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LAKE OSWEGO FIRST TO USE HDPE PIPE FOR SUBMERGED GRAVITY FLOW PIPELINE

Saving Time and Money, New Interceptor Line Also Protects Land, Lake and Residents
-Named PPI Project of the Year-

LAKE OSWEGO, Ore. - The new wastewater interceptor line being built here is the first of its kind to use a submerged pipeline in a gravity flow design for the conveyance of wastewater. High-density polyethylene (HDPE) pipe will create a corrosion resistant pipeline with a life cycle in excess of 100 years and withstand earthquake activity was selected for the project. The HDPE pipe is replacing cast iron and concrete cylinder pipe installed in the 1960's. Nicknamed 'LOIS' for Lake Oswego Interceptor Sewer, the project started in October 2009 and is expected to be completed in mid to late 2011.

Located in northwest Oregon just eight miles south of Portland, the area is primarily a residential community of some 35,000 residents, and the 405 acre lake.

After nearly half a century of serving the Lake Oswego community, the concrete and cast iron, in-lake interceptor system needed to be upgraded. The system was corroded, undersized, and at risk of failing in an earthquake. If a collapse were to occur, millions of gallons of untreated wastewater would enter the lake and millions of gallons of lake water would drain downstream to the receiving treatment plant and overwhelm its hydraulic capacity.

Between 2000 and 2006, engineers at Brown and Caldwell (Walnut Creek, Calif.) evaluated different options for addressing the weaknesses in the existing interceptor and concluded that replacing the existing system was the best way for the City to proceed.

In 2007, after many public hearings and community briefings on replacement alternatives, the City Council accepted the recommendation to replace the system with a combination of pile-supported pipe and a submerged, buoyant, gravity-flow pipeline.

Engineers designed the HDPE pipeline to allow for 14-foot expansions and contractions during temperature changes that could vary 35-4-F depending on seasonal shifts. To allow for these shifts, the pipeline was formed in "S-Curves" to limit horizontal movement.

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"It's easy to take good engineering for granted, particularly when bad engineering makes the press: bridges failing, tunnels collapsing, old water systems crumbling and buildings falling apart. But, good engineering, when done right, is a beautiful thing," stated Tony Radoszewski, executive director of the Plastics Pipe Institute, Inc. (PPI), a non-profit trade association.

"The Lake Oswego Interceptor Sewer project is an outstanding example of engineering that will do more than just get the job done; it is a challenging project solved by ingenuity and innovation.

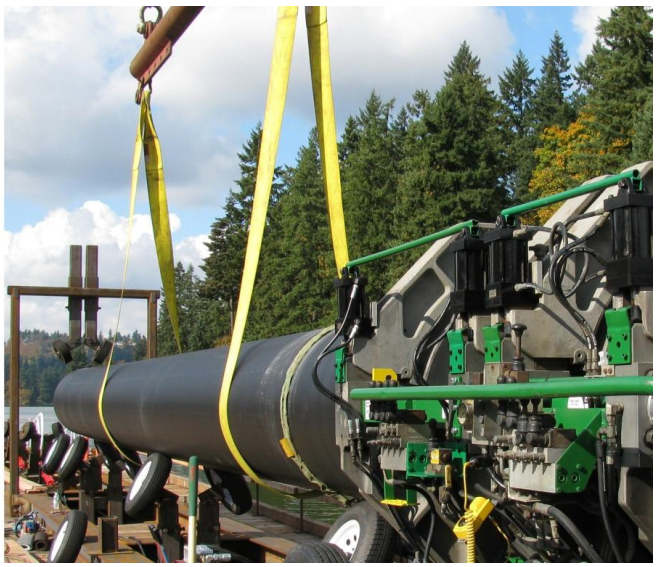
"The project is using HDPE pipe in a new application. Not only does the project further the application of HDPE pipe and impact future wastewater projects, but it also demonstrates the unique benefits and flexibility of HDPE.

"Engineers evaluated alternative plans for going around Oswego Lake or using different materials for the in-water interceptor," Radoszewski continued, "but arrived on using HDPE to go through the lake because it was the best material to withstand corrosion, would result in the fewest number of joints and could function as a submerged, buoyant, gravity-based system to move wastewater.

"This project is an inspiring illustration of how HDPE pipe can be adapted for gravity flow conveyance in a marine environment using innovation and creativity."

Joel Komarek, project director of the City of Lake Oswego, stated in an on-line LOIS project video, "We chose it (the HDPE pipe) because it's impact resistant and corrosion resistant and better than all the other pipe materials we looked at."

The main sewer line will use 10,800 feet of 42-inch diameter DR 13.5 HDPE pipe. The lake will contain 8,000 feet of 30-inch diameter DR 13.5 HDPE pipe that will be used to construct the buoyancy float system. For the laterals to connect the main line, 2,000 feet of 24-inch and 22-inch diameter pipe will be used.



