident commander of Enbridge's company-managed incident command system that was in place between July 26 and July 31. Enbridge personnel served in all of its command staff positions for chiefs of the Operations, Planning, Logistics and Finance sections. The Operations Section was organized into Containment, Pipeline Repair, Cleanup, Site Remediation, Air Support, and Security branches. Enbridge subdivided the Containment Branch, which was responsible for oil containment and deflection activities, into five geographic divisions as follows:

- Division A encompassed a 5-acre spill release area within a wetland to the point where the oil spill entered Talmadge Creek.
- Division B began at an underflow dam on Talmadge Creek and continued downstream to its confluence with the Kalamazoo River.
- Division C extended from the confluence of Talmadge Creek and the Kalamazoo River west along the Kalamazoo River to the Angell Street Bridge in Battle Creek, Michigan.
- Division D covered the Kalamazoo River from the Angell Street Bridge west to the Kalamazoo County line.
- Division E covered the downstream extent of the oil spill on the Kalamazoo River from the Kalamazoo County line west to Morrow Lake Dam.

Among Enbridge's identified response objectives for containment and recovery of the released oil were the following:

- Cease the flow of oil from the pipeline.
- Isolate the source of the release by placement of berms between the release point and Talmadge Creek.
- Contain and recover oil at Talmadge Creek by use of underflow dams.
- Contain and recover oil from Talmadge Creek and Kalamazoo River by use of deflection booms, oil absorbent booms, absorbent pads, oil skimmers, vacuum trucks, and pumps.
- Remove residual crude oil from affected locations.

On July 26, at about 1:50 p.m., Enbridge established its company managed incident command post at its pipeline maintenance facility located at 455 Leggitt Road in Marshall, Michigan. Starting on July 27, EPA personnel were embedded in the Enbridge Operations Section at its Leggitt Road command post. EPA's separate incident command post was initially located at the Calhoun County Emergency Operations Center in Battle Creek, Michigan on July 27, at about 12:00 p.m. The command post was relocated on July 28 to the Walters Elementary School in Marshall, Michigan.

EPA's separate unified command issued its first incident action plan on July 31. Prior to issuance of incident action plans, the EPA disseminated information about current and planned activities through pollution reports (POLREPS) that were issued by the federal on-scene coordinator (FOSC).

On July 31 the unified command consisted of the EPA, Enbridge, Michigan Department of Natural Resources and Environment, Michigan State Police, Calhoun County Emergency Management Agency, Calhoun County Public Health Department, and Kalamazoo County Sheriff's Office. The City of Battle Creek, Michigan was included in the unified command on August 10. The deputy Operations Section chief reported that having these agencies represented in the unified command provided the EPA with local area expertise and assistance with the needs and concerns of residents, thus allowing the EPA to focus on spill response and remediation matters.

Other agencies that participated in the response included the Coast Guard, National Oceanic and Atmospheric Administration (NOAA), Department of Transportation (DOT), U.S. Fish and Wildlife Service (USF&W), Federal Energy Regulatory Commission, and 22 other Federal, state, and local agencies that are identified in the EPA situation reports.

SEE ATTACHMENT 4 – 12

I. U.S. Environmental Protection Agency Response

In the inland zone, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)[10] designates the EPA on-scene coordinator (FOSC) as the Federal official responsible to coordinate and/or direct responses to discharges or threats of discharges of oil to waters of the United States. The NCP also designates the FOSC as the Federal official responsible for coordinating or directing responses to releases or threats of release of hazardous substances that pose a threat to human health or the environment. The FOSC may also take necessary response actions to address releases of pollutants or contaminants that may pose imminent and substantial danger to public health or welfare. The EPA Region 5 staff includes about 35 on-scene coordinators that are available to respond to incidents in the Great Lakes, Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Upon receipt of a notification of a discharge or release, the FOSC is responsible for conducting a preliminary assessment to determine the threat to human health and the environment and assessing the capability of the responsible party to conduct removal of the discharge. The Region 5 Regional Contingency Plan/Area Contingency Plan (RCP/ACP) outlines the responsibilities of the FOSC and other agencies that respond to discharges within the Great Lakes region. The plan directs the FOSC to ensure adequate oversight when response actions are being conducted through responsible party efforts.

[10] The NCP is the federal government's blueprint for responding to both oil and hazardous substance releases. The latest revisions of the NCP were finalized in 1994 to reflect the provisions of the Oil Pollution Act of 1990.

The plan states that if the responsible party cannot or will not initiate action to eliminate the threat, or if the removal is not being conducted properly, the FOSC should advise the responsible party and take appropriate steps to mitigate or remove the threat of a discharge. When the FOSC has determined that a discharge presents a substantial threat to public health or welfare, the NCP authorizes the FOSC to direct all private, state or Federal actions to remove, mitigate, or eliminate the threat of a discharge.

Notifications

On July 26, 2010, at about 1:40 p.m., an on-scene coordinator at EPA Region 5 Chicago headquarters contacted the supervisor, regional engineering to verify the information contained in National Response Center report number 948903. At about 1:51 p.m. the on-scene coordinator contacted the on-call on-scene coordinator in Cleveland, Ohio and a second on-scene coordinator who was nearer to the incident scene in Bridgeman, Michigan and advised them both to respond to the accident scene to verify the content of the report and initiate response activities as necessary. At 1:55 p.m., Enbridge notified the on-scene coordinator that their incident commander would be the company's Chicago region general manager. At 2:00 p.m., the Region 5 on-scene coordinator sent an email spill notification to all Region 5 administrators and on-scene coordinators conveying the information contained in the National Response Center report. At about 2:15 p.m., the Region 5 on-scene coordinator contacted the Superfund Technical Assistance and Response Team (START)[11] and requested deployment of two technicians to assist the two responding on-scene coordinators.

Oversight of Spill Response Efforts

At about 4:32 p.m., the first arriving EPA on-scene coordinator viewed the oil in Talmadge Creek from the Division Drive crossing and concluded that the release was significant upon observing a large amount of oil flowing through a 48-inch culvert. He observed one vacuum truck and no oil boom on the discharge side of the culvert under Division Drive.

At about 5:00 p.m., the first arriving on-scene coordinator traveled to the Enbridge Marshall pipeline maintenance facility where he met with the Enbridge Chicago region general manager and notified that EPA would serve as the FOSC[12] and incident commander for this incident. The EPA did not recognize the Enbridge Chicago region general manager as the incident commander and stated in response to questions from NTSB:

> "*Enbridge was never the incident commander for this spill*."

[11] The Superfund Technical Assessment and Response Team (START) contractors provide technical support to EPA's site assessment and response activities, including gathering and analyzing technical information, preparing technical reports on oil and hazardous substance investigations, and technical support for cleanup efforts.
[12] The first arriving EPA on-scene coordinator served the FOSC role until the arrival of a senior on-scene coordinator on July 27.

The FOSC attempted to collect information about Enbridge response effort, but he noted that the Chicago region general manager was not able to provide sufficient information about the company's response actions or the amount of resources it had deployed.

The second EPA on-scene coordinator arrived on-site at about 5:55 p.m. The two on-scene coordinators gathered information about the spill, met with officials from Enbridge, Michigan State Police, Calhoun County Sheriff's Department, and Michigan DNRE.

The EPA response effort on July 26 consisted primarily of monitoring Enbridge's activities. During the initial few hours, the EPA focused on securing more resources from both EPA and Enbridge for the response effort. The FOSC stated that as resources arrived on-site, EPA directed all Enbridge and EPA resources.

When interviewed by NTSB investigators, the Chicago region manager of pipeline services provided his perspective of the EPA's initial response role during a 7:00 p.m. briefing with the FOSC:

> "*It was more from the standpoint of observation, sitting back and seeing what we were doing, and indicating that they had the capability to take over the response efforts at any point in time.*" [13]

During briefings that occurred on the first day of the spill response, the FOSC and the Chicago region general manager discussed the amount of Enbridge response assets on-scene, the status of the spill, and the current response actions. The FOSC expressed concern that inadequate oil boom and contractor resources had been deployed. The FOSC persisted that the EPA could take over the response if Enbridge's efforts continued to be insufficient.

At about 7:20 p.m., an EPA on-scene coordinator overflew the oil spill site and observed the extent of the discharge to Talmadge Creek and the Kalamazoo River. The on-scene coordinator observed 5 vacuum trucks and about 600 feet of deployed oil boom at that time.

At about 7:30 p.m., the FOSC issued Enbridge a written Notice of Federal Interest in an Oil Pollution Incident, which stated that so long as Enbridge took adequate action in this matter, Federal action would be limited to monitoring of the progress of these actions and the provision of guidance as necessary.

The two on-scene coordinators conferred and determined that a full EPA incident management team would be required to address the discharge. At about 7:40 p.m., they contacted the Region 5 emergency response branch chief to request an incident management team and a senior on-scene coordinator to assume the FOSC role on the following day (July 27), while the two first responders would continue to manage field operations.

[13] See Attachment 26, NTSB interview of Manager of Pipeline Services.

The Region 5 emergency response branch chief advised the on-scene coordinators of the existence of the Kalamazoo River Superfund Site, which extends approximately 80 miles from the base of the Morrow Lake Dam to Lake Michigan. Accordingly, in subsequent briefings with Enbridge officials, the on-scene coordinators stressed that Enbridge should make all efforts necessary to protect the Superfund site and directed that oil boom should be installed 30 miles downstream at Morrow Lake as a collection point.

At about 8:40 p.m., the senior on-scene coordinator contacted the EPA Region 5 emergency response branch chief and requested mobilization of an incident management team, START, and Emergency and Rapid Response Services (ERRS) contractors.[14]

The on-scene coordinators told NTSB investigators that they determined during the initial hours of the response that Enbridge did not have the resources on site to contain or control the flow of oil into Talmadge Creek and the Kalamazoo River. At about 8:45 p.m., the on-scene coordinators met with the Enbridge Chicago region general manager and provided a briefing on the scope of the spill as observed during their aerial reconnaissance. At this meeting Enbridge was not able to provide information regarding the number and capacity of tanks available to store recovered oil or the number of crews that Enbridge expected and when those crews would arrive on site. The on-scene coordinators directed Enbridge to secure more resources for the response action. On learning from the general manager that primary response contractors were responding from Minnesota, one on-scene coordinator provided Enbridge names of local contractors to facilitate a quicker deployment of response resources.[15]

When asked to provide an assessment of Enbridge's spill containment methods and ability to locate needed resources during the initial emergency response, EPA responded:

> "*During the initial hours of the response, Enbridge did not have adequate resources on-site to deal with the magnitude of the spill. Enbridge relied on weirs to control the spill, which were not adequate for the size of the spill*."
>
> "*Enbridge experienced significant difficulties locating necessary resources, due primarily to its lack of familiarity with contractors located anywhere in Region 5 other than Minnesota. Resources were readily available in the local geographic area, but went untapped by Enbridge until EPA provided contact information for available contractors who could respond more quickly and had available resources. In addition, Enbridge was incorrectly ordering small quantities of resources. Once*

[14] The Emergency and Rapid Response Services (ERRS) contractors provide the EPA with time-critical response cleanup services, including personnel, equipment, and materials to contain, recover and dispose of hazardous substances. The contract also provides for sample analyses and site restoration activities.

[15] The Enbridge Bay City PLM supervisor's actions to contact and engage local contractors and agencies during the initial response efforts are described in Section M of this report.

Enbridge contacted the local contractor resources, additional resources were then quickly deployed to the site."

The on-scene coordinators insisted on getting more detailed information about deployed resources by the midnight briefing. Enbridge told the EPA that more company crews and equipment from other PLM offices would be arriving on the morning of July 27. EPA noted that additional Enbridge resources did not appear on scene until the evening of July 27.

On several occasions the on-scene coordinators also requested that Enbridge provide an updated release amount, however no additional refinement of the 19,500 barrel release estimate was available until November 2, 2010 when Enbridge revised its release estimate to 20,082 bbls. (See Section M of this report for additional information concerning the release quantification).

On July 27, at about 8:00 a.m., the senior on-scene coordinator (FOSC) arrived at the Marshall PLM incident command post on Leggitt Road where he was briefed by the first responding on-scene coordinators and the Enbridge incident commanders. On July 27, the unified incident command met at Governmental Center in Battle Creek with state and local agencies and Enbridge representatives.

The FOSC conferred with EPA senior management who directed him to obtain a better understanding of the scope of the oil spill and Enbridge's resource needs. He was directed to assist Enbridge in identifying, mobilizing, and deploying additional resources. The FOSC then obtained inland sensitivity maps for the Marshall area from the Great Lakes Commission[16] and the Enbridge facility response plan from PHMSA. The FOSC also coordinated Federal response assets with the Coast Guard District 9 commander.

At about 8:15 p.m. on July 27, the FOSC issued an administrative removal order to the Enbridge CEO under Section 311(c) of the Clean Water Act requiring that the company stop the flow of oil into Talmadge Creek and the Kalamazoo River, remediate all oil and contaminated soils in and around the vicinity of the release, and deploy appropriate oil recovery and containment devices and equipment. The administrative order also required Enbridge to conduct other activities such as air, water, and sediment sampling, and dispose of wastes at approved disposal facilities. The order further required Enbridge to submit to the EPA for approval within two days a work plan that includes a schedule for completing a health and safety plan, pipeline repair and workplan, sampling and analysis plan, quality assurance project plan, oil recovery and containment plan, source release area remediation plan, remediation plan for downstream impacted areas, and waste treatment, transportation, and disposal plan.[17]

[16] The Great Lakes Commission assists the U.S. EPA in collecting and compiling data on environmentally, economically, and culturally sensitive areas located within the Great Lakes States of U.S. EPA Region 5. Special emphasis is placed on those areas that may need special consideration in the event of a spill.

[17] In contrast to incident action plans which set goals for discreet operations periods, the plans required by the administrative order covered specific work activities and procedures to be accomplished over the course of the entire incident response.

At about 11:30 p.m. on July 27, EPA mobilized additional ERRS contractor services from Environmental Quality Management, Environmental Restoration, and LATA-Kemron Joint Venture to supplement Enbridge's resources. The ERRS contractors began arriving on-site at about 10:00 a.m. on July 28, and by July 29 about 60 operations personnel had installed about 14,000 feet of additional containment boom to fortify booms that had been placed by Enbridge contractors. EPA noted that by July 29, Enbridge response resources included about 23,000 feet of oil boom, over 400 operations personnel, and skimming operations that had been established at 17 locations along Talmadge Creek and the Kalamazoo River.

On July 29, 2010, Enbridge submitted plans to EPA in response to the administrative order. On July 31, the FOSC issued a letter to Enbridge disapproving of each of these plans due to deficiencies in content and technical details. The EPA provided comment on the plans and required that they be revised and resubmitted by August 2. The FOSC also committed the EPA safety officer, the START contractor, and the deputy Operations Section chief to assist Enbridge in revising its plans. The plans were ultimately submitted to EPA on August 4 and approved by the FOSC.

The EPA reported that Enbridge had an approved site-specific health and safety plan beginning on August 5. Until then, EPA used its pre-established Emergency Responder Health and Safety Manual which covers all hazards encountered on emergency response and time-critical removal actions. Contractors working on the spill response also have generic health and safety plans which are established at the beginning of a response and modified to include site specific information. EPA reported that these plans were adequate for the response to be conducted in a safe manner. On July 29, the work areas were inspected by federal and state OSHA representatives at which time some workers were found not wearing appropriate personal protective equipment. On July 31, EPA and OSHA representatives investigated reports of high benzene concentrations in the Division A work area, however they found that Enbridge's existing controls were adequate to address OSHA guidelines for personal protective equipment. On August 1 EPA assigned a safety officer to review the Enbridge site safety plan and to develop a unified plan for private and federal contractors. A coordinated safety plan for response personnel was developed and presented to the unified command for approval on August 4.

Scientific Support

The EPA Superfund Technical Assistance and Response Team (START)[18] arrived on scene at about 5:30 p.m. on July 26. During their first day on-scene, the team performed real-time air monitoring for volatile organic compounds and benzene and logged contaminant concentrations in residential neighborhoods near Talmadge Creek and the Kalamazoo River.[19] The team continued to share real-time air monitoring data with

[18] START contractors provide technical support to EPA's site assessment activities and response, prevention and preparedness activities. This support includes gathering and analyzing technical information, preparing technical reports on oil and hazardous substance investigation and technical support for cleanup efforts.

[19] See Section N of this report for further discussion of air quality monitoring.

public health agencies which used benzene readings to make decisions about evacuation, re-occupation, and worker safety. On August 1, EPA mobilized their Trace Atmospheric Gas Analyzer (TAGA) mobile laboratory to assist with air quality evaluations. The TAGA supplied local health departments with air sample analytical data for benzene until September 2, when Enbridge provided a mobile laboratory that was able to perform the same services.

The National Oceanic and Atmospheric Administration (NOAA) scientific support coordinator (SCC) provided an oil spill trajectory analysis to the incident commanders. The SCC reported that an overflight of August 3 located oil sheen moving downriver with the current between the spill site and Morrow Lake, but it did not appear that the sheen extended to the Morrow Dam. The SCC reported that the river stage had dropped about 2 feet since the spill began and was expected to remain at that level for another week. The SCC reported that significant amounts of free floating oil were not expected to move down river, but rather would beach along stream banks before reaching Morrow Lake. The SCC reported that the oil release was not expected to impact Lake Michigan, but rather as the light condensate fraction of the crude oil blend evaporates or dissolves into the water column; the remaining bitumen was expected to sink and mix with sediment in the river bottom with the furthest downstream collection point at Morrow Lake.

