

## Concreting daily for more than a year

Columbus, Ohio, the fifteenth largest city in the U.S., has been experiencing tremendous growth, prompting officials to expand one of their major wastewater treatment plants. The additional capacity will provide more reliable wastewater treatment service to a larger area and a larger population comprising this central Ohio metropolis. To construct a stable and secure facility, a substantial amount of concrete has been incorporated into the work every day (weather permitting) since June 2005.

### Large undertaking

The expansion involves two projects; the Southerly Wastewater Treatment Plant (SWWTP) Headworks project (a new "gateway" to the existing treatment facility) and the adjoining Big Walnut Augmentation/Rickenbacker Interceptor (BWARI) tunnel (which will convey sewerage to the enlarged treatment facility). Serving as the Construction Manager for all aspects of the work, the Columbus-based, multifaceted consulting firm, H.R. Gray, Inc., is overseeing both projects.

All of the influent to the SWWTP will flow into the Raw Sewage Pump Building where it will be pumped up to the Grit and Screen Facilities before it is sent to the existing treatment facility. The new Headworks will have a pumping capacity of 450 million gallons per day (MGD). Designed by Malcolm Pirnie, of Columbus, OH, the general contractor for the \$50,868,825 million Raw Sewage Pump Building is C.J. Mahan Construction Co., of Grove City, OH, and the general contractor for the \$43,691,550 million Screen and Grit Facilities is the heavy industrial division of Kokosing Construction Company Inc., of Westerville, OH. All concrete work on the Headworks Project was self-performed by the general contractors.

The BWARI project, with a construction budget of more than \$150 million, will yield two soft ground sanitary sewer tunnels, 21,000 and 13,000 ft in length, with finish (interior) diameters of 14 and 12 ft respectively. Further, the project includes an additional 470 linear ft of 14 ft diameter tunnel, 4,500 linear ft of 42-in. open-cut sewer construction, and 1,000 linear ft of 42-in. trenchless sewer construction, as well as a large gate/drop structure. The general contractors are joint ventures who are self-performing the concrete work. These joint ventures are Jay Dee/Michels/Traylor, of Livonia, MI, and McNally/Kiewit of Westlake,

OH. The BWARI project was designed by URS Corp., of San Francisco, CA and LACHEL Felice & Associates, of Golden, CO.

### Excavation

The SWWTP Headworks Project began with a 66-foot deep excavation, which was into shale. The excavation for the starter section for the BWARI Tunnel averaged about 35 ft below grade and was designed to drain into the new Headworks. Since the SWWTP facility is close to the Scioto River, existing groundwater conditions presented a challenge to the excavations.



More than 50,000 yd<sup>3</sup> of concrete will be used to complete this expansion of the Southerly Wastewater Treatment Plant for Columbus, OH.

### Concrete

As the excavation progressed for the Headworks Project, H.R. Gray began the monumental task of scheduling and inspecting the placement of more than 50,000 yd<sup>3</sup> of concrete between two separate construction contracts. H.R. Gray also was responsible for all concrete sampling and testing for both projects. "We have been pouring concrete at the site since June 1, 2005 and have poured every day as long as the weather permits," said George Bates, Senior Construction Manager at H.R. Gray.

The largest concrete pour was 1,500 yd<sup>3</sup> for the lowest section of the base slab for the Raw Sewage Pump Building – a component of the Headworks Project. The weight of the

91-ft by 148-ft by 7-ft-thick, mass concrete foundation will resist flotation of the structure threatened by the site's high groundwater level.

A special concrete mix was used to accommodate this massive pour. "The heat of hydration can be very excessive with mass concrete pours," said Bates. "We have the concrete delivered to the site as cool as possible and even add ice to the mix during the warm summer months. Further, cooling lines (heat transfer pipes) were installed in the mass pours to control the heat of hydration as the concrete hardened."

The concrete mix for the mass pours on these projects had a substantial portion of the cement content replaced with supplemental cementitious material (ground granulated blast-furnace slag or GGBFS) to help control the heat of hydration, yet still provide the design strength. The mix, which was designed to achieve 4,500 psi in 56 days (rather than the normal 28 days), included 227 lb of Type 1/II Portland cement, 415 lb of GGBFS, 395 lb of No. 4 coarse aggregate, 1,167 lb of No. 57 coarse aggregate, 182 lb of No. 8 coarse aggregate and 1,232 lb of natural sand per cubic yard, with a maximum water-cementitious ratio of 0.42, and 5 percent entrained air.

