
# BUILDING CAPACITY AND RESILIENCE:
## *City of Chandler's Largest Sewer Interceptor Rehabilitation in a Thriving Business District*

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DIBBLE

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# EXECUTIVE SUMMARY

The City of Chandler (city) rehabilitated a critical two-mile segment of its aging 66-inch diameter sewer interceptor prior to additional flows being redirected into its system due to a lease agreement expiring in 2027 with the Gila River Indian Community (GRIC) for the Lone Butte Water Reclamation Facility (LBWRF). The 66-inch sewer was installed in the 1980s and conveys approximately half of the city's wastewater to the Ocotillo Wastewater Reclamation Facility (OWRF). The sewer interceptor alignment is located in the middle of the six-lane arterial, Price Road, in a highly traveled and high-tech business economic corridor. To accommodate the additional flows and support continued development, the pipeline required prompt reinforcement. The project used trenchless technology to minimize disruption:

- 12,867 linear feet of water-cured cured-in-place-pipe (CIPP) lining rehabilitates 66-inch diameter T-lock lined reinforced concrete pipe (RCP)
- Polymer concrete manholes (16 new + 1 insert) extend asset life 50+ years
- 16-foot polymer concrete junction structure enables future redundant sewer capacity
- Fiber Reinforced Polymer (FRP) end seals and terminations complement the CIPP
- Temporary bypass pumping system maintains 20 MGD flow during construction

The team faced several challenges with temporary bypass pipe routing through dense infrastructure, traffic control coordination, utility conflicts (e.g. 230kV underground electric, fiber optics, irrigation pipes, and nitrogen gas pipes), and temporary easement acquisition totaling over $1M.

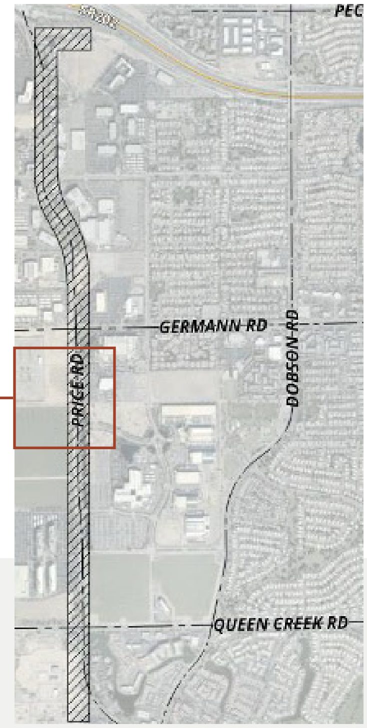
The city collaborated with Construction Management at Risk (CMAR) contractor B&F, and design engineer Dibble from design through construction. This partnership enabled:

- Innovative solutions to hydraulic constraints
- Proactive resolution of traffic/access issues
- Value engineering for long-term resilience

The 66-inch rehabilitated sewer provides 50+ years of service life with a CIPP rehabilitated pipe, new polymer concrete manholes, and FRP end seals and terminations for a corrosion resistant system. This CMAR delivery project supports continued economic development achieved with zero service interruptions to the high-tech businesses.

# INTRODUCTION

As the city's sewer systems continue to age and expand, the need for timely and resilient sewer rehabilitation is growing. Trenchless technology plays an increasingly vital role in maintaining this critical infrastructure, offering efficient solutions for projects ranging in size and complexity. This case study highlights the significant impact of trenchless technology in a large-scale application: rehabilitating more than two-miles of 66-inch diameter sewer interceptor with CIPP liner, in a dry, arid climate. The successful implementation and lessons learned from this project provide valuable insights for agencies exploring this approach for their larger-diameter sewer infrastructure.