SEE ATTACHMENTS 6, 9, 13, 14, 55, AND 78

J. United States Coast Guard Response

The Coast Guard District 9 Incident Management Branch was initially notified of the accident on July 26, 2010 at about 1:33 p.m. by the National Response Center. The Coast Guard evaluated the report and determined that the accident location was about 40-miles inland of the coastal zone and therefore located within EPA jurisdiction as defined by the Region 5 contingency plan.[20] NOAA provided trajectory support to Coast Guard Sector Lake Michigan to determine if and when oil may reach their jurisdictional waters on the Kalamazoo River. The Coast Guard determined that its trigger point for a threat to the coastal zone would be if oil had discharged downstream of Morrow Lake Dam, however the oil spill ultimately did not impact these locations.[21]

On July 26 at about 8:29 p.m., the EPA FOSC contacted the USCG National Strike Force to request available assets to supplement its response in Marshall, Michigan. The USCG Atlantic Strike Team initially sent two petty officers to the accident site to assist with contractor performance monitoring. During August, 10 to 12 Strike Team members were on site at any given time, and 4 to 8 members were on site during September.

[20] Section 1 of the Region 5 Regional Contingency Plan /Area Contingency Plan delineates jurisdictional boundaries of the EPA and the Coast Guard.

[21] EPA would still have retained jurisdiction because, according to the Region 5 Contingency Plan, the lead agency is determined by the location where the spill originates.

In response to an additional request by the State of Michigan for Coast Guard involvement, the Coast Guard District 9 Incident Management Branch chief consulted with the EPA chief of the Region 5 Emergency Response Branch, who agreed to accept Coast Guard assistance. The District Response Advisory Team (DRAT) supervisor told NTSB investigators that on July 31, nine team members responded to the accident to provide incident management support in operations and planning within the existing incident command system. District 9 command personnel, along with the United States Fish and Wildlife Service (USF&WS) personnel assisted in the organization of local, state, and Enbridge responders during days 3-7 of the response.

Beginning with the operational period August 2, 2010 07:00 a.m. through August 3, 2010, specific Coast Guard assignments were included in each daily incident action plan. Six Coast Guard personnel were assigned to conduct roving monitoring of contractor performance and to report findings to the unified command. An additional three Coast Guard personnel were assigned to coordinate oil containment booming efforts with EPA and Enbridge contractors to ensure that boom was deployed efficiently and properly.

SEE ATTACHMENTS 14 - 15

K. State of Michigan Response

The State of Michigan's representation on the Region 5 Regional Response Team is headed by the Michigan Department of Environmental Quality (MDEQ), which is the primary environmental emergency response agency in the state for all non-agricultural-related spills. Prior to this accident the MDEQ had approximately 19 full-time personnel who respond to environmental emergencies within nine field operations districts. The primary response role of MDEQ is one of technical advisor for spill containment, control and mitigation. Although MDEQ has personnel that have been trained to provide hands-on response with deployment of oil boom and absorbents, the agency generally relies on first responding hazardous materials teams to conduct these activities.[22] The state on-scene coordinator (SOSC)[23] told NTSB investigators that the state does not maintain any emergency response resources of its own, but does have limited funding to hire spill response contractors in situations where the responsible party cannot be identified. In October 2009, the MDEQ was merged with the Michigan Department of Natural Resources to form the Michigan Department of Natural Resources and Environment (DNRE), which also has responsibilities for protection of fish and wildlife during a spill response.

Other state agencies that participated in the response to this accident include the Michigan State Police, which serves as the designated emergency and disaster response coordination agency and the Michigan Department of Community Health which was responsible for issuing public health advisories in the affected areas.

[22] Section 2.3.3 of the Region 5 Regional Contingency Plan/Area Contingency Plan (RCP/ACP) outlines the emergency response roles of various state agencies within Michigan.

[23] The state on-scene coordinator was the Kalamazoo district supervisor for the Michigan Department of Natural Resources and Environment.

Notifications

The State of Michigan first became aware of the crude oil release as a result of an independent investigation made by a Michigan DNRE conservation officer who lives near the confluence of Talmadge Creek and the Kalamazoo River. On the morning of July 26, the conservation officer woke up to a strong odor in his home and telephoned his utility company, Consumers Energy, to report a leak. A technician who responded to the conservation officer's home determined that the odor was due not to natural gas, but rather to a petroleum product. The conservation officer assumed his official role upon observing fire department vehicles that arrived on Division Drive between 16 Mile Road and Rt. 27 in Marshall. At about 11:36 a.m., the conservation officer and the Consumer's Energy technician observed heavy black oil flowing in Talmadge Creek at Division Drive.

The conservation officer initiated a search for the source of the discharge. At about 12:49 p.m. he encountered the Enbridge Bay City PLM supervisor who informed him that the oil discharge resulted from a ruptured pipeline and that isolation valves on the pipeline had been closed and spill response crews were enroute to the accident scene.

The conservation officer then went to the Enbridge pipeline maintenance facility on Leggitt Road in Marshall where he found a leak reporting telephone number posted on a sign. Using that telephone number, the conservation officer contacted the Enbridge Chicago Region general manager who confirmed the leak occurred from their pipeline and said that although the pipeline had been isolated, some oil could continue releasing due to material gravity feeding towards the broken segment.

After conducting a survey on foot along Talmadge Creek with the fire department and an Enbridge employee to determine the extent of oiled marsh area, the conservation officer provided details of the incident to the assistant director of the DNRE central dispatch center.

At about 1:49 p.m., the DNRE Kalamazoo district supervisor reported that DNRE staff were enroute to evaluate the incident and confirmed that Enbridge response crews were on-site and enroute.

At about 2:26 p.m., the Enbridge regional engineering supervisor contacted the Michigan DNRE and provided the estimate that 19,500 barrels of crude oil had released into a tributary of the Kalamazoo River and reported that containment was underway with oil boom.

Spill Response Activities

During the first day of the response, the conservation officer remained on-scene to assist with site security until the arrival of additional Enbridge response personnel. One Water Resources Division staff member arrived on scene during the afternoon of July 26 and

visited some oiled locations to gather information about the response activities, and participated in an aerial assessment to evaluate the severity of the release. He reported to the district supervisor that a large amount of oil was released and suggested that the supervisor also respond to the scene.

The State of Michigan was represented in the unified command by the DNRE district supervisor and a lieutenant with the State Police Department of Emergency Management. The two SOSC's joined the unified command on July 27 with EPA, Enbridge, and Calhoun County officials in order to provide oversight of the spill response actions.

On July 27, the State of Michigan activated the State Emergency Operations Center[24] in order to coordinate the response of state agencies to this accident. Among the state agency response activities:

- The Michigan DNRE collected water samples downstream of Morrow Lake for crude oil contaminants. DNRE staff conducted fish kill and aquatic organism surveillance. They also assisted the U.S. Fish and Wildlife Service with wildlife recovery and cleaning efforts.
- The Michigan Department of Community Health issued a precautionary public health advisory notifying the public to avoid water contact recreation and the consumption of fish in the affected areas of Talmadge Creek and the Kalamazoo River between Interstate 69 and the west end of Morrow Lake. The Department of Community Health consulted with the Federal Agency for Toxic Substances and Disease Registry to interpret environmental monitoring data and develop residential evacuation protocols.
- The Michigan Department of Agriculture issued a ban on surface water withdrawals from the Kalamazoo River or connected waters for crop or lawn irrigation and animal watering.
- At the request of EPA, the Michigan National Guard, 51st Civil Support Team[25] was activated to supplement air monitoring activities between Marshall and Galesburg, Michigan.

On September 13, 2010, the DNRE director notified Enbridge that with the emergency phase of response to the oil spill nearing completion, DNRE would be assuming the lead in ensuring that affected water and soils comply with state criteria and are protective of the public health and environment and are restored to the fullest extent possible. On November 1, 2010, DNRE entered into an administrative consent order and partial settlement agreement with Enbridge which required restoration and monitoring activities consistent with its work plans that were approved by the State.

[24] The State Emergency Operations Center (SEOC) located in Lansing, Michigan is overseen by the Michigan Department of State Police, Emergency Management and Homeland Security Division. The SEOC is staffed by members of several state agencies for decision-making and information coordination of disasters or emergencies in the state of Michigan.

[25] The Michigan National Guard 51st Civil Support Team specializes in response to weapons of mass destruction threats and has 22 full time members equipped with advanced field analytical capabilities.

In November 2010, the Michigan Department of Community Health issued a report titled "Acute Effects of the Enbridge Oil Spill." The report provided the results of a multi-faceted public health surveillance system implemented by state and local public health agencies. The surveillance system received 147 health care provider reports on 145 patients, identified 320 individuals with adverse health effects from four community surveys along the impacted waterways, identified one worksite symptomatic employee, and tracked 41 calls that were placed to the poison center. Headache, nausea and respiratory effects were the predominant symptoms reported by exposed individuals in all reporting systems. The report concluded that these symptoms were consistent with the published literature regarding potential health effects associated with crude oil exposure.

SEE ATTACHMENTS 16 -21, AND 79

L. Local Agency Response

Calhoun County

The unified command staff included a health officer with the Calhoun County Public Health Department, and the director of the Calhoun County Department of Emergency Management.

The Emergency Management director arrived at the oil spill scene at 1:30 p.m. on July 26 where he collected information about the release and contacted the Enbridge Bay City PLM supervisor.

On July 27, Calhoun County activated its Emergency Operations Center for use as the incident command post.

The Michigan Department of Community Health designated the Calhoun County Public Health Department the lead local health agency for the emergency response. The state and county health department collaborated to establish appropriate residential evacuation protocols. The county health department contacted residences within the evacuation area and set up distribution centers for bottled water provided by Enbridge and other local organizations and businesses.

On July 29, the county health department issued a water advisory for residents with private wells living within 200 feet of the edge of the affected river bank. On August 3, 2010, the county health department issued a ban on the use of water in the Kalamazoo River for irrigation and watering livestock. It also banned swimming, fishing, and boating along the affected segment of the Kalamazoo River and Talmadge Creek in Calhoun County.

On December 22, 2011, the County health officer issued an update describing actions taken by local health agencies to protect public health. He reported:

"Exposures, particularly by inhalation, may have been significant in the days immediately following the oil spill when chemical contaminant levels were high. However, data gathered in the fall of 2010 through the current date indicate that contaminants have returned to levels that are unlikely to cause human health effects. Sampling prompted by initial concerns about impacts to private wells has demonstrated that people have not been exposed to oil-related chemicals by drinking their well water."

Kalamazoo County

The unified command staff included a lieutenant with the Kalamazoo County Sheriff's Office. The county Office of Emergency Management monitored impacts of the oil spill, and containment and recovery activities. The Kalamazoo County Department of Health and Community Services collected drinking water well samples from residences located within 200 feet of the Kalamazoo River. On August 1, 2010, the department of health issued a ban on the use of water in the Kalamazoo River for irrigation and watering livestock from the Calhoun County line through Kalamazoo County to the Morrow Lake Dam.

City of Battle Creek

The unified command staff included the emergency services coordinator for the City of Battle Creek, Michigan.

At about 2:45 p.m. on July 26, the Battle Creek Fire Department installed oil absorbent boom across the Kalamazoo River near the Ceresco Dam in Battle Creek.

SEE ATTACHMENTS 22-23, AND 80

M. Responsible Party Actions

Release Notifications

At about 11:24 a.m. on July 26, 2010, the Enbridge control center notified the Chicago Region general manager, who is also the Enbridge qualified individual,[26] of pipeline leak reports in Marshall, Michigan. At about 11:30 a.m., the general manager notified the Marshall pipeline maintenance facility crossing coordinator of the reported leak. The crossing coordinator and two other Enbridge pipeline maintenance employees surveyed the Enbridge right of way where they encountered Consumers Energy Company personnel who led them to the source of the release off of Brooks Drive in Marshall. At about 11:45 a.m., the crossing coordinator confirmed that oil was present in a marsh

[26] The Qualified Individual is defined in 49 CFR 194.5 as an English speaking representative of a pipeline operator located in the United States, available on a 24-hour basis, with full authority to activate and contract with required oil spill removal organizations, activate personnel and equipment maintained by the operator, act as liaison with the FOSC, and obligate any funds required to carry out all required or directed oil response activities.

along the right of way about ¼ to ½ miles downstream of the Marshall pumping station. The crossing coordinator contacted the control center to confirm the release at which point he learned that the pipeline segment had been isolated with closed upstream and downstream valves.

At about 11:50 a.m., the crossing coordinator and one of the assisting pipeline maintenance employees also provided confirmation of the release to the general manager, the manager of pipeline services, and the Bay City PLM supervisor. While the general manager and the manager of pipeline services drove from the Chicago Region headquarters in Griffith, Indiana to the accident scene in Marshall, Michigan, the manager of pipeline services made telephone calls advising foremen from five Enbridge Chicago Region pipeline maintenance offices to mobilize personnel and equipment for assistance with the response.

The general manager also directed the supervisor, regional engineering who remained at the Griffith, Indiana office to notify the National Response Center and other government agencies as necessary.

The supervisor, regional engineering collected information about the accident from the Enbridge Control Center shift lead and calculated the amount of crude oil released from the pipeline. He contacted the Enbridge Marshall, MI crossing coordinator who reported that the oil was in Talmadge Creek one mile downstream and running north toward the Kalamazoo River.

The supervisor, regional engineering contacted the National Response Center at about 1:02 p.m. to report the accident; however he dropped the call after 8 seconds. He then re-contacted the National Response Center at 1:09 p.m. and was placed on hold for about 6 minutes before dropping the call to take other incoming telephone calls. The engineering supervisor re-contacted the National Response Center at about 1:23 p.m. and again was placed on hold before being able to convey the release report at about 1:33 p.m. He reported that at 9:45 a.m.[27] Enbridge discovered the failure of a 30-inch diameter pipeline 200 yards west of 17 Mile Road in Marshall, Michigan that resulted in the release of what Enbridge estimated to be 19,500 barrels of crude oil which entered a creek that leads to the Kalamazoo River. The engineering supervisor reported that pipeline valves were closed, oil had not yet entered the Kalamazoo River, crews are attempting to boom the area off, and oil spill response organizations had been contacted for response.

The supervisor, regional engineering provided additional notifications and release details to the following organizations:

- A DNRE conservation officer at about 12:50 p.m.
- The Pipeline and Hazardous Materials Safety Administration (PHMSA) at about 1:50 p.m.

[27] National Response Center report number 948903 incorrectly indicates that the pipeline leak was discovered at 9:45 local time. The Enbridge engineering supervisor stated that he inadvertently provided the time of the incident using Mountain Daylight Time; however he should have reported the local time which was 11:45 a.m. Eastern Daylight Time.

- The EPA at about 1:55 p.m.
- At about 2:19 p.m. the engineering supervisor sent an internal Enbridge notification of the accident which was disseminated through Enbridge's leak reporting system.[28]
- The Enbridge Environmental Department at 2:25 p.m. which dispatched three personnel from Superior Wisconsin along with two compliance specialists and one right of way manager to staff the Enbridge incident command center for environmental response operations.
- The Calhoun County emergency manager was notified at about 3:00 p.m.
- The Michigan Public Service Commission was notified at about 3:55 p.m.

Meanwhile, the Bay City PLM supervisor, who served as the interim incident commander pending the arrival of the Chicago Region general manager, made the following contacts and notifications:

- At about 11:45 a.m. directed the Marshall PLM crossing coordinator to begin boom installation and get vacuum trucks on scene as soon as possible.
- Directed Bay City PLM to respond with personnel and a vacuum truck.
- At about 12:36 p.m. Terra Contracting LLC to inquire about the availability of frac tanks, vacuum trucks, and any other available resources. At about 2:29 p.m. Terra confirmed that it would be sending four 3,000 gallon vacuum trucks and an excavator equipped with a skimmer that was to be stationed in Heritage Park. Terra confirmed that these resources would begin arriving by 3:30 p.m.
- Baker Corporation to rent four frac tanks which would be arriving by the end of the day.
- Worth Construction Company to inquire whether workers were available to respond. Worth reported that it would be arriving with 4 vacuum trucks between 3:30 and 4:00 p.m. and 3 tanker trucks at about 6:00 p.m.
- Escanaba PLM at about 2:00 p.m. to request assistance. The PLM confirmed that it was sending three men with a boom truck and a vacuum truck.
- RG Eisenhardt at about 2:07 p.m. to request tanker trucks. Eisenhardt reported that it would be arriving with 3 tank trucks between 4:00 p.m. and 5:30 p.m.

After he arrived at the accident scene at about 4:00 p.m., the manager of pipeline services contacted Bay West, Inc. of St. Paul, Minnesota, which is one of two contracted oil spill response organizations that is listed in the Enbridge facility response plan. The manager of pipeline services told NTSB investigators that after several telephone calls, Bay West assembled a team of all of the available resources they had, which included 20 response personnel equipped with one 24-foot boat and a trailer containing 1,000-feet of oil boom, a skimmer, and absorbent pads. Bay West launched these resources between 9:00 and

[28] The Enbridge Leak Reporting System is a communication protocol that is the method for internal notification of critical pipeline leak events. The system notified senior management, including the Chicago regional manager, Chicago pipeline services manager, corporate secretary, environment supervisor, vice president of operations, pipeline integrity manager, pipeline operations director, and the health and safety supervisor. Enbridge generally attempts to make this notification within 1 hour of an event.

10:00 p.m., although they had a 10 to 11 hour drive to the accident scene and did not arrive on the scene until July 27.

The other oil spill response organization identified in the facility response plan is Garner Environmental Services, of Deer Park, Texas. Garner's equipment list indicates that all of its response resources are staged within the State of Texas. Garner responded to the accident scene by Thursday, July 29.

At about 3:15 p.m., Enbridge contacted McMillan Construction, Superior Environmental Services, and Young's Environmental Services, for supplemental spill response resources. Crews from Superior and Young's arrived on site that afternoon with a vacuum truck, tank truck, an excavator, and rolloff dumpsters.