Use of fused HDPE pipe saved time and money plus protects land, lake and residents. It was named the PPI Project of the Year.

Performance Pipe, a division of Chevron Phillips Chemical Company, LP, manufacturer of the pipe used, is a PPI member. Other PPI members participating in the LOIS project include Ferguson Waterworks and Ferguson Industrial Plastics. The Plastics Pipe Institute, Inc. (PPI) is a Texas-based, non-profit organization, founded in 1950, that is the major trade association representing all segments of the plastic piping industry. It is a technical, engineering and industry knowledge resource that publishes data for use in development and design of plastic pipe systems.

"HDPE pipe will enable creation of a pipeline with the lowest projected 100-year life cycle

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cost," pointed out PPI's Radoszewski, "because it won't rust, and can withstand seismic activity and still perform under drought and flood conditions that would lower and raise the level of water in the lake," he explained.

"Another favorable attribute of this design is that using HDPE pipe to construct a shorter, less disruptive gravity-flow pipeline is a 'low-impact-development' approach. It will consume fewer natural resources during construction, limit digging up land and it will take less energy to operate, all of which produces a smaller carbon footprint."

Floating System Design and Construction

The engineering team designed a strong pipe system utilizing HDPE. Fifty-foot pipe lengths were fused together into 1,200 to 1,500-foot segments. With walls three inches thick, the pipe can resist more than 2.5 times the maximum water pressure for a projected life of more than 100 years.

Engineers designed a pipe system that allowed for 14-foot expansions and contractions of the pipe during temperature changes that could vary 35-40 degrees F depending on seasonal shifts. To allow for these shifts, the pipeline was formed in waves or "S-Curves" to limit horizontal movement. Engineers also had to control the upward and downward movement by holding the pipe under the lake surface using ground anchors connected to pipe tether brackets that also held additional buoyancy pipes to assure proper tension of the wire-rope tethers under all design conditions: from empty through full flows with 8-inches of debris in the pipe. These and other design considerations ensure that the pipe will continue to maintain the proper seven foot slope along the two-mile long pipe run to deliver wastewater through a gravity system on its way to the treatment plant.

The new sewer interceptor is the first to use a submerged HDPE pipe held under the lake's surface for the conveyance of wastewater.

To float the pipeline, 30-inch diameter buoyancy pipes filled with air create additional upward buoyant forces to maintain the required elevation for gravity flow and control tension on the tethers. HDPE was selected due to the pipe's inherent buoyancy in water.

The new interceptor system will be held under the lake's surface by ground anchors. Custom fabricated stainless steel wire rope tethers connect the 428 ground anchors to tether brackets that hold the main pipe and additional buoyancy 'baskets' in place at specified grades to allow wastewater to flow by gravity to the wastewater treatment plant.

The ground anchors were drilled through lake-bottom sediments, sometimes hundreds of feet thick, and grouted into bedrock. Every installed anchor was tested to withstand 150 percent more load than needed. Anchor spacing was limited to 25-feet on center and the anchors could not vary from specified coordinates by more than 6-inches in the XY

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position regardless of depth. At this spacing, the upward deflection or "sea-serpenting" of the HDPE pipe between anchors was limited to no more than ¼ inch. These exacting tolerances will ensure proper slope and flow velocities in the pipe to minimize future cleaning.

Mayor Plans for Future Infrastructure

"When I talk with other mayors, a reoccurring concern is our infrastructure," stated City of Lake Oswego Mayor Jack Hoffman. "Safe and reliable infrastructure is one of many components of a great community. Our city, like all the cities in our region and like tens of thousands of cities across our nation, has an aging infrastructure. If we don't responsibly invest and maintain it, we risk potential loss of property or life that could financially burden our citizens. Clean water, safe sewerage systems and good roads are just part of our paramount responsibilities."

Located in northwest Oregon eight miles south of Portland, the Lake Oswego area is primarily a residential community of some 35,000 residents and the 405-acre lake.

The cost of the in-lake portion of the new system is estimated at $95 million which is $25 million less than an around-the-lake pumped system. The city is financing the project through revenue bonds and residents will see a 30% rate increase for the next two years, followed by a 17% and a 14% increase to pay for the new system.

"In 2010, Lake Oswego celebrated its centennial," continued Mayor Hoffman. "For me, this was not only a time to contemplate how far we've come with our infrastructure, but just how much attention we need to continue to give to it in order to ensure that our investment lasts."

Looking ahead, Mayor Hoffman concluded, "The City of Lake Oswego is fortunate for the good decisions of the past 100 years that have created, protected and enhanced our property values and the quality of life we continue to enjoy today."

For more information, visit the Plastics Pipe Institute website: www.plasticpipe.org.

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About PPI:

The Plastics Pipe Institute Inc. (PPI) is the major trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastics as the material of choice for pipe applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in development and design of plastic pipe systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.