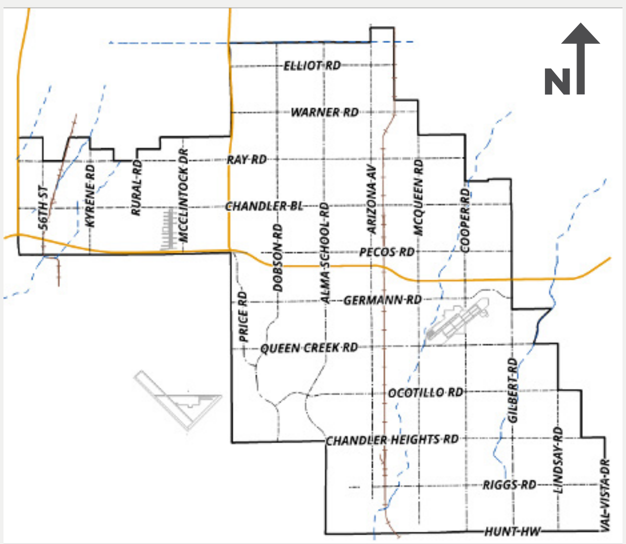
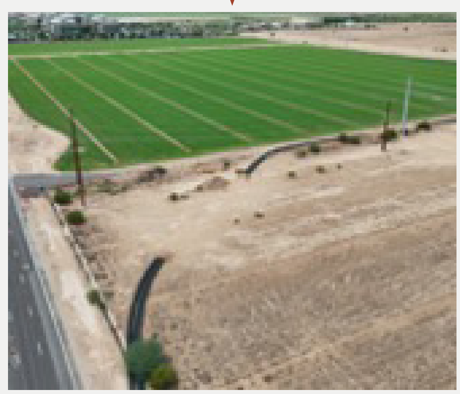




*Figure 1 - City of Chandler, Arizona*



## PROJECT BACKGROUND

The City of Chandler, Arizona is a growing technology hub, home to nearly 300,000 residents and several leading technology, financial services, aerospace and defense, and manufacturing companies. As development has increased over the years, so has the need for wastewater conveyance and reclamation. To meet anticipated demands and provide for future development, the city proactively incorporates wastewater system upgrades into their capital improvement program (CIP). A recent focus in Chandler's CIP program was its aging 66-inch sewer interceptor along Price Road from the State Route (SR) 202 San Tan Freeway to OWRF located south of Queen Creek Road. This T-lock-lined RCP sewer was installed in the 1980s and conveyed about half of the city's wastewater to OWRF. Millions of gallons of additional flows were anticipated to be redirected to the sewer in 2027, when the city's lease agreement with the Gila River Indian Community (GRIC) for the Lone Butte Water Reclamation Facility (LBWRF) expires. To accommodate the additional flows and continued development in the highly traveled high-tech economic corridor, the city took action to rehabilitate the sewer with as little disruption as possible.

# DESIGN AND CONSTRUCTION CHALLENGES

Thoughtful consideration of design items is critical to the success of large diameter buried infrastructure. The project came with several inherent challenges:

**NUMEROUS STAKEHOLDERS:** the massive sewer is buried in the city's Price Road high-tech economic corridor with important business and industrial users. These include facilities for microchips, aerospace, financial services, data centers, and an electrical substation, all of which required continuous service and access.

**SIGNIFICANT TRAFFIC CONTROL NEEDS:** the 66-inch sewer is located along Price Road, a busy six-lane arterial that intersects Arizona's SR 202 (also under construction for widening during the project) and 101, surrounded by industry and ongoing development. Traffic control measures required significant planning and continuous coordination to minimize impacts. Traffic lane restrictions were placed on the project, which required night and weekend work with up/down setups for the temporary bypass installation.

**TEMPORARY CONSTRUCTION EASEMENTS (TCES):** to reduce traffic control impacts and avoid significant utilities in the right-of-way, the team (specifically the city Project Manager and Real Estate Manager) needed to obtain six TCEs for the temporary bypass pipes and pumps. These required considerable coordination with landowners, costed the city more $1M, and took more than a year and a half to obtain.

**HYDRAULIC CONSTRAINTS:** The 66-inch sewer has a relatively flat slope, and a slight decrease in the inside diameter (due to lining) could reduce capacity. A hydraulic analysis was required to confirm the sewer's capacity would remain within acceptable limits. This analysis was completed for two alternative rehabilitation methods: slip lining and CIPP. To limit the reduction in capacity, CIPP was selected as the rehabilitation methodology.