At 3:18 p.m. an Enbridge technical supervisor reported to the Chicago Region general manager and the manager of pipeline services that personnel and equipment from the PLM offices at Thief River Falls, Bemidji, Superior, Ironwood, and Escanaba offices were due to arrive between morning and mid-day on July 27.

See Appendix A for additional details of Enbridge's notifications.

Quantification of the Release

Before reporting the release to the National Response Center, the supervisor, regional engineering made an effort to determine the amount of crude oil released from pipeline 6B. He determined that a mass balance differential in connection with a column separation[29] occurred on July 26 at about 7:52 a.m. of about 1,800 cubic meters, which equates to approximately 11,322 barrels (475,524 gallons). The supervisor, regional engineering learned that the control center initiated closing of mainline block valves to isolate the leak; one block valve at Marshall Station and the other approximately 2.95 miles downstream. The supervisor, regional engineering reported his findings to the Chicago Region general manager who decided that this volume probably would not be large enough to account for the 3 to 4 minute time lag in closing the mainline block valves, so he directed that the official release volume be reported as the amount of oil that would have been contained in that entire section of pipeline. The supervisor, regional engineering calculated the release to be 19,500 barrels (819,000 gallons), and he reported that figure to the National Response Center.

In response to NTSB's request to provide supplemental information about the quantity of crude oil released from the ruptured pipeline, Enbridge later conducted a mass balance calculation that took into account the volume of product that filled the pipeline, the volume of material still in the pipeline upstream and downstream of isolation valves, and the volume of material that remained between the isolation valves once the pipeline repair was made. Accordingly, on November 2, 2010, Enbridge revised its release calculation to about 20,082 barrels (843,444 gallons).

[29] Column separation refers to the breaking of liquid columns in fully filled pipelines.

Environmental Response Operations on the Day of the Accident

At 11:45 a.m. on July 26, 2010, the initial Enbridge personnel on-site included the Marshall PLM crossing coordinator who confirmed the release, an electrician and two senior pipeliners. After confirming the presence of oil in the marsh near the ruptured pipeline, the crossing coordinator followed Talmadge Creek downstream to determine the extent of the oil discharge and they found that no oil had gotten as far as A Drive North, about 1.5 miles downstream of the pipeline release site. The crossing coordinator observed heavy amounts of oil at the next upstream creek crossing on 15 ½ Mile Road, which was located approximately 1 mile from the pipeline release site. The electrician remained at 15 ½ Mile Road to maintain site security with the fire department.

The crossing coordinator notified the Bay City PLM supervisor who directed the 4 person crew to initiate oil containment operations. They returned to the Marshall PLM station and retrieved a vacuum truck, gang truck, semi-truck, and oil boom trailer. At about 12:10 p.m. they returned with the equipment to A drive, and installed a double 20-foot length of absorbent boom across Talmadge Creek and anchored it to a private stream crossing on the north side of A Drive where they still observed little or no oil flowing. At the same time, they placed an additional length of absorbent boom across the culvert on the south side of A Drive. The Marshall personnel noted that the stream was flowing vigorously in a 20-foot wide channel, which is normally only about 4-feet wide.

Locating a third containment site, the crew traveled to the next property upstream of A Drive where they placed about 20 feet of absorbent boom across a narrow section of Talmadge Creek upstream of a driveway crossing. At that time, the crew noted very light oil sheen in the creek.

When interviewed by NTSB investigators, the crossing coordinator told NTSB investigators that the Marshall PLM team had very little awareness of the severity of the oil spill while they installed these initial oil containment measures. Discussing the rationale of initially placing oil boom at two locations near the confluence of Talmadge Creek and the Kalamazoo River, he stated:

> "We *had no idea whether the oil would make it there or not, but if there was some sheen, maybe it would collect it*."

At about 12:30 p.m.[30], the Enbridge crew traveled further upstream and arrived at the 15 ½ Mile Road crossing of Talmadge Creek where they observed a heavy amount of oil in the water. On the upstream side of the culvert, the crew installed 40 feet of containment boom and sections of absorbent boom to funnel the oil to the bank where they began to recover it using the Marshall PLM vacuum truck. At about 2:00 p.m., the crossing coordinator retrieved additional containment and absorbent boom, an air compressor

[30] Times of specific actions taken by Enbridge responders are estimated to the best of the witnesses' ability since in most cases such data was not being recorded during the initial response actions.

from the Marshall PLM shop and returned to 15 ½ Mile Road to set up an oil skimmer to use in conjunction with the vacuum truck. The Marshall PLM crew spent the remainder of the day until 11:00 p.m. using the Marshall PLM vacuum truck and skimmer to recover oil at this location. After a couple of hours, additional vacuum trucks and crews began arriving to assist with the oil removal.

While the Chicago Region general manager was traveling to the accident scene, the Bay City PLM supervisor assumed the role of initial incident commander. He arrived on-scene at about 12:46 p.m. The Bay City PLM supervisor first observed released oil at the Division Drive crossing over Talmadge Creek where he noted a flooded area south of the roadway covered with a 3 to 4 inch oil layer. The supervisor told NTSB investigators that while he observed the oily mixture discharging at a high rate through a 48-inch diameter steel culvert pipe under Division Drive and continuing downstream in Talmadge Creek, the bulk of the released oil was contained upstream (south) of Division Drive. He observed no oil boom or other measures to contain or recover oil at this culvert. The supervisor said that under normal circumstances he would have ordered the culvert pipe plugged with earth; however he considered the flow of water to be too great to attempt this action.

The Bay City PLM supervisor then checked the locations where Enbridge crews had deployed oil boom prior to his arrival at Talmadge Creek stream crossings at A Drive and 15 ½ Mile Road. At about 1:30 p.m., while at 15 ½ mile road, the supervisor encountered the DNRE conservation officer who informed him that oil sheen had migrated further downstream and was entering the Kalamazoo River. He also met with the Calhoun County director of emergency management and discussed Enbridge response actions and informed that additional Enbridge resources and managers were enroute to the scene.

The Bay City PLM supervisor observed Enbridge crews tending one 20-foot strand of oil boom at 15 ½ Mile Road with one vacuum truck. He had the crew separate half of the boom for use further downstream because the channel width was narrow at this location and could be spanned with a shorter length of boom.

The Marshall PLM supervisor arrived on the scene after about 1:30 p.m. and conferred with the Bay City PLM supervisor. They decided that the Marshall PLM Supervisor would concentrate on locating and stopping the source of the leak while the Bay City PLM supervisor would continue concentrating on installing oil boom at downstream areas with the assistance of additional arriving Enbridge crews.

At about 2:45 p.m., the Bay City PLM supervisor contacted the Battle Creek fire department hazardous materials chief at Ceresco Dam at the 12 Mile Road crossing over the Kalamazoo River where at that time he observed spotty oil sheen in the river. A fire department crew was in the process of using a small boat to emplace a 50-foot length of absorbent boom across the river channel. The Bay City PLM supervisor recommended against installing oil boom at this location because there was no access available for oil

recovery equipment. He and the fire department chief found a site with better access further downstream at Heritage Park, located at 9 Mile Drive and G Drive.

At about 3:00 p.m. the Bay City and Marshall PLM supervisors met at the Talmadge Creek crossing under Division Drive. At that time, an Enbridge vacuum truck from the Bay City PLM arrived and began skimming oil from the water surface at the Division Drive culvert pipe. A fire department chief directed the supervisors to the location where oil was entering Talmadge Creek from the source area.

At about 3:42 p.m., the supervisor, regional engineering reported that Enbridge pipeline maintenance crews and internal resources were mobilized as follows:

- Chicago Region PLM – Marshall, Bay City, Griffith (day shift), Vesper, Fort Atkinson (night shift).
- Superior Region PLM – Thief River Falls, Bernidji, Superior, Ironwood, and Escanaba.
- Eastern Region PLM – Sarina.
- Chicago Region support staff – general manager, manager, region engineers, right of way, and safety.
- Superior Environmental Department – mobilizing internal personnel and external contract services.
- Superior Compliance Department.
- Emergency response communications trailer mobilized from Superior.

Between 4:30 p.m. and 6:30 p.m. Baker Corporation delivered four frac tanks[31] to the Marshall PLM shop for temporarily storing oil that was being collected with vacuum trucks.

At about 6:30 p.m. Terra Contracting personnel assisted Enbridge with deployment of 600-feet of oil boom at the Heritage Park site. By that time, the Bay City PLM supervisor estimated that a total of about 14 Enbridge personnel and 6 to 10 personnel from Terra Contracting and Baker Corporation were on-scene actively working to contain the oil.

The Marshall PLM supervisor and two pipeliners on their own initiative worked on the construction of an earthen dam using an Enbridge excavator that happened to be stationed at the Marshall PLM shop. They were assisted by four laborers from Worth Construction Company, who also brought a second excavator that was not used until the next day at a location further downstream. Their initial plan was to block the flow of oil from the marsh into Talmadge Creek, however the width of the marsh was too great and the ground was too soft, so the PLM supervisor abandoned the attempt. Instead, he decided to construct a gravel and earth underflow dam[32] at the confluence of the contaminated

[31] Frac tanks are mobile steel tanks used for temporary liquid storage.

[32] An underflow dam allows water to flow through the bottom of the dam and floating oil to accumulate on the water surface behind the dam. Piping is normally run under or through the dam to let clean water through.

marsh and Talmadge Creek which was the only location they could access with heavy equipment to intercept oil (See Figure 4).

Figure 4: Underflow dam construction on Talmadge Creek, July 30, 2010. State of Michigan Photograph.

Crews used sections of 12-inch diameter surplus PVC pipe they found at the Marshall PLM shop to construct the underflow dam. Having learned this oil containment strategy from participation in previous drills and exercises, this was the first occasion when Enbridge crews constructed an underflow dam. Significant difficulty was encountered with heavy equipment access due to muddy conditions and with high water flows washing out the dam as the crews were working. Construction of the first underflow dam began early in the afternoon and it was functional by 9:00 p.m.

Immediately after the first underflow dam was constructed, a column of trucks vacuumed oil and were offloaded into frac tanks located at the Marshall pumping station. Crews dragged vacuum trucks through the mud to the underflow dam site and oiled marsh locations until gravel roadways were constructed. Other than inability to secure an adequate supply of gravel for road construction on the first day, the Marshall PLM supervisor told NTSB investigators that he had ample locally stored spill response supplies available for the underflow dam objectives until additional resources arrived on scene.

The Marshall PLM supervisor told NTSB investigators that a considerable volume of oil existed in Talmadge Creek between the first underflow dam that Enbridge constructed and Division Drive. Enbridge crews began construction of a second underflow dam on the afternoon of July 27 on Talmadge Creek near its confluence with the Kalamazoo River in an effort to supplement oil booms in that area.

SEE ATTACHMENTS 4,5,7,8, 24 -33, AND 81

N. Environmental Monitoring

Air Quality

On July 26 at about 5:30 p.m., the EPA START contractor Weston Solutions, Inc. began conducting real-time air monitoring along the river and in residential areas bordering Talmadge Creek and the affected segment of the Kalamazoo River and Morrow Lake. Weston measured the highest concentrations of volatile organic compounds between 8:45 and 9:05 p.m. at the 15 ½ Mile Road and A Drive crossings over Talmadge Creek and at the 15 Mile Road bridge crossing over the Kalamazoo River, 1.25, 2.0, and 2.25 miles downstream of the release site respectively.

On July 27, Enbridge contracted the Center for Technology and Environmental Health, LLC (CTEH), a private company that specializes in air monitoring during industrial emergency responses. EPA tasked their contractor, Weston, to oversee and verify CTEH's activities as well as supplement their resources, if needed. At EPA's request, Michigan's 51st Civil Support Team was activated by the Governor to provide air monitoring and sampling assistance with portable analytical instruments. These organizations conducted hourly air monitoring rounds in residential areas. State and local health department scientists compared air monitoring results to health-based screening concentrations for each volatile organic compound and identified benzene as an air contaminant of concern. Initially, the Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk level (MRL)[33] for acute-duration inhalation exposure (less than 14 days) for benzene was used as an awareness level to trigger additional response actions and evacuation decisions by public health agencies (see Section O of this report for additional information about the evacuation). The public agencies developed decision trees based on benzene levels for the protection of workers and public, evacuation of homes, and reoccupation of homes as it became evident that the response would last greater than 14 days. The decision trees utilized all of the ATSDR MRL's established for short, intermediate, and chronic duration exposures.

CTEH and Weston air monitoring throughout work areas was used to assess worker safety through real time monitoring of benzene, carbon monoxide, and hydrogen sulfide concentrations. Air monitoring performed in work zones between July 27 and July 29 found levels of benzene and petroleum hydrocarbons sufficient enough to require respiratory protection for workers in these areas.

[33] ATDSR developed toxicological profiles for certain hazardous substances most commonly found at facilities. The minimal risk level (MRL) for benzene is 0.009 parts-per-million (ppm) for acute-duration inhalation exposure (≤ 14 days). A MRL for benzene of 0.006 ppm has been derived for intermediate-duration exposure (15-364 days). A MRL of 0.003 ppm has been derived for chronic-duration exposure (≥ 1 year). An MRL is defined as an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure.

Potable Water

On July 29 the Calhoun County Health Department and the Kalamazoo County Health and Community Services Department issued an advisory to those residents with private wells within 200-feet of the Kalamazoo River and Talmadge Creek to stop using well water for drinking and cooking. As a precaution, local health departments directed Enbridge to establish a program to provide bottled water to those affected residents.

On September 23, 2010, EPA issued a supplemental order that required (in part) that Enbridge perform drinking water sampling of all private and public drinking water wells located within 200 feet of all impacted waterway, and that Enbridge evaluate potential impacts to groundwater.[34] Enbridge implemented a comprehensive water well testing program that investigated drinking water quality in the affected zone of the Kalamazoo River, from the confluence of Talmadge Creek downstream to Morrow Lake. The program remained in effect as of January 1, 2012.

In response to the requirement to evaluate groundwater impacts, Enbridge installed monitoring wells at key locations along the river to evaluate hydrogeological conditions. On October 31, 2010, Enbridge submitted its hydrogeological evaluation report to local health departments. After review of the report and drinking water sampling results collected to date, the local health departments lifted the drinking water advisory and discontinued the bottled water program.

Surface Water and Sediment

EPA's removal administrative order[35] required Enbridge to perform surface water and sediment sampling of impacted areas by July 27, 2010 and continuously thereafter until notified by EPA. An off-site analytical laboratory collected and analyzed water samples for the presence of volatile organic compounds, semi-volatile organic compounds, and gasoline range organics, including those compounds typically found in crude oil. The test results revealed that waters from Talmadge Creek and the Kalamazoo River, from the confluence point of Talmadge Creek to Morrow Lake, were contaminated to varying degrees with petroleum-related hydrocarbons. As of the date of this report, MDEQ continues to evaluate water quality in the affected river system.

Test results were compared to EPA water quality criteria[36] and Michigan water quality standards.[37] On August 1, and August 3 respectively, the Kalamazoo and Calhoun county health departments issued bans on the use of these surface waters for irrigation and

[34] On September 23, 2010, EPA issued the supplemental order under Section 311(c) of the Clean Water Act, Docket No. CWA 1321-5-10-001.
[35] On July 27, 2010, EPA issued Enbridge a removal administrative order under Section 311(c) of the Clean Water Act, Docket No. CWA 1321-5-10-001.
[36] EPA's compilation of national recommended water quality criteria include data for approximately 150 priority pollutants that are published pursuant to Section 304(a) of the Clean Water Act.
[37] Michigan Department of Environmental Quality water quality standards are found in Part 31 of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

watering of livestock. Calhoun County's ban also applied to water contact recreation. The Michigan Department of Community Health also advised persons not to consume fish from Talmadge Creek or the Kalamazoo River to the west end of Morrow Lake. The Kalamazoo County Health and Community Services partially lifted the water use ban on September 3 in response to improved water sampling test results for the portion of the Kalamazoo River between Morrow Dam and Merrill Park. As of April 29, 2011, the Calhoun County Public Health Department announced that impacted areas of Talmadge Creek and the Kalamazoo River in Calhoun County continue to remain closed to all recreational activities, including boating, swimming, fishing and agricultural use of surface waters.

Beginning on July 27, at EPA's direction, Enbridge began collecting sediment samples to determine the impact the spill had on the river system. EPA tasked its START contractor to oversee and verify these efforts. Enbridge periodically collected sediment samples along the affected waterways, as well as upstream and downstream of the spill zone. EPA also mobilized the sampling vessel *Mud Puppy II* to assist in sampling sediments from Morrow Lake. In August, 2010, field personnel began reporting the presence of submerged oil. On August 23, EPA created a Submerged Oil Task Force comprised of members from EPA, DNRE, and Enbridge. The task force was tasked with evaluating and recommending clean up tactics for the submerged oil. The results of the investigation indicated that there were several areas within the river system where submerged oil was likely to collect. In September, 2010, Enbridge began removal of submerged oil by dredging one of the identified areas upstream of Ceresco Dam and excavating several other areas. Environmentally sensitive areas, primarily Mill Pond and Morrow Lake Delta, and areas with lesser contamination were subjected to aeration techniques to remove the submerged oil. Submerged oil removal continued throughout the fall and winter of 2010 – 2011.

In the spring of 2011, EPA directed Enbridge to reassess the state of submerged oil in the river system. This reassessment revealed that submerged oil primarily collected in three impoundment areas of the Kalamazoo River at Morrow Lake, Mill Pond, and Ceresco Dam. This assessment found moderate to heavy oil contamination covering over 200 acres of river bottom. In addition, over 300 small solidified oil deposits were identified in overbank locations along the river channel. In August, 2011, EPA directed, Enbridge to implement a plan to remove the remaining submerged oil utilizing aeration and excavation techniques. As of the date of this report, EPA continues to direct and monitor submerged oil cleanup efforts at this site.

