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A precast concrete tank provided the perfect solution for an office expansion at Menard's corporate offices Photo courtesy of Wieser Concrete Products.

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## **Specifier Q&A:** Horacio Juarez

This issue, *Precast Solutions* hears from Horacio Juarez, senior project manager with CDMSmith, Inc.

## What's your background and area of expertise?

I have more than 30 years of engineering and management experience in all facets of water and wastewater infrastructure. I have water and wastewater experience in planning, design, construction management, scheduling, review and systems evaluation/analysis. I have experience in field inspection and construction management services for water, wastewater and storm sewer projects.

My expertise is the design and construction of large diameter water transmission mains and wastewater interceptors. I also have extensive experience in the design and construction of raw water well fields and the equipping of these well fields.

## What types of projects do you typically oversee?

I oversee a range of projects from facility plans and technical memorandums to water and wastewater infrastructure designs, well field design, water treatment and wastewater treatment plant improvements and construction management.



Horacio Juarez

## What are some noteworthy projects on which you've used precast concrete?

One of the noteworthy projects which precast concrete was used was for a large diameter wastewater interceptor project. The project was designed in several phases and was completed in 7 years. The 15 mile interceptor required several 60-inch and 72-inch diameter concrete manholes ranging in depths from 10-to-40 feet in some locations. A hexagonshaped manhole was designed, precast and installed to allow two new interceptors to be added to an existing interceptor outfall.



Precast concrete products were used for a large street and drainage project for the City of El Paso thanks to the material's ease of installation, durability and affordability.



## Why was precast chosen for those projects?

Precast was selected for the project because of ease of installation, affordability, durability and the ability to withstand natural conditions.

## Why is precast concrete beneficial for wastewater projects?

Precast concrete is beneficial to wastewater projects because of its compressive strength in deep installations, low maintenance, and it can be customized for any situation.

## How do you see the role of precast concrete as a building material changing in the future?

Concrete is the most used building material. Precast concrete has played a big role in the past and will do so in the future when it comes to building infrastructure that needs to be affordable, aesthetically pleasing and environmentally friendly. **PS** 

# **Top 10 Tips** for Onsite Wastewater Tanks

By Kayla Hanson

Ater and wastewater treatment structures play crucial roles in our daily lives. Like most aspects of underground infrastructure, however, society remains largely unaware of their presence and the breadth of their impact unless something goes wrong that threatens our health and safety.

These structures – specifically septic tanks and grease interceptors – often serve as the heart of treatment systems. Each subsequent step of treatment and conveyance relies on the tank's performance. It is imperative for these critical structures to be designed, manufactured, tested and installed properly to ensure they perform reliably throughout their service lives.

Using these tips for wastewater tanks will help ensure they are efficient and dependable for decades to come.

### 1. REQUIRE THOROUGH QA/QC PRACTICES

All septic tanks and grease interceptors, regardless of material, should be manufactured in accordance with a detailed quality assurance/quality control plan. At a minimum, and where local codes do not specify otherwise, precast concrete septic tanks should be produced in accordance with ASTM C1227, "Standard Specification for Precast Concrete Septic Tanks," and precast concrete gravity grease interceptors should be manufactured in accordance with ASTM C1613, "Standard Specification for Precast Concrete Gravity Grease Interceptors." These standards set forth requirements for design, construction materials, manufacture and testing of these structures. Manufacturers should also have a quality program that goes beyond just inspecting the final product. A thorough QA/QC program is active from raw material acquisition to product shipment.



## 2. DESIGN FOR VEHICULAR TRAFFIC

Precast concrete septic tanks and grease interceptors are often exposed to vehicular traffic, and as such must be designed to accommodate the corresponding loads. Traffic-rated tanks require proper design of both the tank and its lid in accordance with ASTM C890, "Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures," or other applicable standards in the jurisdiction.

### **3. REQUIRE BAFFLES AND FILTERS**

Each tank inlet and outlet shall be outfitted with a baffle or tee to help control the flow pattern. Outlet filters should be used to retain any larger particles that did not settle in the tank to prevent them from being discharged to the leach field or sewer. Baffles and tees must be made of corrosion-resistant material and can be cast monolithically in the tank.