**EXTENSIVE WASTEWATER BYPASS:** Wastewater bypass during construction was complex, with many intricate and interwoven parts. For about 18 months, a substantial 20 million gallons of wastewater needed to be bypassed daily. To put this volume into perspective, it is equivalent to approximately 30 Olympic-sized swimming pools. The bypass required a significant work area to excavate for the five pumps and a suction pit to reduce the lift head, five 18-inch HDPE pipes for the north portion of the bypass (the pipes had to be buried just below the asphalt travel lanes in order to maintain at least one lane of traffic for CIPP lining and manhole replacement), and three 24-inch HDPE pipes on the south portion located outside the right-of-way in dirt fields, as well as asphalt removal, trench plating, and extensive traffic control. This effort required significant coordination with the CMAR contractor and stakeholders.

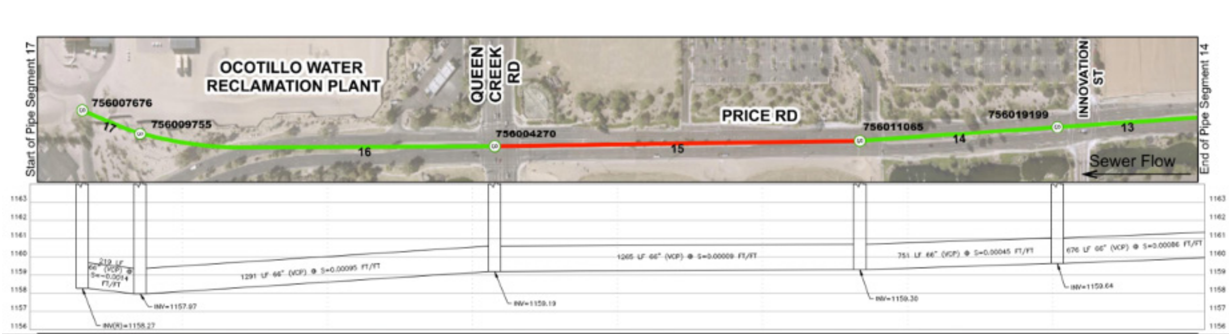



*Figure 2 - 66-inch Sewer Profile*

Through a collaborative CMAR delivery process, Chandler, Dibble, and B&F Contracting worked together to address each of these challenges as detailed on the next page.

# DESIGN SOLUTIONS

## CIPP REHABILITATION DESIGN

Given the sewer's location and need to maintain as much capacity as possible, the city opted to rehabilitate the 66-inch sewer with 12,867 linear feet of water-cured CIPP lining. This approach provided the following advantages:

- Reduced excavation footprint
- Fast installation
- Restored structural integrity – a fully deteriorated liner was specified
- Corrosion and root resistance
- Preserved existing alignment with minimal capacity reduction
- Lower lifecycle cost in comparison to open-cut replacement
- Environmental benefits: lower carbon emissions and less disruption

The team partnered with SAK Construction, leveraging their trenchless expertise during the preconstruction and construction phases of the project. Ongoing team coordination increased efficiency and provided timely insight throughout the process. Dibble designed a phased approach for installation, minimizing the number of CIPP shots and insertion/termination pits. The sewer is 30 feet deep, so reducing the number of pits significantly decreased excavation impacts. The team designed pit locations based on feasible CIPP shot length (averaging 1,100 feet for this project), the geometric layout of the sewer, existing infrastructure, and stakeholder needs in the surrounding areas.

*Figure 3 - CIPP Liner*

Maintaining adequate sewer capacity was an ongoing focus for the team. During design, the engineering team calculated the anticipated liner thickness and how it affected capacity. The liner manufacturer submitted a specific calculated thickness as part of the contractor submittal. After installation, the team verified the thickness of each segment. The finished product was 39 millimeters (1.53 inches) thick, resulting in a minimal decrease in pipe diameter that continues to provide the critical capacity the city needs.

# MANHOLE REHABILITATION DESIGN

Like the 66-inch pipe, the associated 48-inch and 60-inch concrete manholes positioned on top the sewer showed signs of deterioration. To address these aging manholes, the city could either rehabilitate them or replace them as a longer-term solution. The team coordinated with B&F to determine the construction impacts of replacing the manholes with 96-inch polymer concrete bases with Hobas pipe stubs and 60-inch risers. This would require a 16-foot by 16-foot trench box at each manhole, an increased excavation footprint compared to rehabilitating the manholes. Excavation would also require significant utility coordination. Dibble provided a potholing list and held conflict review meetings to confirm affected utilities, which included nitrogen gas, electrical, fiber optic, and irrigation lines.