Shoreline Surveys

The Kalamazoo River was divided into 0.25 mile segments from the confluence of Talmadge Creek, west to Morrow Lake Dam. Each segment was subjected to a five-step joint review and approval process by Shoreline Cleanup Assessment Techniques (SCAT) teams comprised of EPA, DNRE, and Enbridge officials. The shoreline assessment process involved characterizing the river bank oiling conditions and providing clean up

recommendations, followed by verifying compliance with the recommendations through post-cleanup surveys.

As of October 6, 2011, the results of these surveys found that oil remained in Talmadge Creek and in the Kalamazoo River and associated river banks. While much of the cleanup effort has demobilized, EPA has issued a directive to Enbridge to modify its work plans to address assessment and recovery of overbank and submerged oil impacted sediments through the summer of 2012.

SEE ATTACHMENTS 16, 17, 22, 23, 34-38, AND 80

O. Evacuations

On July 26, the residents of six homes self-evacuated because of odors associated with the oil spill. The local health departments developed an evacuation decision tree in which the local health officer would advise immediate evacuation if the concentration of benzene exceeded 200 parts-per-billion (ppb); at concentrations between 60 and 200 ppb additional monitoring would be conducted over a 24-hour period; and if concentrations remained above 60 ppb the health officer would advise evacuation. On July 29, the START contractor Weston Solutions, Inc. produced a map outlining the recommended evacuation area. The recommended evacuation area extended from the spill area, north and northwest to the Kalamazoo River beyond the 15 Mile Road bridge crossing. The Calhoun County Public Health Department issued a voluntary evacuation notice to approximately 50 homes in this area. The Michigan Department of Community Health and the county health department hand delivered evacuation notices to these residents.

On August 12, the recommended evacuation of homes near the oil spill site was lifted after benzene concentrations in the ambient air were identified to be below established action levels. Enbridge reported that as of August 26, it was providing hotel accommodations for approximately 62 individuals displaced by the oil spill.

SEE ATTACHMENTS 9, 16, 22, 39

P. Environmental and Economic Impact

Natural Resources and Wildlife

During its initial response to the accident, the U.S. Fish and Wildlife Service (FWS) responded to calls and picked up wildlife until the Enbridge assets were mobilized. With the cooperation of FWS and DNRE, Enbridge established a Wildlife Response Center in Marshall to accept and treat impacted wildlife. The Wildlife Response Center cared for and released about 3,970 animals, including about 3,650 reptiles and 196 birds.

The National Oceanic and Atmospheric Administration is coordinating with federal and state co-trustees[38] and Enbridge, as the responsible party, to collect data on the oil-impacted natural resources in order to conduct a natural resources damage assessment as required by the Oil Pollution Act of 1990.[39] The trustees and Enbridge representatives are currently conducting studies to assess the extent of the spill impact to marine life and recreation. The trustees may identify restoration projects that Enbridge will be responsible for implementing if the preliminary assessment identifies damaged resources that have not been fully addressed by the spill removal action.

Emergency Response Costs

Enbridge's estimated costs for emergency response equipment, resources, personnel, professional and regulatory support in connection with the cleanup of oil discharged from pipeline 6B is estimated to be approximately $725 million as of October 31, 2011. The estimated federal costs, including contractors employed by the government, are an additional $37 million.

SEE ATTACHMENTS 10, 40-42

Q. Oil Spill Response Plans

National and Regional Contingency Plans

Regional contingency plans are designed to be implemented in conjunction with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) in order to address the timely removal of a worst-case discharge of oil or release of hazardous substance, and to mitigate or prevent a substantial threat of such a discharge from a pipeline or a facility. Section 300.41 of the NCP states that regional contingency plans shall be prepared for each Federal region. The Region 5 Oil and Hazardous Materials Integrated Contingency Plan provides a mechanism for coordinating responses to releases of oil or hazardous materials within the States of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, and Federally recognized Tribal lands. The objective of the integrated contingency plan is to describe response protocols and assist in providing a coordinated capability in the event of a release that poses a threat to human health or the environment.

[38] Trustees include the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service, the Bureau of Indian Affairs, Michigan Department of Natural Resources, Michigan Department of Environmental Quality, Michigan Department of the Attorney General, Notawaseppi Huron Band of the Potawatomi, and Match-E-Be-Nash-She-Wish Band of Potawatomi.

[39] After an oil spill removal action has been completed by the EPA and other response agencies, a natural resource damage assessment is conducted by NOAA and co-trustees to identify the extent of resources injuries that may not have been fully restored by the cleanup action. The assessment also identifies the best methods for restoring those resources and the type and amount of restoration required. If a preliminary assessment identifies resources that have been injured, trustees quantify the injuries and identify possible restoration projects that must be implemented by the responsible party. Such projects may include replanting wetlands, restoring fisheries, or improving fishing access sites.

According to the NCP, initial actions taken by the Federal on-scene coordinator include determining whether proper response actions have been initiated. If the responsible party for the release does not take appropriate action, the local response community or state agencies may play a more authoritarian role in directing the response. If Federal assistance is requested or required, the Federal on-scene coordinator shall direct oil spill response actions as outlined in the NCP and integrated contingency plan.

The integrated contingency plan describes the incident command system structure and the roles and responsibilities of Federal, Tribal, state and local government agencies that participate in response activities. It also includes a description of recommended spill response methods applicable to various inland environments and includes indices such as identification of environmentally and economically sensitive areas.

Facility Response Plan

Title 49 of the Code of Federal Regulations, Section 194, Subpart B, *Response Plans*, provides that each operator of an onshore pipeline for which a response plan is required under Part 194.101 may not handle, store, or transport oil in that pipeline unless the operator has submitted a response plan meeting the requirements of this part. Pipeline operators must review, update, and resubmit facility response plans every five years to PHMSA for approval. The regulation also requires operators to determine the worst case discharge for each of its response zones as provided by 49 CFR 194.105. Each response plan must include procedures and a list of resources for responding, to the maximum extent practicable,[40] to a worst case discharge and to a substantial threat of such a discharge.

The plan must also be consistent with the National Contingency Plan and Area Contingency Plan. The plan must address removal of a worst case discharge, identify environmentally and economically sensitive areas, and describe the responsibilities of the operator, Federal, State, and local agencies in removing such a discharge.

Among planning requirements of Part 194 is the following regulation:

> ***§ 194.115 Response resources.***
> *(a) Each operator shall identify and ensure, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge. (b) An operator shall identify in the response plan the response resources which are available to respond within the time specified, after discovery of a worst case discharge, or to mitigate the substantial threat of such a discharge, as follows:*

[40] Maximum extent practicable is defined in 49 CFR 194.5 as the limits of available technology and the practical and technical limits on a pipeline operator in planning the response resources required to provide on-water recovery capability and shoreline protection and cleanup capability to conduct response activities for a worst case discharge from a pipeline in adverse weather.

	Tier 1	*Tier 2*	*Tier 3*
High volume area	*6 hrs*	*30 hrs*	*54 hrs*
All other areas	*12 hrs*	*36 hrs*	*60 hrs*

The regulation does not provide guidance for determining the amount of response resources that should arrive at the scene of a discharge within the Tier 1, 2 and 3 time frames.[41] Enbridge has developed its own interpretation of the three tier requirement, although this information is not contained in the Enbridge Chicago Region Emergency Response Plan. The Enbridge senior compliance specialist told NTSB investigators that Tier 1 refers to resources that provide initial containment and recovery efforts, such as Enbridge equipment and personnel that are available from the nearest pipeline maintenance facilities to the incident scene. He said that Tier 2 resources would include Enbridge's internal emergency response resources from throughout its Chicago region as well as those local contractors that are listed in the Enbridge emergency response directory, and Tier 3 would be the oil spill response organizations that are identified in the facility response plan. Nonetheless, the Enbridge North Dakota Region supervisor of measurement, audit and compliance told NTSB investigators that he believed the regulation is vague and lacking in guidance as to what level of response is required at each of the three tiers.

On February 23, 2005, PHMSA issued a final rule establishing oil spill response planning requirements for onshore oil pipelines under 49 CFR Part 194.[42] The final rule purported to harmonize certain PHMSA requirements with related oil spill response regulations developed by the Coast Guard. With respect to the response resources requirements of Part 194.115, PHMSA received several comments expressing concern that the regulations do not identify the level of capability that PHMSA would consider sufficient within the three tiers, and as a result operators may not be clear on what is required of them. Commenters suggested that PHMSA adopt the tiered concept and specify the amount of response equipment required under each tier from the US Coast Guard and EPA response planning regulations.[43] In its final rule notice PHMSA responded that it does not believe it is necessary to specify the amount of response resources instead of allowing operators to determine and demonstrate sufficient response resources are provided for in their facility response plans. Based upon this belief, PHMSA did not amend the response resources requirement to include prescriptive response planning criteria.

Enbridge has determined that pipeline facilities within its Chicago response zone meet the significant and substantial harm criteria outlined in 49 CFR 194.103. Enbridge has therefore developed a Chicago Region Specific Emergency Response Plan (#867), most recently revised on April 10, 2010. The Chicago response zone includes eleven pipelines

[41] Tiering is the concept of having a certain amount of personnel and response equipment onscene within a specified period of time. Each increment of time, with its associated level of resources, is called a tier.
[42] *Federal Register*, vol. 70, no. 35 (February 23, 2005) p. 8734, Final Rule Pipeline Safety: Response Plans for Onshore Transportation-Related Oil Pipelines.
[43] The US Coast Guard's rule for marine transportation-related facility response plans is found in 33 CFR Part 154, Subpart F and Appendix C, and EPA has adopted similar planning concepts for non-transportation related facility response planning under 40 CFR Part 112, Appendix E.

and three terminal lines that transport crude oil, diluent, and natural gas liquids. This plan covers 2,108 miles of pipeline with pipe diameters from 12 to 42 inches. The plan specifies that the worst-case discharge for pipeline 6B is 26,456 barrels.

The plan states that the company owns and maintains emergency response equipment throughout its Chicago region pipeline system at thirteen office locations and strategic locations, including the Marshall, Michigan pipeline maintenance facility. The plan indicates that the Marshall PLM inventory of response equipment includes 1,100 feet of river containment boom, 200 feet of small containment boom, 200 feet of sorbent boom, 1,000 sorbent pads, two bundles of sorbent sweeps, three skimmers, 18 pumps, one storage tank, three boats, and two response trailers with additional equipment and supplies that are intended for immediate response to a pipeline release until additional resources can arrive (See Figure 5). Each PLM station also has a single 40 to 60 barrel capacity vacuum truck. The nearest response trailer, boat, and vacuum truck available for use at the accident scene was stored at the Marshall PLM located just under 1 mile by road from the pipeline rupture site.

Figure 5: Enbridge PLM emergency response trailer, October 17, 2010.

According to the plan, Enbridge employs 112 HAZWOPER-trained[44] pipeliners and technicians that are available for emergency response to pipeline releases in the company's Chicago region response zone. The plan states that Enbridge has working agreements with Bay West and Garner Environmental Services, Inc. to supplement Enbridge's resources in the event of a worst case discharge scenario. Bay West is an established Coast Guard oil spill response organization that provides 24-hours emergency spill response from Minneapolis, Minnesota. Garner Environmental Services is an established oil spill response organization that is based near Houston, Texas that

[44] HAZWOPER is the OSHA Hazardous Waste Operations and Emergency Response standard contained in 29 CFR 1910.120. Depending on their job classification, employees receive training in first responder awareness, first responder operations, hazardous materials technicians, hazardous materials specialists, incident commander, and support staff.

advertises numerous locations and away teams which are capable of providing timely response upon notification. Enbridge maintains lists of other local contractors that may be utilized for emergencies in each Enbridge response zone.

According to the Enbridge North Dakota Region supervisor of measurement, audit and compliance, both Bay West and Garner have acknowledged that because of being located distant from much of the region covered by the facility response plan, if contacted to respond to an emergency the companies would have to subcontract to local contractors until their arrival. Garner and Bay West suggested that Enbridge could themselves utilize local contractors in those areas until they are able to respond.

The facility response plan refers to control point maps that Enbridge has developed for use as a tool during spill response activities. The maps provide emergency responders with a reference to accessible locations for containment boom deployment locations. The facility response plan states that aerial and ground confirmation of the control points is performed as a means to field truth the data. The plan states that annual control point reviews are conducted and updates are incorporated into the control maps by qualified emergency response personnel.

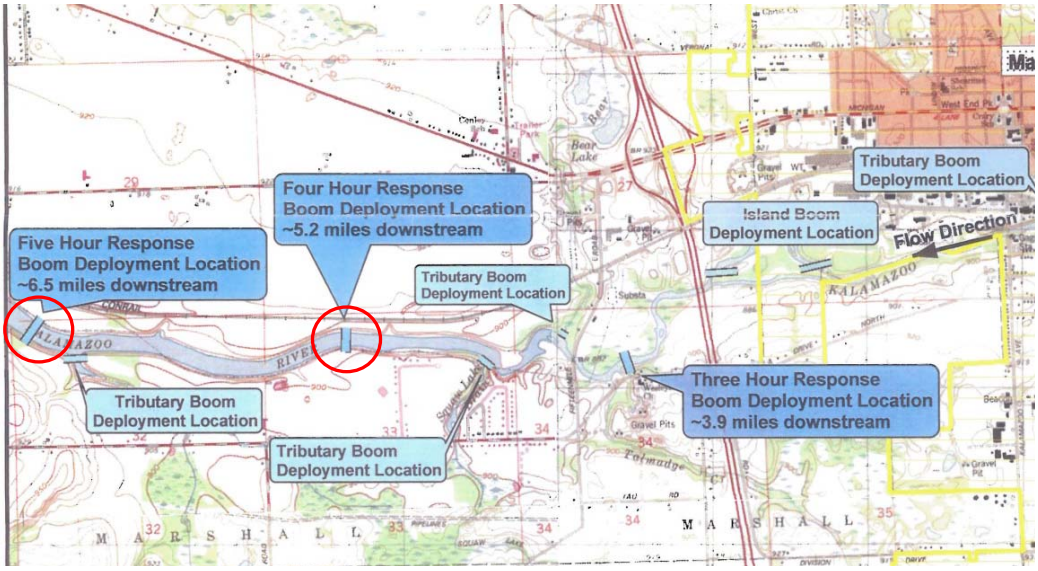

Figure 6: Excerpt of Enbridge Control Point Map 610.89 indicating boom deployment sites that were inaccessible to emergency responders during the first day of the response (circled in red).

The Enbridge control point map for the segment of pipeline nearest to the point of release is Control Point Map MP 610.89. The map identifies booming locations and associated response times based on normal river flow rates downstream of the Line 6B river crossing east of Marshall Michigan. While the control point map provides oil boom deployment locations on the Kalamazoo River downstream of its confluence with Talmadge Creek, the two mapped locations nearest to Talmadge Creek were not

accessible to responders due to weather conditions on the day of the accident and no boom was deployed at those locations (See Figure 6).

Facility Response Plan Review and Approval

PHMSA has responsibility for reviewing and approving the Enbridge facility response plan. After the accident, PHMSA provided the facility response plan to EPA and other federal and state agencies. EPA consulted the plan during the initial phase of the response to this accident in order to gain an understanding of Enbridge's response resources and planning. EPA noted that the plan did not have information specific to spill response at any particular location. PHMSA has not performed a post-accident review of the facility response plan, but has told NTSB investigators that the agency will include a review of lessons learned in its review of the next Enbridge facility response plan renewal that is due in 2015 or when Enbridge next amends the facility response plan.

The plan review process is supposed to emphasize the adequacy of the pipeline operator's response resources, incident command system, and ability to protect environmentally sensitive areas. When questioned about protocols used to evaluate the adequacy of facility response plans, the PHMSA environmental planning officer told NTSB investigators that these plans are assessed based on her professional experience and judgment.

PHMSA has also required plan holders to submit a 16 element self-assessment questionnaire along with their facility response plan submissions. On April 1, 2010, Enbridge submitted its self assessment questionnaire that affirmed the adequacy of the following elements:

- Whether the facility response plan identifies enough spill containment equipment and recovery capacity to respond to a worst-case discharge to the maximum extent practicable;
- If the facility response plan identifies spill recovery strategies appropriate for the response zones;
- If planned spill recovery activities can be accomplished within the appropriate tier times;
- Whether the plan identifies enough trained personnel to respond to a worst-case discharge.

On April 15, 2010, the PHMSA environmental planning officer notified Enbridge that its facility response plan was approved.

Since this accident PHMSA funded the Volpe Center to identify the processes used by four Federal agencies that are responsible for reviewing facility plans that are required

under the Oil Pollution Act of 1990.[45] According to the draft report, PHMSA has a present staff of 1.5 federal employees overseeing approximately 450 facility response plans. Until June of 2010, the PHMSA environmental planning officer reviewed and approved facility response plans. Currently, authority to review and approve facility response plans was delegated to the division director level. PHMSA reports that since Volpe gathered data for their report, another full time employee has been assigned to oversight of spill response plans. In contrast, the Volpe Center report states that EPA Region 6 has for review of 1,700 facility response plans two (2) federal employees, three (3) contractors, and 22 on-scene coordinators who can be delegated to authorize plans as collateral duty. The Coast Guard Sector Boston oversees 45 facilities with a staff of four (4) inspectors and 3 to 4 trainees.

The draft Volpe Center report states that PHMSA does not perform on-site audits or unannounced drills for operators who submit facility response plans for approval.[46] Both the Coast Guard and the EPA conduct on-site audits and plan reviews after initial review and approval of the submitted plan. In addition, both the Coast Guard and the EPA conduct announced and unannounced exercises to test the effectiveness of plans. While the Coast Guard and the EPA report to their headquarters offices on the number of plans, non-compliances, and inspections conducted, PHMSA has not currently implemented performance metrics for its facility response plan program.