## 4. CONDUCT WATERTIGHTNESS TESTING

Septic tanks and grease interceptors may be tested for watertightness using the hydrostatic or the vacuum method, which are outlined in ASTM C1227 and ASTM C1613. The tests can be conducted at the manufacturing facility, on the jobsite or after the tank has been placed in its excavation prior to backfill. Testing should not be conducted after backfill due to both safety concerns as well as challenges with identifying the location of a potential leak. Testing frequency requirements vary with each jurisdiction; however, at least one tank from each form used in manufacturing should be tested annually.

### 5. EXECUTE JOINTS PROPERLY

Mid-seam tanks, also referred to as two-piece or clamshell tanks, often use interlocking joints like shiplap or tongue and groove. Top-seam or one-piece tanks can employ interlocking joints, lap joints or slab joints. Regardless of the type or location, all joints must be manufactured and sealed properly to ensure the structure's watertightness. According to ASTM C1227, the maximum allowable gap between two mating joint surfaces before applying sealant is 3/8 inch.



## 6. USE PREFORMED, FLEXIBLE JOINT SEALANTS

Preformed, flexible joint sealants conforming to ASTM C990, "Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants," must be used to seal joints and access points. Sealants should be applied to surfaces that are clean, dry and free of foreign substances. Follow each sealant manufacturer's instructions regarding proper application and compression. Avoid using rigid materials for sealants and connectors as they are likely to crack during backfill and service and are unlikely to create a watertight barrier.

At a minimum, when applying joint sealant, ensure:

- The sealant is positioned as close to the center of the joint as possible so the entire rope of sealant is contained within the joint.
- The rope of sealant travels around the corner of the tank and extends at least 12 inches beyond the corner before terminating.
- Adjoining pieces or ends of sealant overlap at least 12 inches and are thoroughly kneaded together to create one homogeneous, continuous rope of sealant.

## 7. REQUIRE RESILIENT CONNECTORS

All pipe-to-tank penetrations should be outfitted with watertight, resilient connectors conforming to ASTM Cl644, "Standard Specification for Resilient Connectors Between Reinforced Concrete On-Site Wastewater Tanks and Pipes." These connectors must prevent infiltration and exfiltration of liquids, as well as loss of vacuum. Resilient connectors may be cast into the structure at the manufacturing facility or assembled on the jobsite. Like sealant materials, resilient connectors – rather than rigid connection materials – ensure the penetration will remain watertight after backfill and in service while allowing some movement of the pipe.

## 8. ENSURE PROPER BEDDING

Proper evaluation of the jobsite's soil conditions and water table is necessary to determine the appropriate bedding and backfill materials. Tank bedding generally consists of a wellcompacted, level, uniform base topped with at least 4 inches of sand or other granular material to serve as a bearing surface for the tank. The bedding and bearing surface must be free of debris or larger rocks, which could introduce point loads on the base of the tank. Providing a well-compacted, uniform bearing surface for the base of the tank will help ensure the structure remains level and prevent future settling.



## 9. USE STRUCTURALLY SOUND, WATERTIGHT RISERS

Concrete tanks may use adjustment rings, riser bases, risers and riser lids made of concrete, HDPE or fiberglass. Risers shall be structurally sound and used in accordance with manufacturer's instructions. Casting the adjustment ring or riser base into the tank lid at the manufacturing facility will help ensure a watertight connection and eliminates the need to install and seal the adjustment ring or riser base on the jobsite. However, risers installed in the tank lid after casting can be made watertight by following the manufacturer's installation instructions and ensuring proper application of an appropriate ASTM C990-compliant sealant. Openings with any dimension larger than 12 inches must have lids weighing 59 pounds or more or must be outfitted with a lock, per ASTM C1227. Whenever possible, openings should also be outfitted with secondary safety devices to prevent children or pets from accidentally entering the tank in the event the lid is removed or damaged.

### 10. ENSURE PROPER BACKFILLING PRACTICES

Whether the backfill material is native to the jobsite or transported from off-site, it should be free of debris and consist of material no greater than 3 inches in diameter. Backfill should be placed in uniform layers no greater than 24 inches thick to aid in compaction and prevent movement of the structure.

