



National Transportation Safety Board
Washington, D.C. 20594

Water Treatment Plant Factual Report

Accident No.: DCA-99-MP-008
Type of System: Hazardous Liquids Pipeline
Type of Accident: Rupture and fire
Location: Dakin-Yew Water Treatment Plant, Bellingham, Washington
Date and Time: June 10, 1999; 17:02 P.D.T.
Owner/Operator: Olympic Pipe Line Company
Fatalities: Three
Injuries: Eight
Material Released: Unleaded Gasoline
Component affected: 16" steel pipeline

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The Accident

About 3:30 p.m. on June 10, 1999, a 16-inch diameter steel pipeline owned by Olympic Pipe Line Company (Olympic)¹ ruptured and released about one-quarter million gallons of gasoline into a creek that flowed through Whatcom Falls Park in Bellingham, Washington. The gasoline was ignited about 1½ hours after the rupture with the resulting fire burning approximately 1½ miles along the stream. Two young boys, both 10 years old, and a young man 18 years old were killed as a result of the accident. Eight additional injuries were documented. A single-family residence and the City of Bellingham's water treatment plant were severely damaged.

The Pipeline

An approximate 37.3-mile long segment of 16-inch diameter steel pipeline from Ferndale Station to Allen Station was originally installed in 1965. In 1966, Olympic rerouted a 724-foot section of the pipeline to facilitate the construction of a water treatment plant by the City of Bellingham, Washington. The original pipeline and the rerouted section were both constructed of API X52 steel line pipe with a wall thickness of 0.312 inches with a layered coal tar, fiberglass wrap, and asbestos felt coating for corrosion protection. The pipeline facilities will be discussed in greater detail in the Operations Group Factual Report.

Dakin-Yew Water Treatment Plant

The pipeline rupture and release occurred within the confines of the Dakin-Yew water treatment plant owned and operated by the City of Bellingham, Washington (Bellingham). The original water treatment plant was constructed after Olympic rerouted its pipeline in 1966. In the early 1990's, Bellingham planned and initiated a project to modify the plant. The project involved the installation of a 17 million gallon chlorine contact reservoir, a pumping station, and the ancillary piping. Phase I of the project involved the construction of the chlorine contact tank.

In 1993 and 1994, Bellingham contracted with IMCO General Construction, Inc. to perform Phase II of the planned modifications to the facility. Bellingham also contracted with Barrett Consulting Group (Barrett) to design the modifications and oversee the construction.

Phase II of the modifications consisted primarily of the installation of an underground vault containing 4 pumps (pumping station)², the installation of several additional water lines ranging in diameter to 72 inches, and the installation of the associated ancillary facilities necessary to support the plant additions.

During the design of the plant modifications, Barrett contacted Olympic to obtain more information on the pipeline's location and on Olympic's requirements concerning the installation

¹ Olympic consisted of a partnership between Equilon Pipeline LLC (Equilon), Atlantic Richfield, and GATX Terminal Corporation, with Equilon under contract to manage operation of the pipeline for the partnership. Since the accident several ownership and managerial changes have occurred within the Olympic organization with the overall result that British Petroleum (BP) is now the majority owner with responsibility for operation of the pipeline.

² A 5th pump was later added by the City of Bellingham.

of facilities in proximity to the pipeline. On February 18, 1993, Olympic's pipeline was "potholed" (excavated and exposed) by a Bellingham public works crew at three locations within the water treatment plant to obtain actual elevations. A one-call for this excavation work had been placed on February 12, 1993. Records indicate that Olympic personnel were present during this activity and documented the potholing on a Diagram of Changes form. During the design phase, Olympic personnel responded to three other one-call requests to the water treatment plant.

Upon completion of the design phase of the project, Barrett provided a set of plans to Olympic for review by its engineering personnel on July 30, 1993. On August 11, 1993, Olympic responded to Barrett that the clearances between the new water plant facilities and its pipeline that were proposed in the plans met or exceeded Olympic's requirements. On November 9, 1993, Barrett provided Olympic further information regarding proposed cathodic protection facilities. On November 18, 1993, Olympic notified Barrett that they found no conflict of interest with the proposed cathodic protection.