The director of emergency support and security reported that in its 2012 budget request, PHMSA requested eight additional personnel and over $1 million to enhance its field oil-related activities. However, those resources were not approved in the final budget. He reported that PHMSA is developing plans to increase oil-related activities in its Field Program.

PHMSA Facility Response Plan Advisory Bulletin

On June 23, 2010, PHMSA issued advisory bulletin PHMSA-2010-0175 notifying pipeline facility response plan holders in light of the Deepwater Horizon oil spill in the Gulf of Mexico to review and update their plans within 30 days to ensure that adequate resources are available to comply with emergency response requirements to address a worst case discharge. The bulletin noted that the response to the Deepwater Horizon spill had resulted in the relocation of oil spill response resources to address the oil spill. Nonetheless, PHMSA required affected operators to secure alternate resources and update their response plans accordingly. The Enbridge senior emergency response engineer responded to the advisory bulletin on July 21, 2010 stating that Enbridge has conducted an assessment of its emergency preparedness in relation to a worst case discharge for each of its response zones. He wrote that both identified oil spill response

[45] The four Federal agencies that review and approve oil spill response plans are PHMSA, the Bureau of Safety and Environmental Enforcement (BSEE), the U.S. Coast Guard, and the EPA. The assignment of specific responsibilities among agencies was achieved through Executive Order 12777.

[46] The Volpe report failed to mention that PHMSA inspectors ask several high-level questions about facility response plans during their on-site inspections of pipeline operators.

organizations, Bay West and Garner Environmental Services have confirmed their ability to deploy appropriate spill response resources in the response zones. He further stated:

> "*In relation to the Advisory Bulletin, we have reassessed our facility response and concluded that our plan is complete, complies with 49 CFR Part 194, and is appropriate for responding to a worst case discharge in our Chicago Region Response Zone*."

SEE ATTACHMENTS 14, 26, 43 - 50

R. Response Preparedness

The National Preparedness for Response Exercise Program (PREP) was developed to establish a spill response exercise program that meets the intent of Section 4202(a) of the Oil Pollution Action of 1990. PREP became effective on January 1, 1994 and is a unified federal effort that satisfies the exercise requirements of the Coast Guard, EPA, PHMSA Office of Pipeline Safety, and the Minerals Management Service.[47] The PREP Guidelines[48] were developed to provide minimum requirements for ensuring adequate response preparedness and to provide an opportunity for response plan holders to continually identify deficiencies and improve their response plans.

PHMSA's regulations state that an operator will satisfy the requirement for a drill program by following PREP Guidelines.[49] PREP requirements for onshore transportation-related pipelines require facility response plan holders to participate in both internal (facility specific) and external (area specific) exercises. Internal exercises are conducted within the plan holder's organization and are self-evaluated and self certified. Internal exercises include quarterly qualified individual notifications, annual spill management team tabletop exercises that involve a verbal walkthrough of incident response scenarios, and annual equipment deployment exercises that focus on specific response functions.

Section 5 of the PREP Guidelines provides for unannounced government-initiated exercises to test plan holder's ability to respond to a worst-case discharge event. These full-scale exercises are used to evaluate a plan holder's operational capability and involve all levels of the organization and all aspects of a response operation. Plan holders are not required to participate in unannounced exercises if they have already participated in one over the previous 36 months. Although PHMSA has not been conducting unannounced government-initiated exercises recently, it has committed to conducting not more than 20 per year on the regulated pipeline industry.

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[47] The Minerals Management Service has been succeeded by the Bureau of Safety, and Environmental Enforcement.

[48] *National Preparedness for Response Guidelines* (U.S. Coast Guard, Research and Special Programs Administration, Environmental Protection Agency, and Minerals Management Service, Joint Publication, August, 2002.)

[49] Facility response plan requirements are found in 49 CFR 194.107.

The PREP guidelines identify 16 facility response plan core components that should be exercised at least once during each triennial cycle. These core components relate to such areas as notifications, mobilization of resources, response management, and the ability to contain and recover a discharge. According to the PREP Guidelines, PHMSA is responsible for verifying internal exercises and for conducting and certifying external exercises conducted by the operator and other Federal agencies.

During the 10-year period 2002 to 2011, the PHMSA Office of Pipeline Safety has participated in 26 drills and exercises. Of these exercises, Enbridge participated on September 24, 2003 in an area exercise led by the Coast Guard and the Office of Pipeline Safety in Sault Ste. Marie, Michigan, and on March 10-11, 2004 in an area exercise in Cushing, Oklahoma led by the FBI, the Office of Pipeline Safety, and more than 20 Federal, state, and local government agencies. The PHMSA environmental planning officer stated that Enbridge completed both exercises successfully.

Key Enbridge personnel who participated as initial responders to this accident reported that they had received the following oil spill response training:

- The Marshall PLM supervisor said that he has participated in three to five oil spill drills each year and has had three internal training experiences in boat handling and oil boom deployment on rivers and creeks. He has responded to numerous small and large oil spills both in his capacity as a firefighter and as Enbridge maintenance supervisor, and feels confident about his skills and abilities in oil spill response.
- The Bay City PLM supervisor said that he receives a yearly HAZWOPER refresher class and conducts a table top exercise. This training includes a review of the Enbridge emergency response directory which identifies response resources. He reported that boat handling and oil boom deployment training that Enbridge provided during the past year proved useful to crews that responded to this incident with newer and larger boats.
- The Marshall PLM crossing coordinator reported that although this was his first actual incident experience involving the use of oil boom, Enbridge does provide him with annual oil boom deployment training that he found very useful.

SEE ATTACHMENTS 27, 28, 29, 45, AND 51

S. Pipeline Public Awareness Programs

Regulatory Information

Title 49 Code of Federal Regulations (CFR) Part 195.440 requires pipeline operators to develop and implement a written continuing public education program. Pipeline operators have been required to have written programs as of June 20, 2006. The regulation states that the program must provide awareness information to the public, appropriate government organizations, and excavators. The awareness information must include information about:

- Possible hazards associated with releases
- Use of a one-call notification system
- Physical indications that a release has occurred
- Steps that should be taken in the event of a release
- Procedures for reporting such an event

Public awareness programs must follow the guidance in the American Petroleum Institute's (API) Recommended Practice 1162 (RP 1162) Public Awareness Programs for Pipeline Operators. RP 1162 was incorporated by reference into the pipeline regulations.

API Recommended Practice 1162

RP 1162 establishes guidelines for pipeline operators to develop, manage, and evaluate public awareness programs. RP 1162 states:

- Public awareness and understanding of pipeline operations is vital to the continued safe operation of pipelines.
- Public Awareness Programs should address the needs of different audiences within the community.
- Public awareness messages need to provide a broad overview of how pipelines operate, the hazards that may result from activity in close proximity to pipelines and those hazards possible due to pipeline operations, and the measures taken to prevent impact to public safety, property or the environment.

RP 1162 contains guidance for the development and administration of public awareness programs. RP 1162 identifies audiences that should receive awareness messages, the content of baseline awareness messages, and the frequency of the messages for each audience. Audiences defined in the standard include the affected public, emergency officials, and local public officials. Subsets of the affected public category may include residences, businesses, and farms. The standard also provides guidance for the review and evaluation of awareness programs.

For all audiences, the baseline awareness messages include: pipeline purpose and reliability, the awareness of hazards and prevention measures taken, and how to get additional information. Table 2 summarizes the baseline awareness messages and frequency of the messages.

Audience	Message	Frequency	Method
Affected public	Damage prevention awareness Leak recognition and response Pipeline location information	Baseline: Once every 2 years	Targeted distribution of print materials Pipeline markers
Emergency officials	Emergency preparedness communications Pipeline location information	Baseline: annual	Personal contact, or Targeted distribution of print materials, or Group meetings
Public Officials	Emergency preparedness communications Pipeline location information	Baseline: Once every 3 years	Targeted distribution of print materials

Table 2: RP 1162 baseline messages for transmission pipeline operators.

RP 1162 establishes the requirements for the evaluation of public awareness plans. RP 1162 states that the evaluation should include two areas: the process and program effectiveness. RP 1162 establishes recordkeeping requirements. It states that operators should maintain key program records to including all program evaluations.

RP 1162 states that operators should evaluate the process annually. This evaluation should determine if the program has been implemented and documented according to the public awareness plan. RP 1162 states that operators should evaluate program effectiveness "no more than four years apart." This evaluation should determine if the awareness messages are reaching the audiences and if the audiences understand the messages. RP 1162 states that operators should use one of three methods for annual program evaluations: internal self-assessments, third-party audits, or regulator inspections.

Enbridge Public Awareness Program Plan

Enbridge's public awareness plan was completed in June 2006 and revised in 2010. The program plan states:

> *Inform affected public, emergency officials and public officials how to recognize a pipeline incident and how to respond in a way that protects people and property. This will promote a quick and coordinated response to an incident by Enbridge and emergency officials. Increase awareness of emergency plan (and enhance liaison) with emergency officials.*

According to the program plan, the executive oversight of the public awareness program is a shared responsibility between the Vice President of Operations, the Vice President, Southern U.S. Engineering & Project Execution, and the Director of Public & Government Affairs. The Director of Public & Government Affairs is responsible for appointing a Public Awareness Manager. The Public Awareness Manager is responsible for the overall administration and for facilitating the supplemental program activities with Region/Area Operations Management.

The public awareness program plan describes the baseline messages and frequency of the messages for the transmission system. Table 3 summarizes the minimum frequency and method for baseline public awareness messages for the affected public, emergency officials, and local public officials.

Audience	Frequency	Messages	Method
Affected public	Every 2 years	Pipeline purpose and reliability Awareness of hazards and prevention measures undertaken Damage prevention awareness One-call requirements Leak recognition and response Pipeline location information How to get additional information Availability of pipeline maps through the National Pipeline Mapping System	Direct mail
Emergency officials	Annual	Pipeline purpose and reliability Awareness of hazards and prevention measures undertaken Emergency preparedness communications Potential hazards Pipeline location information Availability of the National Pipeline Mapping System How to get additional information	Direct mail
Public Officials	Every 3 years	Pipeline purpose and reliability Awareness of hazards and prevention measures undertaken Emergency preparedness communications One-call requirements Pipeline location information Availability of the National Pipeline Mapping System How to get additional information.	Direct mail

Table 3: Enbridge's baseline public awareness program as described in the program plan.

According to program plan, supplemental public awareness activities may be conducted on systems or segments of systems based on factors such as potential hazards,

environmental considerations, population density, and the product carried in the pipeline. The public awareness manager and region/area operations managers are responsible for coordinating supplemental public awareness activities. A field guidance document dated March 2009 outlines the supplemental program and provides guidance for operations personnel involved in conducting these activities.

According to Enbridge's program plan, there are two types of program reviews: informal and formal. The plan states that the program awareness manager will review the program annually "to informally assess the effectiveness of public awareness efforts and verify that the appropriate activities have been implemented." The review may include the number of incidents and contacts with emergency responders. This annual review is documented using Enbridge form 11.1.

The plan states the formal review consists of the PAPERS program. The PAPERS program is an industry-wide survey conducted to assess the effectiveness of public awareness programs. The PAPERS review is sponsored by the American Petroleum Institute, Association of Oil Pipelines, and the Interstate Natural Gas Association of America. The program is conducted every two years, and the most recent program conducted prior to the accident date was in 2009.

Enbridge Public Awareness Program Activities

The following section describes Enbridge's recent public awareness program activities for the affected public, emergency officials, and public officials. These sections were compiled from public awareness program documents and mailing lists provided by Enbridge. According to a written communication from Enbridge, direct mail brochures are mailed to these audiences annually. Prior to the date of the accident, the most recent direct mail contacts with these audiences were in May 2010. The complete mailing list for all audiences was searched for Calhoun County and Marshall addresses. For Calhoun County, there were 2304 mailing addresses listed. For Marshall, there were 509 mailing addresses listed.

The affected public is defined in part as residences and business located adjacent of the pipeline centerline. According to the program plan, the baseline plan for the affected public is a direct mail program. For the year 2010, Enbridge's public awareness mailing records for the affected public were filtered for Marshall mailing addresses. For this mailing, there were 35 records for general businesses, 44 records for residences, and 200 records for farmers.

The emergency official audience is defined in part as fire departments, law enforcement agencies, and 911 dispatch centers. According to the program plan, the baseline plan for the affected emergency officials is a direct mail program. For the May 2010 mailing, Enbridge's public awareness mailing records for emergency official were filtered for Marshall mailing addresses. For this mailing, there were 5 records for this audience. These 5 records were for Fredonia Fire Department, Marshall (City) Fire Department,

Marshall Township Fire Department, Calhoun County Sheriff's Office, and the Marshall Public Safety Answering Point.

Enbridge, Paradigm Liaison Services, and other pipeline companies operating in Michigan coordinate the Safety Awareness Training Program. This program provides in-person pipeline awareness training for emergency officials and the 2010 Michigan Pipeline Emergency Response Planning Information written manual. On February 28, 2010, this program was held in Jackson, Michigan. Representatives from Enbridge, Paradigm Liaison Services, and six additional pipeline companies participated in the program. Topics in this program and the manual include product hazards and characteristics; and leak recognition and response. According to an attendance list provided by Enbridge, there was one attendee from Marshall Fire Department and two attendees from Marshall Township Fire Department. Organizations who do not attend the in-person program are mailed the 2010 Michigan Pipeline Emergency Response Planning Information written manual.

For the May 2010 mailing, Enbridge's public awareness mailing records for local public officials were filtered for Marshall mailing addresses. For this mailing, there were 30 records for this audience. The brochure is the same brochure mailed to emergency officials. Attachment 75 lists the government departments that were included on Enbridge's 2010 mailing list for public officials in Calhoun County.

SEE ATTACHMENTS 64 - 75

T. Oil Spill Response Methods

Response methods that are considered to control the environmental consequences of oil spills depend on specific spill conditions, such as the type and amount of oil, weather and site conditions, and the effectiveness of the response strategies. Also critical to the effectiveness of an oil spill response is the time required to bring resources and personnel to the scene. A window of opportunity exists in each incident during which response actions are most viable or effective. Very early during the response when the oil is concentrated near the discharge source, focusing on source control and containment and removal near the source provides the best opportunity to reduce adverse environmental impact.[50]

Although flow data for Talmadge Creek was not available for the day of the accident, Enbridge first responders described the water flow as being faster than they had previously experienced. The Coast Guard reports that controlling and recovering oil spills in fast moving water above one knot is difficult to accomplish because oil entrains under booms and skimmers in swift current thus necessitating quicker and more efficient

[50] *Characteristics of Response Strategies: A Guide for Spill Response Planning in Marine Environments* (American Petroleum Institute, National Oceanic and Atmospheric Administration, US Coast Guard, and US Environmental Protection Agency Joint publication, June 2010.)

responses compared to stagnant water or slow moving current conditions.[51] In streams having a flow rate of greater than 10 cubic feet per second, the Coast Guard recommends the use of underflow dams, overflow dams, sorbent barriers, or a combination of these techniques in lieu of oil containment boom.

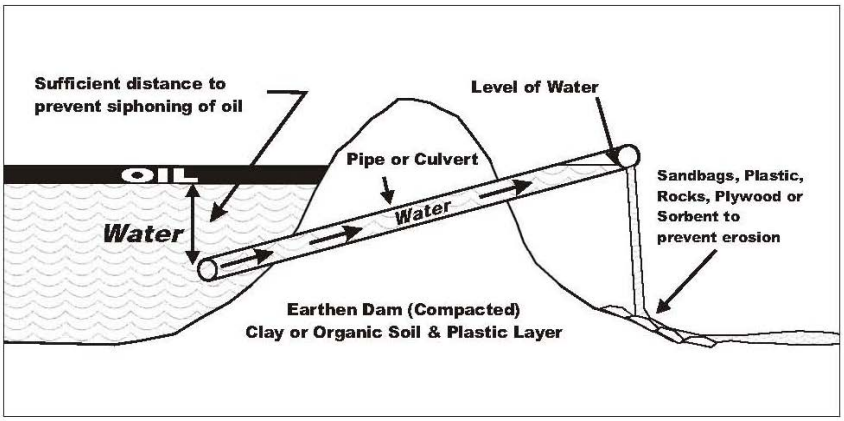

Figure 7: Earthen underflow dam schematic, excerpt from Enbridge OM&P Emergency Response Procedures.

Underflow dams can be erected in shallow rivers and culverts using hand tools or heavy machinery. Pipes are used to form an underflow dam to allow water to pass while retaining oil (See Figure 7). On the day the release was discovered, Enbridge first responders made use of surplus pipe and an excavator that was stationed at the Marshall PLM shop to construct an earthen and pipe underflow dam structure near the source area which was functioning by 9:00 p.m. (See Section M of this report).

Underflow dams can also be quickly installed at culverts by using sheets of plywood or other suitable barrier over the upper portion of the pipe and regulating the height to prevent floating oil from escaping downstream (See Figures 8 and 9).

[51] *Oil Spill Response in Fast Moving Currents, a Field Guide* (Groton, Connecticut: United States Coast Guard Research and Development Center, October 2001.)