Precast concrete is an inherently strong, durable and low-maintenance material perfectly suited for wastewater applications. Families, schools, businesses, restaurants and entire communities put their trust in these structures, as the performance of the entire wastewater treatment system often resides with the septic tank or grease interceptor. Keep these ten tips top of mind to help ensure these structures provide safe, reliable treatment for decades to come. **PS** 

Kayla Hanson, P.E., is NPCA's director of technical services.



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# Improvement Beyond the Home

Close collaboration is key to the installation of a multi-tank precast concrete wastewater treatment system for a new Menards office facility in Wisconsin.

By Mason Nichols Photos courtesy of Wieser Concrete Products

More than a decade ago, Tony Birrittieri, president of Petersen Onsite, contacted Mark Wieser and Andy Winkler of Wieser Concrete Products to discuss an important opportunity. The two Wisconsin-based companies had already established a great relationship, working together over the years on a wide variety of wastewater projects. But Birrittieri and the Wieser team had noticed a significant uptick in mid-sized work – projects falling between single-family home septic systems and larger, municipal-style treatment systems.

"There was a huge niche in the market that no one was serving," Birrittieri said. "So, I sat down with Mark and Andy and said, 'Look, let's start using some of your larger precast tanks, customizing and compartmentalizing them so that we can install them on these mid-range wastewater jobs."

The two companies quickly got to work. In less than a year,

they collectively generated products capable of being combined into larger systems to address complex wastewater issues. Today, many of those initial systems serve as blueprints for new work. Such was the case in early 2020, when Wieser Concrete and Petersen Onsite teamed up to provide retail giant Menards with a new precast concrete wastewater treatment system capable of handling a flow of nearly 12,000 gallons per day.

### **HIGH FLOWS, HIGH CUSTOMIZATION**

As one of the largest home improvement chains in the U.S., Menards is consistently growing, needing larger facilities and enhanced amenities for its team members. To better serve its employees in Elk Mound, Wis., Menards sought to expand a 500-person office facility. This expansion included adding a fullservice restaurant, significantly elevating the on-site wastewater



A new office complex for Menards required an on-site wastewater system, and precast concrete provided the solution.

volume and necessitating the installation of a new treatment system.

Winkler and Birrittieri knew a mid-sized on-site system would be perfectly suited for the job due to a relatively small site and drain field. But besides limited space, the two companies faced a slew of difficulties. According to Winkler, general manager at Wieser Concrete, the site featured light and sandy soils, requiring a 1.5:1 ratio for excavation depth.

"For every foot you go down, you must move back 1.5 feet with the crane," he said. "With this hole, we had to be back 26 feet before the crane could be set up. So, a major challenge on this one was having to set nearly 50,000 pounds at a 50-foot radius."

The team used a 220-ton hydraulic crane on-site to address this issue.

Another concern was the gravity sewer's depth coming to the site. According to Birrittieri, the depth was lower than what the team wanted – meaning the tanks would have to be placed in the groundwater with ballasting if no modifications were made. To help solve the problem, the team installed a lift station with two pumps to grind up the wastewater and move it into the tanks at a higher elevation.

Finally, there was the design of the system itself. To maximize the use of the available real estate, Wieser Concrete and Petersen Onsite collaborated to craft a highly customized, four-tank solution.

### WORKING OUT THE DETAILS

The relationship between Wieser Concrete and Petersen Onsite paid major dividends when designing the Menards



Limited space on the job site as well as light and sandy soils led to precast being used for the project.

system. With the analysis of the site completed and a better understanding of the challenges, the two companies began generating a system that could handle the high flow needs of the office facility while also remaining viable for the long-term. Birrittieri worked closely with Wieser Concrete throughout the process.

"This job was intricate with the way that the inlets and outlets of all the tanks had to line up to take advantage of the footprint," he said. "But thankfully, Wieser Concrete is a major player in the entire process. We worked in step with them to do all the tank drawings and customize them exactly the way we needed them to be."