The city made a strategic decision to add full polymer concrete manhole replacement to the rehabilitation program so both the pipe and manholes would be inert to hydrogen sulfide (H2S) gases and corrosion. This increased construction cost by approximately $10 million dollars and extended the schedule by about six months. This forward-looking change implemented 16 new polymer concrete manholes and one polymer concrete insert to improve corrosion resistance and extend service life by more than 50 years. By sequencing manhole construction with the wastewater bypass for the sewer rehabilitation, the city reduced the need for future bypass, lowered life-cycle costs, and minimized traffic and stakeholder impacts.

*Figure 4 - Deteriorated Manhole*

*Figure 4 - Manhole Excavation*

*Figure 6 - New Polymer Manhole*

## 16-FOOT JUNCTION STRUCTURE

As part of its proactive strategy, the city planned to construct a redundant 66-inch sewer beneath the SR 202 San Tan freeway. In anticipation of this future sewer, the team designed a custom 16-foot diameter polymer concrete junction structure at the upstream side of the project. This innovative structure includes corrosion-resistant fiberglass-reinforced-polymer (FRP) slide gates, enabling the city to divert flows between the existing and future sewer for maintenance or operational shutdowns. Dibble designed the structure to direct flows with appropriate velocities and keep turbulence at bay—promoting smooth flow and reducing the production of corrosive $H_2S$ gas.

Facilitating safe operations and maintenance was a key focus in the design. The city and Dibble developed standard operating procedures for diversion operations. In coordination with the city's operations team, Dibble designed the lid of the structure to include a davit crane base, improving ease of maintenance by allowing the city to operate the large access hatch with a davit crane. The structure also includes removal FRP grates for operations and access. Collaboration with B&F was essential during structure design, providing additional forethought into how the structure could be transported and built. Extensive manufacturer and contractor submittals provided the basis for confirming the design was feasible and technically sound.

