



A Balancing Act

BELOW GRADE

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Photos Courtesy of
Wade Trim

A light dusting of snow blankets the staircase of earth forming the sides of a 50-foot-deep mass excavation. Merlyn Contractors, Inc., Novi, sculpted a series of stepped tiers over the course of an unpredictable Michigan winter, managing the excavation of Van Buren Township's new equalization basin with the same precision as the cut terrace of clay and sand chiseled into the site near Hannan and Wabash Roads. As excavation and site utilities subcontractor, Merlyn and its convoy of excavators cleaved the earth to plant the seeds of an award-winning wet weather project created to block flooding and

protect waterways through the prevention of sanitary sewer overflows (SSO).

The unofficial motto of this cost and environmentally conscious undertaking could have been Reduce, Reuse and Replant. Taylor-based Wade Trim's cost-effective design of this sanitary sewer equalization system reduced the size of the new basin, in part, by making use of existing sewer lines. "The project even reused components of an old wastewater treatment plant abandoned on the site nearly 40 years ago," said Greg Svabik, project manager for Walbridge, Detroit, the general contractor for the second of two project contracts. The project

reused an 110,000-gallon tank from the former plant for the storage of on-site stormwater, ultimately using the water to flush the new basin and to help the entire site achieve zero stormwater discharge. Capping off the project, the planting of native prairie grass and wetland mitigation turned this former nuisance site into a pleasant expanse, easily blending with the leafy vista of the nearby Lower Huron Metropark.

Clearly, this installation required expert navigation around an array of site constraints, ranging from carving a deep excavation on a small site to excavating in



New design criteria, based on expected future performance of SSO control rather than a hypothetical 25-year design storm, was developed with MDEQ to determine the equalization basin's storage volume, resulting in a cost-effective solution that meets regulatory objectives.

close proximity to the reused tank. "One of many constraints was excavating below and next to the retained portion of the old wastewater treatment plant structure," said Robert Solway, president of this experienced earthwork firm established in 1990. Merlyn's lengthy roster of accomplished LEED projects includes the Blue Cross Blue Shield of Michigan parking structure in downtown Detroit, a corporate expansion and pond remediation for Delta Dental in Okemos, and the conversion of a former power plant into the Accident Fund Headquarters in Lansing. The firm's accomplishments also include the excavation and site utilities contract for the upgrade and expansion of a waste treatment facility for the Ypsilanti Community Utilities Authority.

Walbridge steered the project around another series of obstacles, including rerouting an existing drainage ditch near the basin excavation. The soil of the site also yielded several unexpected discoveries, ranging from an abandoned fuel tank to a threatened wildflower. "The abandoned fuel tank had to be properly abated and surrounding soil monitored for any possible remaining fuel," said Svabik. Of the rare wild plant, David Nummer, PE, Wade Trim project engineer, added, "Although the Goldenseal, a threatened wildflower, was not in the active construction site, fencing was installed to protect the plant."

This demanding project contained innumerable challenges wrapped into two separate contracts. Executed by Six S, Inc.,



A three-mile force main constructed through urban and environmentally sensitive areas, connects the North Huron Valley/Rouge Valley system to the Downriver system and basin, providing more in-system storage capacity for wet weather flows.

Waterford, Contract 1 consisted of three miles of 16-inch force main and a 3,000 gpm pump station, said Nummer in a written statement. Managed by Walbridge, Contract 2 focused on construction of the 1.3 million gallon equalization basin and two forced mains. The entire \$11.3 million project earned an American Council of Engineering Companies of Michigan Engineering Honorable Conceptor Award and an American Public Works Association-Michigan Chapter Project of the Year Award in the Environment category for projects ranging from \$10 million to \$100 million.

A SYSTEM OUT OF BALANCE

The project's mission was to expand the capacities of Van Buren Township's sanitary sewer system, for when Old Man Winter melted or heavy rains fell, the aging system did not have the capacity to handle the influx. Any overflow carried the potential for overburdening the subterranean web of wastewater infrastructure connecting a number of communities across Southeast Michigan.

According to Nummer, the Van Buren Township system is located upstream of three separate wastewater transport and treatment systems: the North Huron Valley/Rouge Valley System, the South Huron Valley Utility Authority, and the Downriver Interceptor System. Because of its pivotal location, the township's aging sewers left residents, downstream communities, and regional waterways vulnerable to sanitary sewer overflows. Wade Trim's design offered a

cost-effective solution that accommodated the township's flows while meeting their contract capacities for discharging into these three regional wastewater systems. Basically, fixing the problem upstream prevents potential problems downstream.