Birrittieri added that Petersen's relationship with Wieser Concrete is unique. The Wieser Concrete team generates fullscale CAD drawings for Petersen Onsite that include every component of every tank so the entire team can see how all components fit ahead of time, eliminating hiccups while on-site. According to Winkler, when wastewater enters the system, it first runs into a 25,000-gallon, two-compartment septic tank. This initial tank, which is 12-feet-wide-by-30-feet-long, uses the walls for sediment and stop channeling and helps slow down the initial flow. From there, the wastewater enters a 20,000-gallon tank that's divided into two compartments. This tank stabilizes the flow and doses the first treatment unit, a BioMicrobics MyFAST 1.0. With the MyFAST unit, the second tank can handle a surge capacity of up to 10,000 gallons.

As Birrittieri explained, it is vital to the success of the overall system.

"MyFAST reduces the organics and pathogens in the wastewater," he said. "This is crucial to prevent a bio-mat from forming that would eventually clog the drain field. Overall, MyFAST reduces negative effects on the soil before the wastewater is discharged to the subsurface."

Additionally, by significantly reducing organic matter, a





smaller drain field is needed – something which was necessary for this project given the small footprint.

Next, the wastewater enters a second 20,000-gallon tank that also contains two compartments – one with another MyFAST 1.0 system and the second with a BioMicrobics MyNitriFAST 1.0 solution. These two compartments further reduce organic matter and nitrogen before the wastewater enters the final tank. This 12-foot-wide-by-20-foot-long tank filters and doses the wastewater, which is then carried out to the dispersal field.

#### SAVING BIG MONEY

After Wieser Concrete manufactured the precast tanks, team members from Petersen Onsite arrived at the plant to begin installing some of the necessary components ahead of the on-site work. This allowed for a shorter installation time at the project site and resulted in a higher-quality product.

"Working at Wieser Concrete's shop is a lot more controlled than working in the field," Birrittieri said. "The major treatment components are time-consuming on a job site. We'd also have to use an expensive crane to do that work on-site; here, we can just use a gantry crane at their plant."

Once the tanks arrived in Elk Mound, the two companies continued working together, with Wieser Concrete setting the



Being able to cast connections and install components in a quality-controlled environment reduced time on the job-site significantly, saving time and money.

tanks in the excavation and Petersen Onsite performing the plumbing and electronics work necessary to complete the job. The time savings achieved on-site, generated in part by the work completed in advance, allowed the tanks to be set in just one day and backfilled the next morning. According to Winkler, production began on April 23. Installation was complete just two weeks later, on May 7.

All that time saved equates to a significant reduction in cost, something other building materials can't achieve.

"This project would have never been possible with fiberglass or cast-in-place concrete," Birrittieri said. "It just doesn't make sense financially to go through that process on-site. The costs would be astronomical."

The excavation was 17 feet deep and a few hundred feet wide. Using precast concrete tanks minimized the amount of time the hole remained open, which was key to protecting everyone onsite.

#### A COMPLETE SOLUTION

From quality to safety, time savings and beyond, precast concrete offered the best wastewater treatment solution for the Menards office facility. And because Wieser Concrete and Peterson Onsite have worked so closely together for such an extended period, they understand what it takes to deliver high-end solutions, emphasizing just how critical collaborative work between a precast manufacturer and installer or general contractor can be.

"With excavating, tank setting, building the drain field and all the electrical work, the site was up and running in about a week," Birrittieri said.

Winkler praised the people involved for the project's success. "We have inhouse engineering for design and drafting,

experienced plant personnel, dedicated installation staff, and a top notch quality control program," he said. "We are very fortunate to have these highly skilled people working with us to make these large tank projects materialize." **PS** 

Mason Nichols is a Grand Rapids, Mich.-based writer and editor who has covered the precast concrete industry since 2013.

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## ast Tanks d with Advanced tion a Win for eowners

A precaster in Ontario provided a complete residential onsite wastewater solution that installs quickly, reduces the overall footprint and provides the homeowners with peace of mind for many decades to come.

> By Kirk Stelsel, CAE Photos courtesy of Unit Precast



Concrete's primary components are coarse and fine aggregates, cement and water. While there are other elements added to modern mix designs such as admixtures, fibers and sometimes even color, the four primary ingredients can be found in every batch of concrete. It's only fitting, then, that an engineer and homebuilder are using precast concrete tanks with advanced filtration systems to meet stringent effluent requirements for a new subdivision being built around a lake that was once an aggregate mine.