Two Olympic employees (inspectors) shared responsibility for monitoring the Dakin-Yew water treatment plant modification project and responding to locate requests, etc., in the area. Olympic's Right of Way Surveillance and Pipeline Safety Procedures called for an Olympic inspector to be on-site whenever a "contractor or property owner digs across our line(s)." For this project, both inspectors understood that one of them needed to be present whenever IMCO was working within 10 to 15 feet of the pipeline. The Olympic inspectors stated that they had notified IMCO of this requirement and had asked them to provide Olympic with advance notice whenever such excavation was to occur. They stated that they then relied primarily upon IMCO to let them know when excavation was to occur. Both of Olympic inspectors stated that they also made occasional, maybe as often as two to three times per week, unannounced visits to the site to check on the progress of the project. These site visits were not documented. Neither inspector noticed any evidence during these visits that IMCO was excavating within 10 feet of the pipeline without notifying Olympic. Both Olympic inspectors stated that whenever they were on-site witnessing the work, IMCO hand-excavated the pipeline within two feet of it as required. Neither inspector was aware of any damage having been done to the Olympic pipeline by IMCO during the Dakin-Yew modification project.

IMCO personnel also stated that Olympic representatives were on site on numerous occasions whenever excavation was performed in the vicinity of the pipeline. IMCO personnel did not report any problems contacting Olympic personnel or with Olympic's responsiveness when called to the site.

Records indicate that Olympic met with IMCO personnel on January 13, 1994, and completed an "Action Memo" documenting IMCO's receipt of Olympic's standard right-of-way stipulations and requirements. Olympic personnel also obtained another set of plans for the project at this time. A planner notation made by one of the Olympic inspectors states that these plans were sent to the Renton office. The Action Memo, under "Type of Work" listed "72" waterline, 24" ductile, 12" ductile waterline installation."

A pre-construction meeting on the Dakin-Yew modification project was held on January 25, 1994. A notation concerning the meeting entered into the planner pages of one of Olympic's

inspectors states that “this was done when we met with Chris Heart at Emco & picked up plans.” No Olympic employees were listed on the attendance roster prepared during the pre-construction meeting.

IMCO placed one-calls for the excavation activities at the water treatment plant on March 23, 1994, April 25, 1994, and May 18, 1994.³ As a result of the first of these one-calls, Olympic completed a second Action Memo on March 25, 1994, again documenting IMCO’s receipt of Olympic’s standard right-of-way stipulations and requirements. This Action Memo under “Type of Work”, listed “New construction. Install water pipelines to new water tank.”

Olympic’s inspectors did not retain a set of construction plans for their use while monitoring the Dakin-Yew water treatment plant modification project. IMCO maintained on-scene a complete working set of plans for the project that were kept updated to reflect as-built conditions. Neither Olympic inspector reported making inquiries during site visits to determine what activities were planned and how they might impact the pipeline, nor did they report reviewing the construction plans as the project progressed.

An inspection report⁴ indicates that Olympic’s pipeline was exposed on May 9, 1994, while a 72-inch diameter, steel waterline was being installed across the top of it. This waterline supplied water to the new reservoir from the existing water treatment plant. The inspection report notes that Olympic personnel were on site during the excavation.⁵ Meeting minutes from May 10, 1994, indicate that Olympic had been contacted about the placement of CDF fill atop its pipeline and that the only concerns Olympic expressed were with the cathodic protection and any re-excavation. Olympic’s pipeline was then covered with CDF fill material on May 12, 1994. According to a Diagram of Changes report prepared by Olympic personnel, dated May 19, 1994, the bottom of the waterline was 36 inches above the top of the pipeline.

An inspection report also indicates that Olympic’s pipeline was exposed, with Olympic personnel present, on July 6, 1994, during excavation to install a 24-inch ductile iron waterline crossing beneath it north of the pump station. This line was the suction line for the new pump station. Two PVC lines, one 2-inch diameter and one 4-inch diameter, were also going to be installed in the same trench. Olympic’s pipeline remained exposed throughout the construction of the waterline. Planner notes made by one of the Olympic inspectors indicates that additional site visits were probably made between July 6 and July 13, 1994. The inspection report for July 18, 1994, indicates that additional excavation was performed to realign the ditch as necessary to accommodate the new lines, again with Olympic personnel present on site. A Diagram of Changes, dated August 11, 1994, indicates that the construction of the line crossings had been completed. The Diagram of Changes reports that there were 29 inches of clearance between the bottom of Olympic’s pipeline and the top of the new waterline. The Diagram of Changes further indicates that there was 18 inches of clearance to the 2-inch PVC line and 25 inches of clearance to the 4-inch PVC line. Olympic records indicate that the coating on the bottom of the pipeline at this location was repaired on August 12, 1994.

³ The next one-call placed for this project was on October 17, 1994, as discussed later in this report.

⁴ Barrett’s on-site inspector prepared daily inspection reports documenting the progress of the project.

⁵ Although the daily inspection report indicates that a “Cascade Pipeline inspector” was present, photographs and the Barrett inspector that completed the report both confirm that it was Olympic’s pipeline that was being excavated.