In this cost-effective design, the basin, force main and pump station work in concert with existing sewer infrastructure to keep waterways clean and basements dry. "Wade Trim engineers developed a hydraulic model to determine how much storage capacity was needed during wet weather and how sewage flows could be routed through existing sewer pipes to use available capacity in each transport system," said Nummer. "...A series of diversions were installed in existing sanitary sewers to distribute high wet weather flows among the three systems' available capacity, bringing the overall system into balance and ultimately sending above contract capacity flows to the equalization basin for temporary storage.

"This project demonstrates that wet weather transport and treatment constraints can be addressed by optimizing existing collection system capacity and providing additional capacity with flexible, small storage facilities instead of building new, large facilities," Nummer added.

A BACKYARD FOR BACKFILL

Merlyn was on site for the duration of the yearlong project, first razing the site and leaving a blank expanse of earth for the mass excavation of the 90-foot-wide by 200-foot-long basin. Two excavators worked in tandem, the one placed in the very depths of the mass excavation transferring its load to another positioned at a higher point to more easily transfer the spoils to a waiting convoy of trucks from John D. Osborne Trucking.

For safety, Merlyn carved the deep excavation with stepped tiers and a suitable angle of repose stretching back almost 50 feet from the actual basin footprint. The angle of repose, coupled with other significant site constraints, left little room for stockpiling the 20,000 cubic yards of backfill and topsoil that needed to be reserved from "the big dig" of over 40,000 cubic yards of western Wayne County dirt. A local property owner opened his nearby field for temporary soil storage, offering a sound alternative to hauling and storing the soils at a distant location. "We stockpiled the topsoil to be reused on site and a portion of the backfill on an adjoining rented piece of land," said Solway.

This accommodating neighbor eased some of the strain of winter construction, a season often impacted by state requirements for reduced load limits on trucking during freeze-thaw periods. "We can only haul half loads during those periods, which decreases efficiency," said Solway. But winter excavation was a benefit to the residents living across the road. "All major basin excavation and concrete pours were performed in the winter months to help alleviate residents' concerns about construction impacts, such as dust," said Nummer.

TAMING A RIVER OF STORMWATER

As a whole, "tight site constraints on the basin site posed by the former wastewater treatment plant infrastructure and by an existing drainage ditch initially limited the work area to about half of the 5-acre site," said Nummer. In fact, the existing drainage ditch ran straight through the center of the active jobsite. "Stormwater from Hannan and Wabash Roads was sent to the Huron River via an existing drainage ditch at the center of the new building area," said Svabik.

Walbridge worked with Wade Trim and Wayne County in the early planning stages to discuss options and resolve concerns imposed by this river of stormwater. "In the contractors' planning sessions, the proximity of the existing drainage ditch to the proposed limits of excavation was the first issue to address," said Nummer. "Maintaining an open ditch along the top of a 50-foot-deep excavation was not practical or safe. Also, to maintain the open ditch during construction would require the crawler crane for the concrete work to be positioned much further south, which would require larger equipment and further reduce available space on site."

As a solution, "the contractors proposed installation of a temporary, 12-inch corrugated conduit to divert the flow during construction," said Svabik. Nummer adds further details to the plan: "Routing the drain into the corrugated metal pipe further south on the site allowed excavation to proceed without pumping stormwater. The crawler crane that supported the concrete work was then positioned above the pipe for better access to the work area." Although fully enclosed during the construction phase, the final ditch combined open and closed portions, Nummer added.

DIRECTING THE FLOW

Diverting the drainage ditch during construction was not the only stream subject to control. "Walbridge constructed

two new forced mains designed to pump water from the new basin back into the sewer system once the flow levels return to normal within the sanitary sewer system," said Svabik. Merlyn aided the effort to divert flow into the basin during high flow conditions from the Downriver interceptor sewer connection. Renting a crane and taking care to avoid a web of overhead electric lines, as well as shoring a pole, Merlyn hoisted, lowered, and set a 10-foot-diameter diversion chamber around an existing 42-inch sewer pipe located almost 40 feet below grade. "We had to use a crane, because the structure was too heavy for a typical excavator," said Solway.