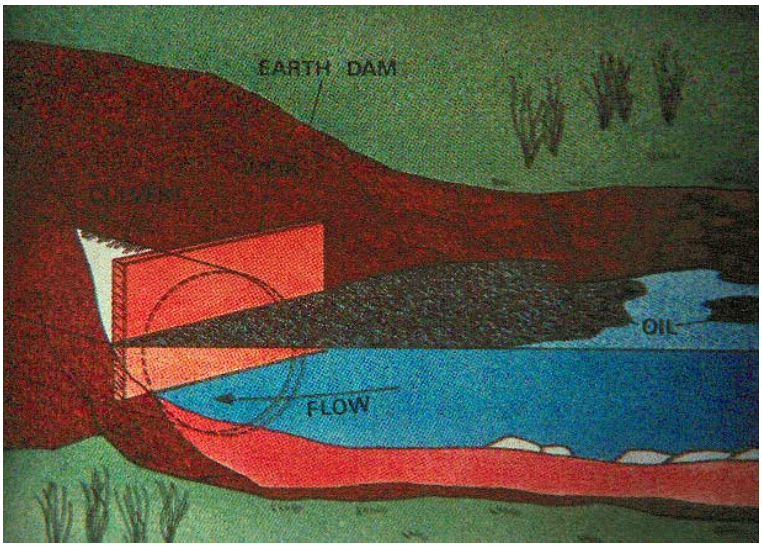

Figure 8: Schematic of an underflow dam installation at a culvert. Courtesy U.S. Coast Guard Research and Development Center.

Figure 9: EPA training exercise installing an underflow dam at a culvert, Platte River Whooping Crane Maintenance Trust, Wood River, NE, August 26-27, 2008. Courtesy EPA.

Pipe culverts were located on Talmadge Creek at seven locations upstream of the Kalamazoo River: midway between the source and Division Drive; at Division Drive; along an unnamed driveway downstream of Division Drive; at 16 Mile Road; at 15 ½ Mile Road; along an unnamed driveway upstream of A Drive; and at A Drive. However, this method of constructing underflow structures at culverts was not used in response to this accident, and is not described in the Enbridge facility response plan.

As discussed in Section M of this report, Enbridge responder's first actions between 12:30 and 2:00 p.m. on the day the release was discovered were to install 20-ft lengths of sorbent boom across the Talmadge Creek channel at three locations north and south of A Drive and at the culvert upstream of A Drive. They then placed a 40-foot length of skirted containment boom and additional sorbent boom at the 15 ½ Mile Road culvert from where oil was recovered using a vacuum truck and skimmer (See Figure 10).

A similar strategy was used at the corrugated pipe culvert under Division Drive where lengths of containment and sorbent boom were placed upstream of the culvert (See Figures 11 and 12). When asked to identify lessons learned from the response to this accident, the Bay City PLM supervisor told NTSB investigators that in the future he would ensure that sheets of plywood are included in Enbridge's boom trailers so that adjustable underflow dams can be constructed over culvert pipes; a strategy that he believes might have been used effectively at the Division Drive culvert pipe.

Figure 10: Boom Deployment at Talmadge Creek and 15 ½ Mile Drive, July 28, 2010. Enbridge Energy Photograph.

Figure 11: Installation of oil boom upstream of Division Drive culvert, August 3, 2010. State of Michigan Photograph.

Figure 12: Oil stain line on interior of Division Drive culvert pipe showing the previous elevation of flowing oil in Talmadge Creek. October 27, 2010.

The Region 5 Integrated Contingency Plan discusses response methods for small river and stream environments, in which the primary use of booming should be diversion of slicks towards collection points in low-current areas. The plan states that booming is ineffective in fast current, shallow water and steep bank environments.

The Region 5 contingency plan states that sorbent boom should be used to recover sheen in low current areas and along shore. Sorbent boom is most effective as a protective measure in very quiet stagnant waters. Although it is designed to absorb oil sheens from the surface of the water, sorbent boom is an ineffective barrier to flowing oil.[52] The Coast Guard Research and Development Center further describes the proper use of sorbent boom, stating that it is used for the recovery of trace amounts of oil and sheen in stagnant or slow moving water, or as a polishing technique to control escaping sheen from containment boom. The Coast Guard recommends that when containment boom is used in a fast moving current, the maximum deflection angle must be maintained to prevent oil entrainment with the goal of moving oil from fast moving waters in the center of the channel to calm water in a protected inlet along the bank.

The Enbridge operating and maintenance procedure for emergency response which is referenced in the facility response plan identifies methods for containing oil in wetlands, rivers, and in sensitive areas. The procedure states that when containing releases in rivers, an attempt must be made to confine the product as close to the release source as possible and prevent the product from entering a major river. The procedure states that releases can be contained using one or a number of the following techniques: containment booms; diversion booms; sorbent booms; earth dikes; and containment weirs. The procedure for containment of releases in rivers, states that sorbent booms may be used in calm waters when current speeds are less than 0.5 m/s and the degree of contamination is minor.

SEE ATTACHMENTS 27, 28, 29, 43, 44, 52

U. River Conditions

On July 26, at 12:45 p.m., the US Geological Service (USGS) reported the river level at 7.19-ft for the Kalamazoo River at Marshall, Michigan. The established flood state for this location is 8.0-ft. Within 24-hours the river level fell below the action stage of 6.0 ft.

The USGS gauging station on the Kalamazoo River in Marshall, Michigan reports the average current velocity in the Kalamazoo River is 1.44 miles-per-hour.

SEE ATTACHMENTS 53 – 55

[52] *Mechanical Protection Guidelines* (Research Planning, Inc., National Oceanic and Atmospheric Administration, U.S. Coast Guard National Strike Force, Joint publication, June 1994.)

Paul L. Stancil, CHMM
Emergency and Environmental Response Group Chairman

Dana Sanzo
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ATTACHMENTS

ATTACHMENT 1 – ENBRIDGE RESPONSE PLAN FOR DOWNSTREAM IMPACTED AREAS
ATTACHMENT 2 – ENBRIDGE PIPELINE SYSTEM DESCRIPTION, FRP EXCERPT
ATTACHMENT 3 – MATERIAL SAFETY DATA SHEET HEAVY CRUDE OIL DILUENT MIX
ATTACHMENT 4 – NATIONAL RESPONSE CENTER REPORT 948903
ATTACHMENT 5 – ENBRIDGE EMERGENCY RESPONSE TIMELINE
ATTACHMENT 6 – EPA RESPONSE TIMELINE
ATTACHMENT 7 – ENBRIDGE INCIDENT BRIEFING FORMS JULY 26 TO AUGUST 1, 2010
ATTACHMENT 8 – ENBRIDGE RESOURCE DEPLOYMENT LISTS JULY 27 TO JULY 31
ATTACHMENT 9 – EPA POLLUTION REPORTS NO. 1 THROUGH 5
ATTACHMENT 10 – EPA SITUATION REPORT NO. 124
ATTACHMENT 11 – ENBRIDGE SOURCE AREA RESPONSE PLAN
ATTACHMENT 12 – ENBRIDGE OIL RECOVERY AND CONTAINMENT PLAN
ATTACHMENT 13 – REGION 5 ACP/RCP FEDERAL OSC RESPONSIBILITIES
ATTACHMENT 14 – EPA RESPONSES TO NTSB QUESTIONS OCTOBER 29, 2010
ATTACHMENT 15 – INTERVIEW OF USCG DRAT SUPERVISOR
ATTACHMENT 16 – MICHIGAN DEPARTMENT OF COMMUNITY HEALTH SITUATION REPORT
ATTACHMENT 17 – MICHIGAN DEPARTMENT OF NATURAL RESOURCES SITUATION REPORT
ATTACHMENT 18 – MICHIGAN DNRE NOTICE TO ENBRIDGE SEPTEMBER 13, 2010
ATTACHMENT 19 – MICHIGAN DNRE ADMINISTRATIVE ORDER, NOVEMBER 1, 2010
ATTACHMENT 20 – INTERVIEW OF MICHIGAN DNRE CONSERVATION OFFICER
ATTACHMENT 21 – INTERVIEW OF MICHIGAN DNRE DISTRICT SUPERVISOR
ATTACHMENT 22 – CALHOUN COUNTY HEALTH DEPARTMENT AUGUST 18, 2010 UPDATE
ATTACHMENT 23 – KALAMAZOO COUNTY HEALTH DEPARTMENT AUGUST 10, 2010 UPDATE
ATTACHMENT 24 – INTERVIEW OF ENBRIDGE CHICAGO REGION GENERAL MANAGER
ATTACHMENT 25 – INTERVIEW OF ENBRIDGE CHICAGO REGION ENGINEERING SUPERVISOR
ATTACHMENT 26 – INTERVIEW OF ENBRIDGE MANAGER OF PIPELINE SERVICES
ATTACHMENT 27 – INTERVIEWS OF ENBRIDGE BAY CITY PLM SUPERVISOR
ATTACHMENT 28 – INTERVIEWS OF ENBRIDGE MARSHALL PLM SUPERVISOR
ATTACHMENT 29 – INTERVIEWS OF ENBRIDGE MARSHALL PLM CROSSING COORDINATOR
ATTACHMENT 30 – ENBRIDGE SUPPLEMENTAL RELEASE VOLUME CALCULATION
ATTACHMENT 31 – ENBRIDGE RESPONSE RESOURCE LIST
ATTACHMENT 32 – CONTRACTORS ONSITE JULY 26 THROUGH JULY 28, 2010
ATTACHMENT 33 – INCIDENT BRIEFING NOTES JULY 26 THROUGH JULY 28, 2010
ATTACHMENT 34 – EPA START CONTRACTOR AIR MONITORING RESULTS
ATTACHMENT 35 – ENBRIDGE AIR MONITORING RECORDS JULY 27 TO JULY 29, 2010
ATTACHMENT 36 – CALHOUN COUNTY HEALTH DEPARTMENT WATER ADVISORY
ATTACHMENT 37 – CALHOUN COUNTY HEALTH DEPARTMENT WATER BAN
ATTACHMENT 38 – EPA WORK PLAN MODIFICATION DIRECTIVE, OCTOBER 6, 2011
ATTACHMENT 39 – RECOMMENDED EVACUATION ZONE MAP
ATTACHMENT 40 – USFWS WILDLIFE RESCUE ACTIVITIES
ATTACHMENT 41 – NOAA NATURAL RESOURCES DAMAGE ASSESSMENT DESCRIPTION
ATTACHMENT 42 – ENBRIDGE ENVIRONMENTAL REMEDIATION COSTS
ATTACHMENT 43 – REGION 5 OIL AND HAZARDOUS SUBSTANCES INTEGRATED PLAN
ATTACHMENT 44 – EXCERPTS OF ENBRIDGE CHICAGO REGION EMERGENCY RESPONSE PLAN

ATTACHMENT 45 – INTERVIEW OF PHMSA ENVIRONMENTAL PLANNING OFFICER
ATTACHMENT 46 – PHMSA REVIEW OF ENBRIDGE FACILITY RESPONSE PLAN
ATTACHMENT 47 – PHMSA APPROVAL OF ENBRIDGE FACILITY RESPONSE PLAN
ATTACHMENT 48 – DRAFT VOLPE CENTER REPORT ON OPS BUSINESS PROCESS REVIEW
ATTACHMENT 49 – PHMSA ADVISORY ON UPDATING FACILITY RESPONSE PLANS
ATTACHMENT 50 – ENBRIDGE RESPONSE TO PHMSA ADVISORY BULLETIN
ATTACHMENT 51 – PHMSA PARTICIPATION IN PREP EXERCISES
ATTACHMENT 52 – EXCERPTS OF ENBRIDGE OMP EMERGENCY RESPONSE BOOK 7, RESPONSE METHODS FOR RIVERS
ATTACHMENT 53 – USGS RIVER STAGE DATA FOR KALAMAZOO RIVER AT MARSHALL MI
ATTACHMENT 54 – KALAMAZOO RIVER FLOW VELOCITY MEASUREMENTS
ATTACHMENT 55 – NOAA OIL SPILL TRAJECTORY ANALYSIS
ATTACHMENT 56 – COMPUTER AIDED DISPATCH REPORTS
ATTACHMENT 57 – TRANSCRIPT OF 911 CALLS
ATTACHMENT 58 – TRANSCRIPT OF RADIO COMMUNICATIONS
ATTACHMENT 59 – INTERVIEW OF MARSHALL TOWNSHIP FIRE DEPARTMENT CAPTAIN
ATTACHMENT 60 – INTERVIEW OF MARSHALL FIRE DEPARTMENT LIEUTENANT
ATTACHMENT 61 – INTERVIEW OF CALHOUN COUNTY CONSOLIDATED DISPATCH AUTH. DIR.
ATTACHMENT 62 – MICHIGAN GAS UTILITIES FIELD INVESTIGATION REPORT
ATTACHMENT 63 – MICHIGAN GAS UTILITIES EMPLOYEE INTERVIEW TRANSCRIPT
ATTACHMENT 64 – TITLE 49 CODE OF FEDERAL REGULATIONS 195.440
ATTACHMENT 65 – ENBRIDGE PUBLIC AWARENESS PROGRAM PLAN
ATTACHMENT 66 – ENBRIDGE PUBLIC AWARENESS PROGRAM FIELD GUIDANCE DOCUMENT
ATTACHMENT 67 – ENBRIDGE PUBLIC AWARENESS BROCHURE MAILINGS
ATTACHMENT 68 – MAILING BROCHURE FOR THE AFFECTED PUBLIC EXAMPLE
ATTACHMENT 69 – MAILING BROCHURE FOR EMERGENCY AND LOCAL PUBLIC OFFICIALS
ATTACHMENT 70 – SAFETY AWARENESS TRAINING PROGRAM SESSIONS HELD IN 2010
ATTACHMENT 71 – SAFETY AWARENESS TRAINING PROGRAM ORGANIZATIONS INVITED
ATTACHMENT 72 – EXCERPTS FROM THE 2010 MICHIGAN PIPELINE EMERGENCY RESPONSE PLANNING INFORMATION MANUAL
ATTACHMENT 73 – COVER LETTER FOR THE 2010 MICHIGAN PIPELINE EMERGENCY RESPONSE PLANNING INFORMATION MANUAL MAILING
ATTACHMENT 74 – ENBRIDGE PUBLIC AWARENESS PROGRAM FORM 11.1 AND REVIEW
ATTACHMENT 75 – ENBRIDGE 2010 PUBLIC AWARENESS MAILING LIST LOCAL OFFICIALS
ATTACHMENT 76 – ENBRIDGE ACCIDENT REPORT TO PHMSA, FEBRUARY 22, 2011 UPDATE
ATTACHMENT 77 – ATSDR BENZENE FACTS
ATTACHMENT 78 – ENBRIDGE LINE 6B INCIDENT CONCEPTUAL SITE MODEL, JULY 8, 2011
ATTACHMENT 79 – MICHIGAN DEPARTMENT OF COMMUNITY HEALTH REPORT ON THE ACUTE HEALTH EFFECTS OF THE ENBRIDGE OIL SPILL, NOVEMBER 2010
ATTACHMENT 80 – CALHOUN COUNTY HEALTH DEPARTMENT UPDATE, DECEMBER 22, 2011
ATTACHMENT 81 – TELEPHONE RECORDS, ENBRIDGE SUPERVISOR, REGIONAL ENGINEERING

APPENDIX A: CHRONOLOGY OF OIL SPILL RESPONSE ACTIONS.