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### Major reconstruction of Cleveland's Euclid, Continued from page 7

portion of the roadway with cars and pedestrians using the outside lanes. Also known as a Bus Rapid Transit (BRT) system, the new buses called rapid transit vehicles, will have priority. The traffic signals will be programmed to give approaching rapid transit vehicles the right-of-way.



Seen here in front of Cleveland State University, new Euclid Avenue pavement (in foreground) will have doweled joints at 15 ft spacing and tied longitudinal joints.

This \$200 million project is headed by the Greater Cleveland Regional Transit Authority (GCRTA), with joint efforts from the Federal Transit Authority (FTA), the Ohio Department of Transportation (ODOT), the City of Cleveland and the Northeast Ohio Area-wide Coordinating Agency (NOACA). Work on the project commenced in March 2006 and is expected to be complete in December 2008. The project was designed by Wilbur Smith Associates (Cleveland Office).

Perk Construction, of Cleveland, is the contractor for one of the six Corridor Project segments (the part extending from Public Square to E 30<sup>th</sup> Street), with the concrete being supplied by Tech Ready Mix, also of Cleveland. Quality Control Inspection, Inc., of Bedford OH is providing inspection services and serving as Resident Engineer.

The street is being constructed with 10 in. thick non-reinforced concrete using doweled joints at 15 ft intervals. The inside (median side) 12 ft wide exclusive rapid transit vehicle lanes are slipformed and the outside car travel lanes are mechanically

screeded between the curbs and the previously placed bus lane.

The concrete mix design is a modified ODOT Specification Item 499 Class C mix using 650 lbs of cement instead of 600 lbs, and a maximum water-cementitious ratio of 0.45. Approximately 63,000 yd<sup>3</sup> of 10 in. pavement will be constructed for the total project.

In a separate, but concurrent project in the Corridor, the City of Cleveland is specifying low strength mortar (LSM) to fill some of the sidewalk vaults in front of the businesses. This work is mostly in areas where the vaults had to be abandoned due to installation of proposed tree pits and where roadway widening encroached on the vaults.

When complete in 2008, the Euclid Corridor will be served with 20 new, articulated 62 ft long rapid transit vehicles that will allow a 115 passenger capacity. The vehicles will utilize diesel/electric technology to provide electric power to the drivetrain.

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Concrete for the two projects was supplied by two local ready mix producers, Anderson Concrete Corp. and Harmon Concrete (formerly F.W. Slotter, Inc.) Several pours were made at night to avoid rush hour traffic on U.S. 23, a major thoroughfare adjacent to the work. Additionally, the night pours helped to ensure a continuous pour of concrete because of reduced demand for the materials during those hours.

#### Completion

The SWWTP Headworks Project is expected to accept flow in the spring of 2007, about twelve months ahead of the BWARI tunnel project completion. These improvements are designed to relieve the area's existing 108-inch Big Walnut Outfall Sewer, provide sewer service to new developments, and accommodate approximately 37 million

gallons of storage to reduce sewage overflows. Further, the improvements will provide the required downstream capacity for the City of Columbus' long-term Wet Weather Management Plan. These projects are part of a series of capital improvements in an overall program intended to significantly increase the capacity of the Columbus sanitary sewer system by the middle of 2008.

### Revitalizing Cincinnati's Fountain Square, Continued from page 9

was supplied by Hilltop Basic Resources, Inc., of Cincinnati, with testing and inspection services performed by the HC Nutting Company, also of Cincinnati.

Thin bonded topping slabs were required to provide sub-surface drainage at the existing garage roof structure and other ancillary areas. In some areas, a lightweight concrete topping was used to provide additional structural depth to carry increased loadings. The design required a low shrinkage concrete. The mix chosen, incorporated shrinkage reducing agents (SRA) and macro-fibers. Hilltop produced this mixture with specialty concrete additives, Eclipse Plus SRA and Strux 90/40 synthetic fiber produced by Grace Construction Products.

The pervious concrete used throughout the project was also installed by 21<sup>st</sup> Century Concrete. This open-textured material was specified to provide a free draining rigid base beneath a pedestrian surface of granite pavers that surround tree and planting bed areas. The pervious concrete layer is intended to facilitate water and oxygen access to the root beds of the plants.

Other, more typical concrete mixtures for new wall, foundation, curb, and other construction made up most of the 1,400+ cubic yards of concrete placed in these projects. The \$28.5 million plaza project, with the \$14.2 million parking garage improvement beneath it, was officially opened on Saturday, October 14, 2006.



The 1871 Tyler Davidson Fountain, featuring the Genus of Water, still the focal point for the revitalized Fountain Square in Cincinnati; seen here as concrete work was being performed.