Plans for Phase II of the water plant modification project included the installation of a new 24-inch diameter ductile iron discharge waterline from the new pumping station. The original design called for this discharge line to cross beneath the new 72-inch waterline and tie into an existing 16-inch waterline southwest of the pumping station. Due to a realignment of the 72-inch waterline and the presence of the CDF fill beneath it, IMCO requested that Barrett modify the design so that the new 24-inch discharge line would tie into the existing 16-inch waterline north of the 72-inch waterline, thus eliminating the need to cross beneath it. In the original design, the new 24-inch discharge line did not cross Olympic's pipeline. Once modified, the tie-in, or "tee," connecting the new 24-inch discharge waterline to the existing 16-inch waterline was directly above the Olympic pipeline. Based on the potholing done north and south of the tie-in location, the elevation of the top of Olympic's pipeline varied from 253 to 256 feet. The centerline elevation of the existing 16-inch waterline was shown as approximately 257 feet on the modified design plan. The Olympic pipeline was not depicted on this modified plan.

The installation of the tee was originally scheduled for June 22, 1994, but was later postponed until July 7, 1994.

Excavation of the existing 16-inch waterline for installation of the new tee connection began on the afternoon of July 6, 1994, in anticipation of draining the existing waterline and completing the tie-in the following day. As mentioned previously, the inspection report prepared for July 6, 1994, indicates that an Olympic representative was on site for at least a portion of the day. On July 7, 1994, it was determined that in order to maintain clearance from the pump station footings as intended, the installation of the tee would conflict with the CDF fill supporting the 72-inch waterline. Efforts to complete the tie-in on July 7, 1994, were abandoned. IMCO and Barrett personnel discussed the matter and revised the alignment of the 24-inch discharge line, effectively shifting it and the associated tee 2-3 feet northward. The excavation had to be enlarged and then, on July 8, 1994, the existing waterline was drained and the tee installed. Once the tee had been installed, the excavation remained open for several days until the discharge waterline from the pumping station was constructed and connected to the tee and the associated concrete thrust block was poured.

The project plans were modified on May 13, 1994, to reflect the proposed design change in the discharge line's location. The Barrett inspector stated that he thought he had given a plan showing the revisions to one of the Olympic inspectors. No documentation indicates that Olympic was provided with information concerning this design revision. None of the meeting minutes discussing the tee installation project mention providing Olympic with notice of the project or the scheduling changes. Both Olympic inspectors stated that they were unaware of the tee's installation above the Olympic pipeline. A Diagram of Changes form documenting the tee's installation was not located.

A concrete thrust block was installed on the west side of the tee to reinforce the connection. Photographs indicate that the thrust block had been completed by July 21, 1994.

One of the valves on the tee was reportedly inoperative because the riser installed to allow access to the underground valve stem had become misaligned during backfilling.

Excavation to expose and realign the valve risers was reportedly performed in August 1994.

A ductile iron pipeline that drains an air-gap manifold located north of the suction line crossing with Olympic's pipeline was also installed crossing beneath the Olympic pipeline. This installation was performed the last week of August 1994. Photographs indicate that the Olympic pipeline was exposed during this installation. The inspection reports do not mention the presence of Olympic personnel on site during this activity. A Diagram of Changes form documenting this crossing was not located.

A 12-inch PVC utility duct was also installed crossing above the Olympic pipeline approximately 17 feet north of the centerline of the tee. The inspection reports do not mention the presence of Olympic personnel on site as this duct was installed across the Olympic pipeline. A Diagram of Changes form documenting this crossing was not located.

On October 17, 1994, a one-call was placed for work at the water treatment plant to install fencing.

On January 2, 1996, a one-call was placed for work at the water treatment plant to excavate a valve. According to Bellingham's water treatment plant superintendent, the valve that was excavated was on a 36-inch waterline that was not near Olympic's pipeline.

No other excavation activities were discovered to have occurred within the vicinity of the pipeline rupture between 1991 and 1997.

Reported Damage to Olympic Pipeline

An electrician working for an electrical subcontractor to IMCO on the project reported that he witnessed the pipeline being struck by a backhoe operated by an IMCO employee during the project. He stated that the damage occurred just south and west of the pump station entrance and that he was told that the excavation was being performed to realign the valve risers. He further reported that the same operator damaged buried telephone lines on the same day that the pipeline was struck. The inspection report for August 11, 1994, notes that excavation is occurring in the vicinity of the pump station. The inspection report further notes that "The telephone conduit in front of SW pump station corner, 15' from the 72" line was damaged severely by Imco loader...US West personnel on site repairing wires. 2 people from noon on working on wires." Telephone company records do not document any repairs at the Dakin-Yew water treatment plant on August 11, 1994.