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
25-Jul-10	21:26	First 911 call to Marshall City Fire Dept. complaining of an odor in Marshall area. Firefighters sent to investigate.	*Enbridge Time Line For Oil Spill at Marshall MI*
25-Jul-10	22:54	Odor complaint closed by Marshall Township Fire Dept.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	7:00	Darel Carter travels to Niles Pump Station and Minden Pump Station to see if a release has occurred at these locations and finds no evidence of a release.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	7:48	Brian Whittaker investigates potential release at Marshall Pump Station and finds no sign of a release.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	11:16	Date and time of incident as recorded by Enbridge. Consumers Energy, Chirs Treacher, reported oil spotted on a creek south of Marshall MI on Hwy 27 at Division Rd. Immediate actions taken by ECC to shut down and isolate lines.	*Enbridge Incident Event Log*
26-Jul-10	11:16	External call received at Control Center from local gas company stating odor present.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	11:24	Called Tom Fridel to inform him of the reported leak. PLM was dispatched. Also notified CCO on-call.	*Enbridge Incident Event Log*
26-Jul-10	11:36	Brian Fish, MI DNRE, and Chris Treacher, Consumers Energy, confirm oil on ground.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	11:45	Enbridge first responder, Ben Camp (Marshall PLM crossing coordinator) confirms pipeline leak. He states that it is about 1/4 - 1/2 miles downstream of Line 6b Marshall Station. Camp initiates first notification to Mick Collier, Bay City Maintenance Supervisor, and Rusty Smith, Marshal Pipeline Maintenance Supervisor, to report release of oil. Order issued to begin boom deployment. K & D Environmental Response contacted for Frac Tanks.	*Enbridge Emergency Response Timeline. Enbridge Incident Event Log. Enbridge Time Line for Oil Spill at Marshall MI.*
26-Jul-10	11:50	Tom Fridel and CCO on-call notified of confirmed leak. Fridel states that there is no need to contact the police as we have field staff on site and don't require assistance at this time.	*Enbridge Incident Event Log*
26-Jul-10	11:55	Tom Fridel initiates call to Enbridge senior management. Incident command structure put into place.	*Enbridge Emergency Response Timeline.and Enbridge Time Line for Oil Spill at Marshall MI*
26-Jul-10	12:00	Tom Fridel initiates emergency response protocol.	*Enbridge Time Line For Oil Spill at Marshall MI*
26-Jul-10	12:10	Marshall PLM crossing coordinator, two pipeliners and an electrician installed absorbent boom at two locations in Talmadge Creek upstream of A Drive, at a culvert and private stream crossing ahead of the oil discharge.	*NTSB Interviews of Ben Camp, Jeff Rahn, Phill Heath, and Brian Whittaker*
26-Jul-10	12:30	Marshall PLM crossing coordinator Ben Camp and two pipeliners arrive at 15 1/2 Mile Road crossing of Talmadge Creek and installed additoinal oil boom. They began using Enbridge vacuum truck and skimmer to vacuum oil from the creek. The crew remained at this location throughout the day.	*NTSB Interviews of Ben Camp, Jeff Rahn, Phill Heath, and Brian Whittaker*
26-Jul-10	12:46	The Bay City PLM maintenance supervisor Michael Collier arrived on-site at Division Road stream crossing and contacted MI DNRE conservation officer Fish who informed that oil had entered the Kalamazoo River.	*NTSB Interview of Michael Collier.*
26-Jul-10	12:50	Enbridge receives a call from Michigan DNRE conservation officer Brian Fish.	*Enbridge Emergency Response Timeline.*
26-Jul-10	13:02	Vince Kolbuck contacted the National Response Center, but dropped the call after 8 seconds.	*Vince KolbuckTelephone Records*
26-Jul-10	13:09	Vince Kolbuck contacts National Response Center; Kolbuck placed on hold for 6 minutes before dropping the call to receive other calls.	*Enbridge Emergency Response Timeline. Enbridge Communications Planner Notes. Vince Kolbuck Telephone Records*
26-Jul-10	13:20	Distrubution of control points from Enbridge's Chicago Region Faciltiy Response Plan to facilitate boom placement locations.	*Environmental Response Group Field Notes Timeline.*
26-Jul_10	13:23	Vince Kolbuck contacts National Response Center for 22 minutes to convey information for NRC 948903.	*Vince Kolbuck Telephone Records*
26-Jul-10	13:30	Bay City PLM maintenance supervisor Collier met with Calhoun County EMS director Dunham and provided information about Enbridge response. Discussed setting up a unified command at 17:00.	*NTSB Interview of Michael Collier.*
26-Jul-10	13:33	NRC Report #948903 was issued to provide initial Federal, State, and Local agency notification.	*NRC Report #948903*
26-Jul-10	13:40	Enbridge resources from Superior Region and Eastern Region PLM begin mobilization to assist with response and cleanup effort. 5 Chicago Region PLM areas mobilized.	*Enbridge Emergency Response Timeline*
26-Jul-10	13:40	EPA OSC Schlieger contacts Vince Kolbuck, Enbridge Griffith Facility to verify information reported to NRC. Enbridge confirmed the report, but stated it had no further informaiton.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	13:46	MI Dept. of Natural Resources & Environment received NRC notification.	*MI Department of Natural Resources and Environment Situation Report*
26-Jul-10	13:47	PHMSA notification confirmed by NRC.	*Environmental Response Group Field Notes Timeline.*
26-Jul-10	13:47	USCG Atlantic Strike Team notification confirmed by NRC.	*Environmental Response Group Field Notes Timeline.*
26-Jul-10	13:47	MI Dept. Community Health and Department of Natural Resources and Environment notificaiton confirmed by NRC.	*Environmental Response Group Field Notes Timeline.*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
26-Jul-10	13:49	EPA Region 5 notification confirmed by NRC.	*Environmental Response Group Field Notes Timeline.*
26-Jul-10	13:49	MI Dept. of Natural Resources & Environment advised by Enbridge that isolation valves have been closed and response crews are on site and enroute. Local emergency response personnel are on scene. Aware of reports that oil had entered Kalamazoo River 1 to 2 miles downstream of spill location.	*MI Department of Natural Resources and Environment Situation Report*
26-Jul-10	13:50	Incident command post established at Enbridge Marshall office. Enbridge contacted OSRO Bay West.	*Enbridge Communications Planner Notes. Environmental Response Group Field Notes Timeline.*
26-Jul-10	13:50	Enbridge receives a call from PHMSA, Hanz Shieh. V. Kolbuck provides details of the event. Explained oil in tributary, approximately 3-miles of pipeline shut down.	*Enbridge Emergency Response Timeline.and Enbridge Communications Planner Notes*
26-Jul-10	13:51	EPA OSC Schlieger contacts OSC Wolfe to advise begin mobilization.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	13:55	Enbridge receives call from US EPA, Brian Schlieger. V. Kolbuck provides details of the event. Identified incident commander Fridel.	*Enbridge Emergency Response Timeline.*
26-Jul-10	14:00	EPA email notification of spill to all OSC's.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	14:15	EPA OSC Wolfe departs for spill site, ETA 4 hours.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	14:15	EPA OSC Schlieger contacts Weston Solutions Superfund Technical Assistance and Response Team (START) to begin mobilization to Marshall MI to begin oversight and air monitoring.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	14:19	Internal Enbridge notification sent out via the leak reporting system.	*Enbridge Emergency Response Timeline.*
26-Jul-10	14:20	EPA OSC Kimble departs for spill site.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	14:25	Enbridge mobilizes its Environmental Department for deployment to the site.	*Environmental Response Group Field Notes Timeline.*
26-Jul-10	14:26	Enbridge contacted MI DNRE, reported pipeline shut down after abnormal pressure, estimated 19,500 bbl crude oil released, oil released into tributary of Kalamazoo River, emergency response crews are on site and containment is underway with oil boom.	*Enbridge Communications Planner Notes*
26-Jul-10	14:26	MI Dept. of Natural Resources and Environment confirmed report of 19,500 bbl crude oil spill to creek upstream of the Kalamazoo River.	*MI Department of Natural Resources and Environment Situation Report*
26-Jul-10	14:29	EPA OSC Schlieger contacts the lead OSC for the Kalamazoo River Superfund site to request follow-up on possible implications of oil spill on the Superfund site.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	14:45	Bay City PLM maintenance supervisor Collier observed Battle Creek Fire Department installing oil absorbent boom across the river channel at Ceresco Dam (12 Mile Road crossing of Kalamazoo River). Spotty oil sheen was arriving at that location.	*NTSB Interview of Michael Collier.*
26-Jul-10	14:55	EPA OSC Schlieger sends email to Region 5 emergency response notification list, including senior management and section chiefs.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul_10	15:00	Bay City and Marshall PLM maintenance supervisors Collier and Smith met on site - Collier would continue with downstream containment actiivities while Smith would isolate the source with an underflow dam.	*NTSB Interview of Rusty Smith.*
26-Jul-10	15:00	One Bay City PLM vacuum truck arrives at Division Drive and begins oil removal from Talmadge Creek.	*NTSB Interview of Michael Collier.*
26-Jul-10	15:00	Enbridge contacts Calhoun County Emergency Manager, Dirk Dunham. V. Kolbuck provides details of the event, reports that oil is on Kalazmazoo River.	*Enbridge Emergency Response Timeline.and Enbridge Communications Planner Notes*
26-Jul-10	15:15	Enbridge contacted McMillian Construction, Superior Environmental Services, and Youngs Environmental Services for resources.	*Environmental Response Group Field Notes Timeline.*
26-Jul-10	15:55	Michigan Public Service Commission contacted Enbridge. V. Kolbuck speaks to Don Mazuchowski to provide details of the event. Reported 19,500 bbl released and that response is in the containment phase.	*Enbridge Emergency Response Timeline.and Enbridge Communications Planner Notes*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
26-Jul-10	16:30	One Baker Corporation frac tank arrives and is stationed at Marshall PLM shop.	*NTSB Interview of Michael Collier.*
26-Jul-10	16:32	EPA OSC Kimble arrives at spill site and observes oil in Talmadge Creek at Division Street and large quantities of oil gushing through a culvert. City of Marshall an d Marshall Township fire departments were on scene.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	17:00	EPA OSC Kimble arrives at Enbridge facility and meets with the incident commander Tom Fridel.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	17:30	START arrives on scene and begins air and oil sampling.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	17:30	Two Baker Corporation frac tanks arrive and are stationed at Marshall PLM.	*NTSB Interview of Michael Collier.*
26-Jul-10	17:55	EPA OSC Wolfe arrives at the spill site.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	18:00	Estimated 19,500 bbl released. Recovered products to be taken to Griffith or Stockbridge tank farms. Concern about water speeds and how far downstream response is set up. Enbridge monitoring benzene levels. Communications schedule established for every 3 hours. Hot zone established around spill site.	*ICS 201 Incident Briefing, 7/26/10, 6:00 p.m. Environmental Response Group Field Notes Timeline.*
26-Jul-10	18:30	One Baker Corporation frac tank arrives and is stationed at Marshall PLM shop.	*NTSB Interview of Michael Collier.*
26-Jul-10	18:30	Bay City PLM maintenance supervisor Collier estimated that 14 Enbridge and 6 to 10 Terra Contracting and Baker Corporation personnel were on-site. Terra contracting assisted Enbridge with installation of 600-feet of oil boom at Heritage Park.	*NTSB Interview of Michael Collier.*
26-Jul-10	18:35	EPA OSC Dollhopf (FOSC) mobilizes enroute to the spill scene.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	18:48	EPA OSC Dollhopf contacts the Emergency and Rapid Response Service Contractor, Environmental Quality Management, for delivery of the mobile command post to house the incident command.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	18:49	EPA OSC Kimble contacts Branch Chief El-Zein to discuss the level of response initiated by Enbridge.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	18:52	EPA OSC Dollhopf contacts START to mobilize additional assets to the incident.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	19:03	EPA OSC Dollhopf contacts EPA Environmental Response Team to request advanced air monitoring support.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	19:05	EPA BC El-Zein contacts OSC Dollhopf to discuss his response role.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	19:20	EPA OSC Wolfe conducts overflight of the spill.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	19:30	EPA OSC Kimble issued Notice of Federal Interest to Enbridge.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	19:40	Enbridge helicopter conducted first overflight of spill.	*Enbridge Corporate Aviation email*
26-Jul-10	19:40	EPA OSC Wolfe returns from overflight and based on observations orders a full incident management team with OSC Dollhopf to assume the incident commander role.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	20:29	FOSC Dollhopf contacts USCG NSF to request available assets.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	20:40	EPA Branch Chief El-Zein contacts FOSC Dollhopf to discuss mobilization of the IMT, TAGA, START, OSC's and ERRS.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	20:45	EPA held meeting with Enbridge, State and Local agencies. EPA notified Enbridge that federal resources will be mobilized if they do not demonstrate adequate resources for spill response deployment.	*EPA Timeline (comments to Environmental Response Group Field Notes)*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
26-Jul-10	21:00	Construction of first underflow dam completed. Vacuum trucks begin collecting the contained oil.	*NTSB Interview of Rusty Smith.*
26-Jul-10	21:00	Unified Command established with EPA, Enbridge, MDNRE, and cooperating agencies at the Enbridge Marshall office. Enbridge states that more resources are on the way for deployment and will have detailed information regarding additional resource deployment at 00:00.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	21:00	Hot zone established 50-feet from edge of work zone. Determined that more vacuum trucks and frac tanks are needed, and more resources for wildlife recovery. 4 flumes were set up and are collecting about 75% of the spillage. Boom and vac trucks at A drive and mile 15; 600 ft. boom deployed at Heritage Park where leading edge of sheen noted; boom to be deployed further downstream at Linear Park. No concern about potable water wells. Posting warning signs on Morrow Lake.	*ICS 201 Incident Briefing, 7/26/10, 9:00 p.m.*
26-Jul-10	21:07	EPA Branch Chief El-Zein instructs OSC's to ensure that Kalamazoo River Superfund Site which includes PCB contamination is protectected from this oil spill.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	22:46	EPA OSC Kimble reported that 12 vacuum trucks, 6 frac tanks and 600-feet of oil boom were now at the spill.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	23:00	US Fish and Wildlife Service reports 43 geese dead and an additional 20 oiled geese affected.	*EPA POLREP #1*
26-Jul-10	23:00	1st PHMSA representative Brian Pierzina, arrives on site.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	23:24	START is established to provide situational awareness and to provide updates to assets that were mobilizing.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
26-Jul-10	?	Contractors mobilized: Marine Pollution Control, Bay West, Superior Environmental, Youngs Environmental, Worth Construction, Eissn.	*Enbridge Communications Planner Notes*
27-Jul-10	0:00	Enbridge provides Unified Command with briefing on resources mobilized and those enroute. Enbridge is still seeking additional resources to mobilize.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	0:00	Air monitoring: benzene in residential area less than 50 ppb, no LEL detected. 24 residents have evacuated, no mandatory evacuation deemed necessary. Oil boom deployed at A Drive, 15 Mile Road, Heritage Park. Pulling boom from Linear Park. Frac tanks on site are full, tankers to transport crude oil to Griffith.	*ICS 201, Incident Briefing, 7/27/10, 12:00 a.m.*
27-Jul-10	3:00	Air monitoring: 460 ppm benzene bridge, <4 ppm at homes. Preparing to close bridge to traffic due to expected increase in benzene concentrations by morning. 20 additional frac tanks in route with capacity between 20,000 and 30,000 gallons (ea?). Oil being vacuumed by 2 or more vacuum trucks at each site. Oil boom removed from Burnum and Riverside due to swift current; boom installed at Linear Park along with 2 vac trucks.	*ICS 201 Incident Briefing, 7/27/10, 3:00 a.m.*
27-Jul-10	6:00	POLREP #1 issued with reporting period from 7/26/10, 18:00 to 7/27/10, 06:00. Unified Command: Enbridge (Incident Commander), EPA (FOSC), Michigan Department of Natural Resources and Environment (SOSC). Approximately 16 miles of the kalamazoo River has been impacted. Tallmadge Creek has been boomed at the confluence to the Kalamazoo River. Preliminary booming is in place along the Kalamazoo River. RP is booming 30 miles downstream at Morrow Lake as a collection point, and 12 miles downstream at leading edge of release on Kalamazoo River near Battle Creek MI. START is assisting RP with hourly air monitoring in residential neighborhoods for benzene. 6 residences have self evacuated due to the odor. The Kalamazoo River is currently running fast due to heavy rain and affecting booming strategies. The RP has been informed of a PCB superfund site about 35 miles down river below Morrow Lake and was advised to make all efforts to ensure the oil does not reach the superfund site.	*EPA POLREP #1*
27-Jul-10	6:00	Air monitoring: residential area <50 ppm. Added resources include: 2 tankers, 4 vacuum trucks, 15 frac tanks, additional manpower from Consolidated and Charps. Strong current at Linear Park preventing boom installation. Leading edge of oil is at 20th Street in Battle Creek MI.	*ICS 201 Incident Briefing, 7/27/10, 6:00 a.m.*
27-Jul-10	8:00	FOSC Dollhopf arrives at Enbridge Leggett Road facility meets with OSCs and Enbridge personnel. Dollhopf then travels to Calhoun County Sherrif's Office EOC.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	9:00	Flume setup near the leak site continues to be successful. Continuous air monitoring is provided for residential neighborhoods, CTEH is on site to assist with monitoring. Several reports of residents feeling ill. Boom deployed at: 15 1/2 Mile Rd., A Drive North, Heritage Park, Linear Park at Jackson, 20th Street, Bedford Road.	*ICS 201 Incident Briefing, 7/27/10, 9:00 a.m.*
27-Jul-10	9:00	EPA senior management objectives; 1) better understand the responders' resource needs and assist them in identifying, mobilizing, and deploying additional resources; 2) better understand the scope of the spill; 3) to order Enbridge to address the spill under CWA 311(c).	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	9:15	FOSC Dollhopf instructs Environmental Quality Management to move mobile command post to Calhoun County EOC.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	10:00	Calhoun County Emergency Manager Dirk Dunham activates Emergency Operations Center at Justice Building for unified command.	*Enbridge Communications Planner Notes*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
27-Jul-10	11:44	FOSC Dollhopf contacts Great Lakes Commission, Stuart Eddy, to request most recent versions of inland sensitivity atlas for Marshall area.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	12:00	Unified Command shifts from Marshall PLM to Justice Center in Battle Creek MI.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	12:38	Email from DOT forwarded to FOSC Dollhopf about Enbridge Facility Response Plan.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	13:30	Briefing to local agencies held at State Emergency Operations Center. Calhoun County Health Dept. is the local public health lead agency.	*Mi Department of Community Health Situation Report*
27-Jul-10	13:30	FOSC Dollhopf coordinates assets with USCG-Milwawkee Commander Meier.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	14:00	POLREP #2 issued with reporting period 7/27/10, 0600 to 1400. The RP has deployed boom and skimming equipment at the following locations which intersect Talmage Creek; Division Street; Culvert at I-69; A Drive; and 15 mile Road. RP has also deployed boom and skimming equipment at the following locations which intersect the Kalamazoo River; Heritage Park at I-94; 20th Street; Helmer Road; and at a boat launch south of the City of Augusta. Unified command expanded to include Michigan State Police, Calhoun County Public Health Department, and Calhoun County Sheriff.	*EPA POLREP #2*
27-Jul-10	14:22	MSP Aviation conducted photo mission over spill site with EMHSD staff.	*State Police Situation Report*
27-Jul-10	15:00	Air monitoring: benzene readings continue to drop, but odors still persist. Surface and well water sampling has begun.	*ICS 201, Incident Briefing, 7/27/10, 3:00 p.m.*
27-Jul-10	15:32	Estimated loss stands at 877,000 gallons, 16 miles of river affected, leading edge of spill at boat launch at Fort Custer State Park. An ample supply of equipment seems to be on site and enroute. Over 30,000 feet of boom and several vac trucks are available, more are on the way. High water making mobilization difficult, so all equipment has not yet been utilized. Boom and collection activities are in place on Talmadge Creek and Kalamazoo River between Marshall and Battle Creek. Booms are being placed downstream near Augusta and on the Kalamazoo at Morrow Lake. USFWS is overseeing wildlife collection , damage assessment and rescue.	*MI Department of Natural Resources and Environment Situation Report*
27-Jul-10	16:00	EPA OSC Gulch requests support from 51st Civil support Team for additional air monitoring.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	16:04	Fredonia Fire Dept. is lead fire department. Enbridge is providing all hazmat and decon assets at the incident. Fire service decon and hazmat assets are on standby if required. Local assessment is that Enbridge assets are sufficient to contain the incident, but additonal resources are on standby in the event of incident escalation.	*MI Fire Marshal Situation Report*
27-Jul-10	17:41	The leak has traveled at least 16 miles down the Kalamazoo River. Two homes evacuated, and residents of another 28 homes were relocated because of odors.	*MI Department of Community Health Situation Report*
27-Jul-10	17:45	MI Dept. Natural Resources and Environment crews are on scene monitoring the river and conducting damage assessments. Heavy rains have swollen creeks and the Kalamazoo River making it possible for oil to get past booms and barriers.	*MI Department of Natural Resources and Environment Situation Report*
27-Jul-10	19:00	Air monitoring: no detections of benzene in community areas. Additional 2,200 feet of oil boom requested. Two flumes installed at release site. A Drive: flume being installed, 1 tanker, 5 vacuum trucks. Heritage Park: 2 skimmers, 1 vacuum truck. Linear Park: booming difficulties. Fort Custer: 1,000 ft. oil boom. Morrow Lake: 2 oil boom runs. Dam: one vacuum truck.	*ICS 201, Incident Briefing, 7/27/10, 7:00 p.m.*
27-Jul-10	20:00	Throughout the evening EPA orders additional cleanup contractor services.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
27-Jul-10	20:15	EPA issues administrative order to Enbridge under Section 311 to perform specific response and mitigation actions.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
28-Jul-10	0:00	Air monitoring: elevated benzene reading in flume area, respiratory protection required. No benzene detected in residential areas. 4-miles of creek evaluated for wildlife impact. Flume site: 2 skimmers with vacuum trucks. 16 Mile Rd: 2 vacuum trucks, 15 1/2 Mile Rd: vacuum trucks working. A Drive: flume upstream, skimmers downstream. Heritage Park: 3 vaccum trucks. 11 total locations with oil boom; 10 additional locations need oil boom.	*ICS 201, Incident Briefing, 7/28/10, 12:00 a.m.*
28-Jul-10	3:40	EPA OSC Kimble sends email to Environmental Restoration (ER) requesting that additional resources be placed on standby. OSC Kimble also instructs ER not to divert to EPA resources already being sent to Enbridge.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
28-Jul-10	6:00	Resources assigned/deployed: 38 vacuum trucks, 4 tankers, 9 skimmers, 9 boats, 13,500 ft. oil boom, 67 responders.	*ICS 204, Enbridge Assignment List*
28-Jul-10	9:45	The spill has advanced to within 4-5 miles of Morrow Lake. After Morrow Lake the river flows on to Allegan County, including Plainwell. In that area are several SuperFund Sites that have not yet been remediated. If the oil travels into that area, it would combine with PCBs. The goal is to stop the spill before it gets into Morrow Lake.	*MI Department of Community Health Situation Report*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
28-Jul-10	10:08	Boom being deployed across Morrow Pond.	*Kalamazoo County Emergency Management Situation Summary*
28-Jul-10	10:17	Talmadge Creek is extremely impacted with aquatic and terrestrial species either confirmed or assumed dead. Investigation of wildlife impact is hindered by health risk and high water. Wildlife that may be impacted include fish, ducks, geese, swans, river otter, mink, muskrats, turtles, racoons, frogs, salamanders, mussel beds, and macroinvertabrates. A wildlife rehabilitation center has been established and dead animals are being collected for pathology testing and natural resources damage assessments. 10 oil booms are in place along with vac trucks, skimmers, and waste transport trucks.	*MI Department of Natural Resources and Environment Situation Report*
28-Jul-10	11:16	Kalamazoo County EOC has 1 hazmat team and 2 decon trailers. These resources have not been requested for assistance to decontaminated spill responders.	*MI Fire Marshal Situation Report*
28-Jul-10	12:49	46 total public evacuations due to fumes and odor.	*Battle Creek Emergency Services Situation Summary*
28-Jul-10	13:55	MI Dept. of Community Health reported some locations where levels of benzene are of public health concern; particularly two locations close to the leak site at Talmadge Creek. Calhoun County Health Dept. is working to relocate residents who are at risk.	*Mi Department of Community Health Situation Report*
28-Jul-10	14:36	Oil continues to move west and into Kalamazoo County. Adding more booming lines in Kalamazoo River from east county line to the City of Galesburg.	*Kalamazoo County Emergency Management Situation Summary*
28-Jul-10	15:11	CTEH reports air quality along Kalamazoo River in Battle Creek is good, other than odor. Less than 0.01 ppm readings for benzene. *The EPA is in the process of overtaking the incident command with 40 oversight staff on site and bringing in an additional 40 staff. The EPA is also bringing in a large amount of resources for oil containment to help supplement Enbridge. There are no 45,000-feet of boom on site. Booms were doubled at all sites per MI governor's request*	*Battle Creek Emergency Services Situation Summary*
28-Jul-10	15:27	MSP Aviation conducted spill survey and video mission over spill area.	*State Police Situation Report*
28-Jul-10	19:00	No more free oil is entering the river. New boom installed at Morrow Lake. Div B flume site, tanker unloading frac tank. Div C no access to collect oil. Div D, oil collection reduced from 100-bbl/hr to about 8 bbl/hr. Div E, sites with sheen, not as much oil.	*ICS 201, Incident Briefing, 7/28/10, 7:00 p.m.*
28-Jul-10	20:53	The heavy oil deposits are found within the upper 10 miles of the 30 mile contaminated zone. Below that is heavy sheen, then a lighter sheen at 35th Street at the upper end of Morrow Lake. There is plenty of boom material available for deployment, but access to some of the sites for consideration may be difficult, and construction of access roads may be required. Enbridge reports that 2,300 barrels of liquid (90% oil) has been collected.	*MI Department of Natural Resources and Environment Situation Report*
28-Jul-10	22:46	CTEH reports air quality along river is good and not a risk to public health.	*Battle Creek Emergency Services Situation Summary*
28-Jul-10	23:36	POLREP #3 issued. USEPA has mobilized ERRS contactors to provide additional resources for personnel and oil skimming, containment, and recovery activities. Currently USEPA ERRS contractors have deployed 2,000 feet of boom. RP has deployed boom and skimming equipment at a minimum of 17 locations along Talmage Creek and the Kalamazoo River. Booms and skimming equipment have been deployed at 3 new locations. To date approximately 98,000 gallons of oil/water has been recovered. No oil is observed on Morrow Lake at this time.	*EPA POLREP #3*
28-Jul-10	?	Unified Command shifts incident command post to Walter Elementary School in Marshall MI.	*EPA Timeline (comments to Environmental Response Group Field Notes)*
29-Jul-10	0:00	Flyover results indicate a lot of oil removed, but still have sheen on water. Div A and B still have significant oil collection. Div C3 still has oil. Div. D collected 200 gallons, Div E collected 100 gallons. **Transition to cleanup to start tomorrow**.	*ICS 201, Incident Briefing 7/29/10, 12:00 a.m.*
29-Jul-10	6:00	Resources assigned/deployed: 51 vacuum trucks, 10 tankers, 14 skimmers, 9 boats, 7,550 ft. oil boom, 120 responders.	*ICS 204, Enbridge Assignment List*
29-Jul-10	10:44	Air concentrations of benzene in Talmadge Creek area are of public health concern. Calhoun County Health Dept. and MI Dept. of Community Health are recommending voluntary evacuation of a corridor along Talmadge Creek that extends to the intersection of Talmadge Creek and the Kalamazoo River. Teams to go door-to-door in the evacuation area.	*MI Department of Community Health Situation Report*
29-Jul-10	11:00	12,290 feet of boom deployed. 8,070 ft. contaniment boom; 4,220 ft. absorbent boom; 7,103 gph rate of recovery; 16,190 bbl oil/water collected at Marshall; 2,874 bbl oil at Griffith; 37 vacuum trucks; 15 skimmers; 15 tank trucks; 64 frac tanks; 15 boats; 188 contractor personnel.	*Enbridge Boom Deployment Chart, Enbridge Recovery Progress Chart.*
29-Jul-10	12:31	51st Civil Response Team (CBRNE Response) continues to provide support to the EPA with air quality monitoring and reporting. Providing a 4 man team 24/7 to conduct air sensor polling along Talmage Creek and Kalamazoo River from Marshall to Galesburg.	*MI National Guard Situation Report*
29-Jul-10	15:00	13,710 feet of boom deployed. 9,470 ft. contaniment boom; 4,240 ft. absorbent boom; 8,390 gph rate of recovery; 16,190 bbl oil/water collected at Marshall; 2,874 bbl oil at Griffith; 39 vacuum trucks; 16 skimmers; 15 tank trucks; 64 frac tanks; 15 boats; 230 contractor personnel.	*Enbridge Boom Deployment Chart, Enbridge Recovery Progress Chart.*
29-Jul-10	15:55	Calhoun County Health Dept. is recommending immediate evacuation of 30 to 50 homes north and northwest of the spill site.	*MI Department of Community Health Situation Report*
29-Jul-10	16:01	Calhoun County Health Dept. issued a water advisory for residents with private wells living within 200-feet of the edge of the river bank between Talmadge Creek and along the Kalamazoo River to the Kalamazoo County line.	*MI Department of Community Health Situation Report*
29-Jul-10	17:36	Teams from Calhoun County Health Dept. and MI Dept. of Community Health are contacting residents within the red zone of a map of the evacuation area. Distributed fact sheets to residents, set up 3 locations for distribution of bottled water.	*MI Department of Community Health Situation Report*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
29-Jul-10	17:41	The Enbridge MSDS was provided to Calhoun and Kalamazoo County fire department chiefs.	*MI Dept. Energy, Labor, and Economic Growth Situation Report*
29-Jul-10	18:00	20,510 feet of boom deployed. 12,270 ft. contaniment boom; 8,240 ft. absorbent boom; 15,417 gph rate of recovery; 19,460 bbl oil/water collected at Marshall; 3,280 bbl oil at Griffith; 45 vacuum trucks; 19 skimmers; 16 tank trucks; 64 frac tanks; 24 boats; 252 contractor personnel.	*Enbridge Boom Deployment Chart, Enbridge Recovery Progress Chart.*
29-Jul-10	19:00	Total oil/water recovery is 19,000 bbl. 3,280 bbl was shipped to Griffith. Boom is being added in multiple locations. Two boat mounted skimmers are on-site. Potable water samples reported as negative.	*ICS 201, Incident Briefing 7/29/10, 7:00 p.m.*
29-Jul-10	21:50	POLREP #4 issued for reporting period 7/28/10, 1800 to 7/29/10, 1800. No sheen has been observed on Morrow Lake to date. Calhoun County Health Department in consultation with Michigan Department of Community Health and Agency for Toxic Substances and Disease Registry has issued a voluntary evacuation for several residences located immediately downstream of the spill site along the Talmedge Creek up to the confluence with the Kalamazoo River. Resources deployed: 252 personnel; 45 vacuum trucks; 19 skimmers; 16 tanker trucks; 64 frac tanks, 24 boats, 12,270-ft containment boom; 8,240-ft. absorbent boom; rate of recovery 15,417 gph; total oil/water recovery 19,460 bbl Marshall, 3,280 bbl Griffith. EPA is assisting Enbridge with drafting a site specific health and safety plan.	*EPA POLREP #4*
29-Jul-10	23:00	27,420 feet of boom deployed. 17,870 ft. contaniment boom; 9,550 ft. absorbent boom; 11,697 gph rate of recovery; 19,136 bbl oil/water collected at Marshall; 4,851 bbl oil at Griffith; 55 vacuum trucks; 26 skimmers; 7 tank trucks; 64 frac tanks; 11 boats; 158 contractor personnel.	*Enbridge Boom Deployment Chart, Enbridge Recovery Progress Chart.*
30-Jul-10	0:00	Div B reporting major drop in amount of il moving down the river.	*ICS 201, Incident Briefing 7/30/10, 12:00 a.m.*
30-Jul-10	3:00	19,270 ft. contaniment boom; 10,550 ft. absorbent boom; 14,781 gph rate of recovery; 19,136 bbl oil/water collected at Marshall; 4,851 bbl oil at Griffith; 64 vacuum trucks; 30 skimmers; 10 tank trucks; 64 frac tanks; 13 boats; 160 contractor personnel.	*Enbridge Recovery Progress Chart.*
30-Jul-10	7:57	20 collection points are operational. Oil is present up to 16 miles downstream of Talmadge Creek. A lot of oil on the river banks and in pockets where water has receeded upstream of Battle Creek.	*MI Department of Natural Resources and Environment Situation Report*
30-Jul-10	10:00	24,765 ft. contaniment boom; 16,115 ft. absorbent boom; 9,321 gph rate of recovery; 19,136 bbl oil/water collected at Marshall; 5,060 bbl oil at Griffith; 68 vacuum trucks; 35 skimmers; 13 tank trucks; 77 frac tanks; 35 boats; 348 Enbridge contractors, 58 EPA contractor personnel.	*Enbridge Recovery Progress Chart.*
30-Jul-10	11:14	MI Dept. of Natural Resources and Environment staff collect water samples downstream of Morrow Lake to test for crude oil contaminants. Additional samples of dead or stressed fish are collected.	*MI Department of Natural Resources and Environment Situation Report*
30-Jul-10	11:24	Analytical results for 5 private well samples were all non-detect for chemicals related to crude oil. Planning for additional groundwater sampling because of long-term contaminate migration concerns. Two personell from the federal Agency for Toxic Substances and Disease Registry arrived on site to assist with interpretation of monitoring data and evacuation protocols. About 2/3 of residents in voluntary evacuation area elected to remain in their homes.	*MI Department of Community Health Situation Report*
30-Jul-10	14:00	24,755 ft. contaniment boom; 18,465 ft. absorbent boom; 27,501 bbl oil/water collected at Marshall; 71 vacuum trucks; 36 skimmers; 12 tank trucks; 77 frac tanks; 36 boats; 356 Enbridge contractors, 58 EPA contractor personnel.	*Enbridge Recovery Progress Chart.*
30-Jul-10	15:11	DNRE staff are on river in 3 boats in area of Historic Bridge Park conducting surveillance determining the numbers of aquatic organisms affected by the spill and collecting water samples. Several oiled turtles collected for rehabilitation. No fish kill evidence was found from Battle Creek to Augusta.	*MI Department of Natural Resources and Environment Situation Report*
30-Jul-10	17:57	Where oil booms are located the concentrations of benzene in air samples have increased.	*MI Department of Community Health Situation Report*
30-Jul-10	21:44	POLREP #5 issued for reporting period 7/29/10, 1900 to 7/30/10, 1900. USEPA ERRS contactors have deployed 14,000 feet of boom. The RP has deployed 23,000 feet boom and skimming equipment at seventeen locations along Talmage Creek and the Kalamazoo River. To date, approximately 6303 barrels of oil/water has been recovered and has been transported to an Enbridge facility in Griffith, IN. 27,500 barrels have been collected and are being stored in frac tanks for future transport. No sheen has been observed on Morrow Lake to date. Two hundred animals were being investigated and/or collected for rescue cleaning. Sixty one residences were given voluntary evacuation notices. Twelve residences evacuated., twenty seven chose to stay and twenty two did not answer. Resources deployed: 366 Enbridge contractors; 83 EPA contractors; 71 vacuum trucks; 39 skimmers; 17 tanker trucks; 77 frac tanks; 39 boats; 29,575-ft containment boom; 21,515-ft absorbent boom.	*EPA POLREP #5*
31-Jul-10	13:08	Evacuation decision tree developed: benzene air concentraions greater than 200 ppb advise immediate evacuation; between 60 and 200 ppb require additional sampling; concentrations exceeding 60 ppb will advise evacuation.	*MI Department of Community Health Situation Report*
31-Jul-10	17:17	Unified command briefing: 61 residents notified of voluntary evacuation – 12 residents left, 27 declined, 22 not home. 28 Boom locations which are extended to just short of 57,000 feet, 27,000 feet of boom in storage, 33,000 barrels of oil and water recovered.	*State Police Situation Report*
31-Jul-10	18:00	Response resources summary: 712 workers on river; 79 vacuum trucks; 48 skimmers; 19 tanker trucks; 82 frac tanks; 43 boats; 36,055 ft. containment boom deployed; 30,840 ft. absorbent boom deployed; 27,300 ft. containment boom staged; 27,120 ft. absorbent boom staged. Oil/water recovery: 32,927 bbl.	*Enbridge Recovery Resource and Progress Chart*