### FROM MINE TO MANSIONS

Driving through Heritage Lake Estates in Puslinch, Ontario, it's hard to imagine it was previously home to a steady stream of heavy equipment and dump trucks. Today, well-manicured lawns, picturesque greenspaces and homes torn straight from the pages of magazines dot the shoreline and area surrounding a lake that is now ready for fishing, boating and swimming.

Not that long ago, though, the lake was a quarry, and those lawns were roads for heavy equipment coming and going. Once mining operations subsided, the pit became the lake that now serves as the heart of the development. Natural ecosystems and wildlife have reclaimed the spaces not occupied by homes, creating a scenic, natural allure that has drawn in homeowners.

A housing development, however, is much more than just homes. The infrastructure needed to supply water, power and carry away waste must be designed to meet the demands of future homeowners and the needs of the land while complying with all applicable codes.

Residents of Heritage Lake Estates are relying on Timberworx Custom Homes to turn their dream homes into reality. Timberworx, in turn, relies on Van Harten Surveying, a professional land surveying and engineering company, to take the architectural house plans and site them on the properties to ensure they comply with the zoning requirements and determine the drainage characteristics of the soil.

This important work leads to a critical consideration for the homes being built for the development – how they handle wastewater. The houses are not connected to a sanitary sewer line, so each property is privately serviced. As part of Van Harten's engineering work for the development, it designs and specifies the system for each house. Many factors come into play, including the fact that the houses are maximizing the 20% coverage of house area versus lot, which limits the disposal area. Van Harten also takes into account a potential future pool or amenity area on the property. Finally, the system must meet a requirement for an extraordinary high level of sewage treatment.

"We're putting together a complete detailed site-grading, sitesewage-design drawing and a report that our client uses to get a permit to start building the house," said John Duffy, a consulting engineer with Van Harten. "With septic systems, it's traditionally a septic tank and a leaching bed. In most of the subdivisions that we do work in, as part hydrogeological work that is done, the



With stringent nitrate requirements and varying soil conditions, a new housing development in Canada used precast concrete for its on-site systems.

calculations tell the developer that instead of a standard septic tank system they have to install an advanced sewage treatment system."

Nitrate is a concern due to Heritage Lakes being a rural development, and Ontario has a 10 mg/L limit for nitrate in groundwater. As the effluent seeps into the ground in the subsurface disposal bed, it enters groundwater and could impact drinking water in surrounding neighborhoods. The result of the hydrogeological study for Heritage Lakes set the target nitrate concentration at 14 mg/L, which dictates the need for an advanced treatment system.

The soils in the Heritage Lakes development vary greatly as well, from native gravel that was not mined and allows for a small filter bed to much less permeable native soil that requires an area bed or a shallow buried trench bed. As a result, each lot's system is unique.

#### **BEYOND THE BASICS**

While it was clear the residents of Heritage Lakes Estates would need more than a standard septic tank system, the need for this development exceeds what most advanced systems provide. Duffy said most systems typically achieve a 30-50% nitrate reduction. In this particular development, however, the engineering identified that the system needed a 65% reduction of nitrate concentration in the effluent. As homebuilding got underway, Van Harten turned to Unit Precast in Breslau, Ontario, thanks to a longstanding relationship. Unit Precast is able to supply the homes with the high quality precast concrete tanks paired with an advanced filtration system that would meeting the required effluent levels.

In January 2017, the development was thrown a curveball when the Ontario Building Code was changed, which meant the treatment systems needed to meet the new CAN/BNQ 3680-600 reference standard. Unit Precast prides itself on meeting the customer's needs from start to finish and was able to pivot quickly in order to continue its work in the development.

"Unit Precast's way of doing business has always been to provide installers with a complete solution so they can focus on excavation and disposal and not on the technology standpoint," said Scott Robinson, managing director of Unit Precast. "We provide a complete, full package including the precast concrete tanks, all components fully plumbed and wired and ready for backfill, along with full startup and commissioning services and after sales support and service. That's a differentiator and another way that a precaster can add value to their products in order to differentiate themselves from the crowd."