The inspection report for August 18, 1994, notes that "Damage to the telephone cable occurred just before noon, near treated water meter man hole. The back-hoe struck it and took ~1/2 the wires." Telephone company records indicate that telephone line repairs were performed at the Dakin-Yew water treatment plant location on August 18, 1994.

The electrician who reportedly witnessed the pipeline strike also reported that IMCO personnel made a conscious decision not to notify the Barrett inspector or Olympic about the damage. He reported that the IMCO personnel coated the area of the pipeline that had been

struck with a mastic coating and that they then covered the pipeline back up. The electrician did not report witnessing any other occasions when the pipeline was struck. Certified payroll records for the job reported that the electrician had worked 4 hours on August 11, 1994. The electrician stated that he had worked on repairing the conduit for the telephone company after the telephone lines had been damaged and that it was possible his time was charged back to IMCO for the conduit repairs.

A second electrician reportedly working at the site on the same day did not recall the event and could not verify the accuracy of the first electrician's statements.

A laborer who was working for IMCO during the Dakin-Yew water treatment plant modification project recalled IMCO hitting a pipeline on the project. He recalled recoating the damaged pipeline with a primer and white vinyl tape coating material. The laborer stated that the pipeline he had recoated was a 24-inch ductile iron water pipeline. He had reviewed photographs of Olympic's ruptured pipeline and stated that he was certain that it was not the pipeline that he had repaired.

All of the other IMCO employees interviewed denied hitting or repairing a pipeline in the vicinity of the pumping station during the Dakin-Yew water treatment plant modification project. None of the Barrett or Olympic employees interviewed reported that they were aware of any damage done to Olympic's pipeline during the project.

Post-Accident Activities at the Dakin-Yew Water Treatment Plant

After the accident, the ruptured pipeline was carefully excavated under the direction of Safety Board investigators. Excavation of the ruptured pipeline was delayed for several days due to safety concerns associated with the presence of gasoline vapors and on-going fires. The excavation was further delayed while a temporary water pumping station and waterline could be constructed to bypass the pumping station in the water treatment plant. This pumping station, which was the same station that had been completed in 1994 during the Dakin-Yew water treatment plant modification project, was damaged by the accident and the temporary facilities were necessary to ensure uninterrupted water service to the approximately 30,000 customers supplied by the system.

A crater approximately 15' in diameter was created above the rupture as the gasoline was released from the pipeline. The crater was located west of the southwest corner of the pump station. Two valve risers were visible in the crater.

On June 27, 1999, excavation began to expose and examine the ruptured pipeline. On June 30, 1999, the ruptured section of pipeline was removed, crated, and taken into custody for further examination. The ruptured section of pipe was approximately 10-1/2 feet long. Numerous gouges and dents were found on the ruptured section of pipe.

Given the presence of reported anomalies in the vicinity of the Dakin-Yew water treatment plant, a second section of pipeline, south of the ruptured section was also retrieved. Prior to excavation of the second section, the waterline tee and associated thrust block had to be

removed. It was also necessary to remove some of the CDF fill from around the Olympic pipeline to complete the cuts necessary to remove the second section of pipe. On July 8, 1999, the second section of pipe was removed, crated, and taken into custody for further examination. The second section of pipe was approximately 10 feet long. A dent was found approximately 1-1/2 feet downstream of a girth weld in the section.

The external damage to these sections of pipe is fully documented in the Materials Laboratory Factual Report.

The elevation at the top of Olympic's pipeline at the point of rupture was approximately 254.5 feet. The 72" waterline crossed approximately 68" above Olympic's pipeline, with its centerline located approximately 20 feet south of the rupture. The tie-in between the 24" and 16" waterlines, the tee, was approximately 21" above Olympic's pipeline, with its centerline located approximately 8 feet south of the rupture. A large concrete thrust block was located adjacent to the tee on its west side. The approximate elevation of the bottom of the thrust block was 254.8 feet. The 12" PVC utility conduit crossed approximately 31" above Olympic's pipeline, with its centerline located approximately 9 feet north of the rupture.

An irregular-shaped chunk of concrete was found approximately 1 foot above and slightly east of the rupture.

Allan C. Beshore
Investigator-in-charge

List of Appendices

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- B. Dakin-Yew Water Treatment Plant Modification Records
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- E. Phone Line Repair Records
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- G. Ken Roberts, Olympic – Interview Transcript
- H. George Nordby, Barrett – Interview and Deposition Transcripts
- I. John Hatch, Barrett – Interview and Deposition Transcripts
- J. Tom Franklin, Barrett – Interview and Deposition Transcripts
- K. Frank Imhof, IMCO – Interview Transcript
- L. Greg Burress, IMCO – Interview Transcript
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- S. Post-accident Excavation Photographs
- T. Post-accident Site Surveys