Appendix A
Emergency Response Timeline for Marshall MI

Date	Time	Event	*Source*
31-Jul-10	19:00	POLREP #6 issued for reporting period 7/30/10, 1900 to 7/31/10, 1900. Approximately 67,000 feet of boom and skimming equipment have been deployed at thirty two locations along Talmadge Creek and the Kalamazoo River. To date, approximately 10,800 barrels of oil/water have been recovered and have been transported to an Enbridge facility in Griffith, IN. Approximately 33,000 barrels have been collected and are being stored in frac tanks for future transport. No sheen has been observed on Morrow Lake to date. US F&W reports a total of 47 geese, 4 ducks, 6 muskrats, 27 turtles, 2 swans, and 2 domestic geese have been recovered. Voluntary evacuation remains in effect for 61 residences between spill site and Kalamazoo River. Resources deployed: 366 Enbridge contractors; 83 EPA contractors; 71 vacuum trucks; 39 skimmers; 17 tanker trucks; 77 frac tanks; 39 boats; 29,575-ft containment boom; 21,515-ft absorbent boom.	*EPA POLREP #6*
31-Jul-10	20:30	EPA incident management team issued first Incident Action Plan covering period 07:00 8/1/10 to 07:00 8/2/10.	*Environmental Response Group Field Notes Timeline.*