"The chamber or manhole was constructed around the sewer line and new 36-inch reinforced concrete pipe was installed from the chamber to the basin," said Svabik. "The chamber has a hydraulic gate that can open and close to allow material into the basin. Sensors read the elevation and flow rate of material within the sewer pipe to signal when to open the gate and allow sewage into the basin."

Added Nummer, "The basis of design for the basin was very complex, involving inflow from three systems and maintaining outflow to contractual limits. Flow was maintained in all three systems during the entire construction period."

"GREEN" STORMWATER PRACTICES

This commendable project also serves as a role model for "green" stormwater management. The basin site has achieved zero discharge of stormwater through the use of bioswales and the reuse and modification of the former wastewater treatment plant tank. Nummer explains the overall strategy: "Bioswales were designed to collect stormwater on the surface, filter it through drain tiles, and direct it into the tank below. After the equalization basin is dewatered, stormwater collected in the tank is used to clean and flush the equalization basin."

The basin itself sports a lush crop of native grasses. "The earth-covered basin is an extension of the natural landscape, affording Metropark users a view of a grass-covered hill," said Nummer. The low-maintenance, no-mow native prairie grass covers the site, promoting ground water infiltration, decreasing the amount of stormwater runoff, and reducing maintenance costs.

In other botanical additions, "construction activities on the basin site and force main required wetland mitigation, which included planting native species for re-establishment of wetland plants," said Nummer.



Because of the basin's 50-foot-depth, two excavators worked in tandem to more easily transfer the spoils to the trucks, provided by John D. Osborne Trucking.

WADE TRIM AND SIX S TACKLE FIRST PHASE OF VAN BUREN SSO PROJECT

Construction of Van Buren Township's wet weather project was divided into two contracts both funded through the State Revolving Fund. Wade Trim, Taylor, designed and Six S, Inc., Waterford, built the first contract consisting of three miles of 16-inch force main and a 3,000 gpm pump station. David Nummer PE, Wade Trim project engineer, describes the work involved: "The force main was constructed along Haggerty Road using open-cut methods supplemented with directional drilling and jack and bore at crossings. High Density Polyethylene (HDPE) pipe was used with directional drilling, since it was the only type of pipe suitable for this construction method. The force main depth was relatively shallow with only six feet of cover.

"The route follows Haggerty Road for two miles and then crosses under I-94. Directional drilling was used for the freeway

crossing. Permits were obtained from the Wayne County Road Commission as well as the Michigan Department of Transportation. For about half the length of Haggerty, the force main was placed underneath the drainage ditch. The final mile of the force main crosses under railroad tracks and Belleville Lake before discharging into the Downriver Interceptor. Directional drilling was used for these crossings.

"Constructing the force main connection into the North Huron Valley System was particularly challenging. This developed area is congested with numerous utilities, including a 36-inch gas main, three other gas mains, two water mains, one sanitary sewer, and a telephone fiber optic line. Careful review of existing drawings from a previous project as part of advance construction planning enabled construction through this area without any problems."

The project team has certainly created a visually pleasing project acceptable to the residences lining the nearby roadway. "Native plantings and woodland species screen the facility from adjacent residential properties," said Nummer. "Concerns about odor and noise were addressed by isolating equipment in an earth-sheltered, reinforced concrete structure. In addition, the visible portion of the control building has an architectural concrete stonewall finish that is pleasing and that minimizes maintenance needs.

"Residents also benefited from improvements to a county drain that had longstanding flooding problems that were undertaken in conjunction with force main construction," added Nummer. "Restoration work included regrading the drain to improve its operation during heavy rain."

Merlyn was a part of a project team who delivered a complex and diverse job under budget thanks to monthly progress meetings and close coordination throughout the job. Other subcontractors on the project included R.L. Shekell, Inc., Wayne, the concrete contractor responsible for the placement of over 5,000 cubic yards of concrete for the basin; mechanical, J.F. Cavanaugh Company, Farmington Hills; and electric, Doublejack Electric Co., Inc., Royal Oak.

Storm drains, sanitary sewers, pump stations, and forced mains are the hidden and decidedly unglamorous part of the built environment, but without this grid below grade, rivers would be dirtier and basements would flood far more frequently. Clean water and dry communities are the blessings gained by the efforts of the expert team of Wade Trim, Walbridge, Six S, Inc. and Merlyn Contractors. ♦♦



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