Each system is comprised of three precast tanks, which are installed in tight locations. Unit Precast was able to reduce the

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footprint of the tanks by approximately 40% by pouring the tanks upright, a first for the company, in a new form custom made for the job. Prior to that, Unit Precast had always poured tanks upside down and flipped them. The tank capacities range from 500 to 2,000 gallons.

Inside the tanks is an advanced treatment system from Waterloo Biofilter. The system features an anerobic digester with a long tube, either 12 inches or 15 inches, that runs the extent from the inlet to the outlet back around to the inlet. This tube hangs inside of the tank and works like a digester rather than a traditional septic tank. The concept is based on the laminar flow principle, which means all of the particles are flowing at the exact same speed and the overall movement of the fluid is calm.

Next, the effluent is transferred to the basket tank which contains foam cubes. The foam cubes are the home for the microorganisms. The wastewater is pumped from the digester tank and is sprayed onto the foam cubes. There's a pump in the bottom of the basket tank which then transfers the effluent to the WaterNOx media, which is a denitrification filter. It uses autotrophic bacteria to de-nitrify effluent. It's an upflow filter so the water is pumped into the bottom through two layers of different sized aggregate, and then through a fertilizer and out into another chamber that pumps the fully treated effluent to the disposal bed. The system is designed to remove 95% of total nitrogen.

### **OFF AND RUNNING**

The new systems have been installed at eight properties so far, and Robinson said Unit Precast will install another eight later this year as new houses are built. The tanks in place are performing well and have met the stringent requirements set forth by the province. Unit Precast has had such success pairing its tanks with the advanced treatment system that it will be installing another 92 of the same system in another development yet this year.

By using precast concrete tanks in combination with the advanced filtration system, homeowners can rest easy knowing the system in place will meet local requirements and also stand the test of time thanks to the durability and resilience of precast concrete. **PS** 

*Kirk Stelsel, CAE, is NPCA's vice president of communications and public affairs.* 

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# Precast Concrete Provides Value for California Project

By using precast concrete products, a new project in California was completed quickly and efficiently with value engineering.

> By Matt Werner Photos courtesy of Jensen Precast

C ombined sewer overflows are slowly becoming a remnant of the country's early infrastructure. New wastewater and stormwater management projects have given cities the ability to treat wastewater effectively and safely without sending overflows to nearby water sources.

In addition to replacing or supplementing these aging systems, many municipalities are investing millions in collection system redundancy to ensure their systems can handle capacity in the event of catastrophic events. One California town is using precast concrete as a critical component to its solution.

## **CREEKVIEW DEVELOPMENT**

Roseville, Calif., just 20 minutes outside of Sacramento, has seen substantial growth – its population has nearly doubled in the past 20 years – and many businesses now call the idyllic town home.

Part of that growth is a new 500-acre development called Creekview, which includes more than 2,000 residential units, parks, space for commercial development and a school. Expanding infrastructure in the area is a natural part of that growth, including roads, utilities and wastewater collection infrastructure.

California-based HydroScience Engineers Inc. partnered with a civil development team and the City of Roseville to conduct the planning and engineering design of a 1-million-gallon-per-day sanitary sewer lift station to convey domestic wastewater into the city's wastewater treatment plant.



A 1-million-gallon-per-day precast concrete lift station is being used for a massive development in California.



By manufacturing the tank in manageable sections, transportation and installation went seamlessly.

Project Manager Jason Crowley, P.E., said that HydroScience Engineers designed a turnkey facility that would serve the residents of the Creekview Development and eventually become public infrastructure. Crowley and his team determined the facility hydraulics, evaluated the process and designed a pumping system that met the City of Roseville's public standards. Crowley said Roseville has been forward-thinking with its engineering requirements, one of which is to build in four hours of emergency storage within the collection system itself. However, the city did not have public standards for how to design or construct an underground emergency storage basin to the capacity required.

"The whole point of the city's 4-hour storage requirement is to mitigate a peak wet-weather flow event combined with an operational failure," Crowley explained. "Four hours gives their operators ample time to respond. You never want something to overflow. The city's method of calculating required storage, combined with conservative peak flow determinations, is a

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pretty bulletproof way to build redundancy into the system and eliminate overflow events that can cost public agencies in fines."

### ENTER PRECAST

Taking into account all the piping, manholes and other structures, HydroScience was able to calculate how much storage the underground basin would need based on several factors such as the city's average rate of flow and multiplying it by the "peaking factor."

"The hard thing about this design scenario is that the reservoir needs to be completely underground for automatic filling and gravity return. The elevation section is also driven in elevation by the lowest rimmed manhole in the collection system," Crowley explained.

To meet the storage requirement, crews started looking for an underground solution that would give them 13,500 gallons of excess storage. The answer came in the form of a Type II precast concrete box culvert system which includes top and bottom culvert sections and structural end caps.

Thanks to an existing relationship with Jensen Precast, Crowley reached out to see what solutions were available.

"We sat down with them prior to specifying our design and pitched our ideas to see if it was feasible," Crowley said. "As a

civil engineer, we regularly evaluate the feasibility of cast-inplace vs precast. For the underground structure, it made a lot of sense to go the precast route because it meant less time with an open excavation and less upfront engineering cost for the developer to bear."

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Jensen was able to engineer and design the basin, in coordination with HydroScience, which was one of the biggest benefits to Crowley.

"They, and a lot of precasters, have in-house engineers and civil guys who are in tune with water," he noted. "All I needed to tell them was the length and how deep so they could figure out the approximate soil loadings, reinforcement design and structural requirements. That's a huge benefit for us and the project owner."

Not having to worry about all the codes, standards and requirements gave Crowley a lot of peace of mind. He knows Jensen specializes in this type of project and does it nearly every day, so it can expedite the design using templates, standards and lessons learned from prior projects.

"You know they're building it in accordance with all ASTM, structural codes, seismic requirements and everything that's project-specific," he explained. "They are taking on that burden.

## SEAMLESS PRODUCTION AND INSTALLATION

Jensen Estimating Engineer Tim Pellegrini noted the past work with HydroScience as a driving factor in the project. Working with each other on successful projects in the past gave both sides a lot of familiarity and comfort. Jensen made one large tank for the Creekview project but manufactured it in several pieces.

"It was five overall pieces that we put together," Pellegrini said. "That made it a lot easier for transport, and also made it easier for our setting and lifting capacity."

The 10-foot-long-by-10-foot-wide-by-20-foot-high precast concrete tank holds 13,500 gallons and is buried 8 feet. Jensen also manufactured precast endcaps that with a tongue-and-groove design to fit together along with butyl gaskets for additional watertightness. The precast option came with many other benefits for Crowley. He appreciated having Jensen's employees on the job site to provide additional quality control with installation. He also likes working with precasters because he can specify items such as hatch requirements and the precaster can integrate them into the lids and cast them into the structures

"That's a huge benefit," he said. "With precast, as soon as we open up the hole, we can put it in the ground so you save a lot of time onsite, which saves you money too."

Jensen installed liners to provide additional protection for the structure. Since these are overflow structures and are rarely exposed to, let alone filled with, wastewater, a larger interior surface of the tank could be exposed to very high levels of hydrogen sulfide gas over a long period of time. Various options are available to provide added protection in this scenario, and the team determined the liner system was the ideal option in this case.

Being able to do all of that in a qualitycontrolled environment was another benefit for Crowley, who appreciated the ability to apply it in the factory, rather than in the field where it would require applying something postconstruction or adding a coating.



"It's just a lot easier embedding the locking extensions into the concrete, and boom, you have your liner," he said. "You don't have to do some coating or anything post-construction. It's just a matter of getting the joints welded, so it takes a lot off our on-site time."

#### **MOVING FORWARD**

While Jensen's work is finished, the system is still under construction along with the rest of the development.

All sides consider the project a success and hope to continue their work together in the future.

"We've been really happy working with their team," Crowley said. "The project has gone great, they've met their deadlines and they produce great precast. And from an engineering standpoint, they've been great to work with."

And with precast concrete playing a critical role, the homeowners and environment don't have to worry about the system for many decades thanks to its durability and resilience. **PS** 

Matt Werner is the managing editor of Precast Solutions magazine and is NPCA's communication manager.







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