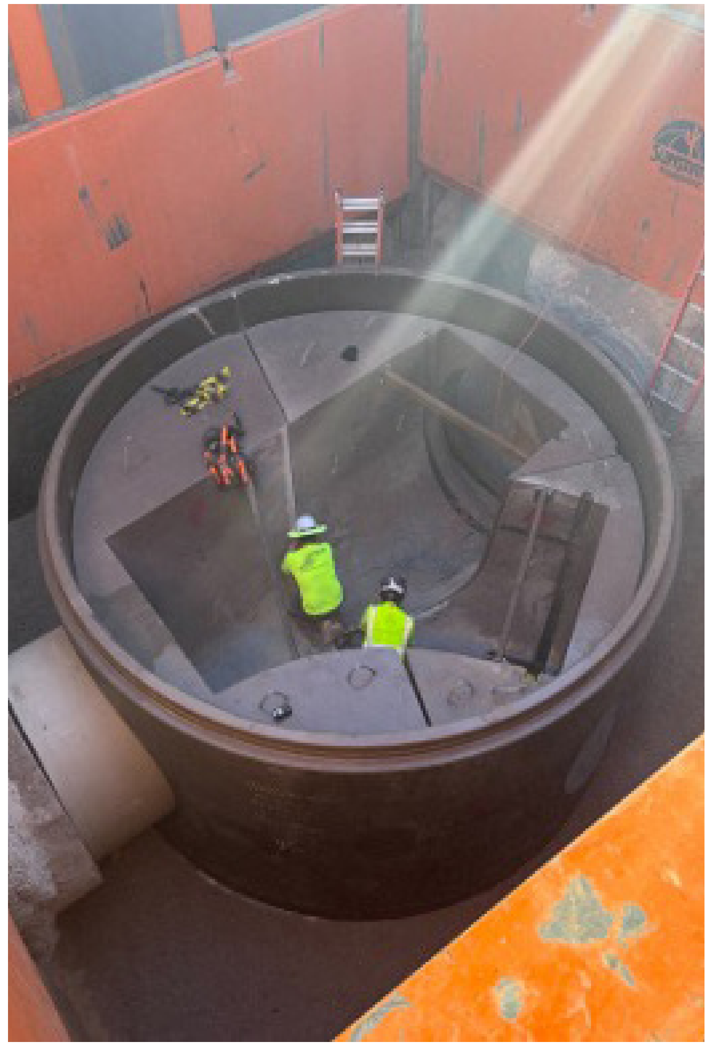


*Figure 7 - 16-foot Junction Structure*

*Figure 8 - Installed FRP Termination Seal*

## FRP TERMINATION SEALS

Sealing the CIPP terminations—the unfinished ends of the CIPP lining—is an important consideration for CIPP sewer projects. While CIPP rehabilitates and strengthens the existing sewer host pipe, insufficient termination seals could allow wastewater to seep between the liner and the host pipe, allowing corrosion to occur and potentially create a weak point in the system. Dibble's structural engineering team has developed a solution for this issue: FRP terminations. This innovative material provides a watertight seal with a lifespan that complements the lifespan of CIPP lining, creating a long-term structural connection with no mechanical parts. FRP terminations withstand groundwater pressure and are chemically compatible with both CIPP liner and the new/rehabilitated polymer manholes, resulting in a resilient, holistic solution.

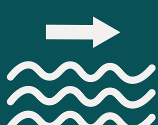
# CONSTRUCTION SOLUTIONS

## BYPASS PUMPING

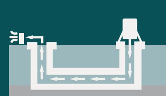
Planning and implementing the extensive temporary bypass pumping system was a significant effort. B&F's construction team bypassed 20 MGD for more than 2 miles through five 18-inch HDPE bypass lines that transitioned to three 24-inch HDPE pipes outside the roadway right-of-way, requiring numerous quantities and stats, careful evaluation of flow rates and routing, traffic control, odor control, and public outreach. Because the 66-inch sewer is a major interceptor, the bypass needed to provide service line redundancy and integrate each of the many laterals that discharge into the 66-inch sewer.

*Figure 9 - Complex Bypass Pumping System Staged Near ADOT Loop 202*

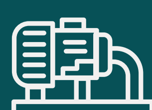
Main Bypass
28 MGD Flow



63,000 LF -
24" & 18"
Bypass
Piping



21 Pumps



10 Lateral
Sewers

1 Diversion
Structure

2 Inserts

15 Manholes

**BYPASS DURATION: JAN 2025–OCT 2026**

*Figure 10 - Buried Bypass*

*Figure 11 – Bypass Outside Right-of-way*

The complex bypass pumping system took months to plan and install. One particular challenge was diverting the flow from a 28-inch force main that discharged into the 66-inch during installation. To minimize service disruption, the team had a strict 4-hour window to complete the bypass installation. This required coordination with city Operations staff and multiple subcontractors. The team met the challenge by developing and implementing a detailed diversion and bypass installation plan. Before the diversion window, the team mobilized resources and crews and brought additional parts to minimize the chance of delays, resulting in a successful installation.

*Figure 12 - Force Main Vault Bypass*

# CIPP LINING INSTALLATION

With the temporary bypass system in place, the team began preparations for the CIPP liner installation. This included high-pressure jetting to clean each sewer segment as well as careful CCTV inspection to confirm readiness. Each shot of liner was saturated with thermosetting resin (polyester, epoxy, and vinyl ester) on-site and installed utilizing water inversion. Saturating the liner on-site reduced trucking weight and allowed for longer liner shots, which in turn reduced the number of access pits, setups, and traffic control disturbances due to the large number of trucks and equipment needed for lining. The 66-inch liner was water-cured, requiring boilers onsite to heat water to the appropriate temperature and completely fill the pipe for the required "cook" time. The liner then cured and hardened fully, and the water was cooled prior to releasing downstream due to the proximity to OWRF. Overall, the team installed 12,867 linear feet of CIPP lining in 10 shots. Depending on the length of the shot, the construction duration of each liner shot took approximately one week. Dibble's rehabilitation specialist inspectors were onsite to provide quality control and critical inspection hold points for the city. The team minimized impacts through effective coordination and project phasing.


*Figure 13 - Installing the CIPP Liner*

*Figure 14 - Overview of CIPP Lining Installation*

## FRP TERMINATION SEAL APPLICATION

Once the CIPP liner was cured and trimmed within each manhole, the team installed the FRP termination seals. This process involved the following:

1. Preparing the surface by grinding/scarifying both the cured CIPP liner and the polymer manhole wall.
2. Applying a structural, corrosion-resistant, 3-layer laminate at the pipe-manhole interface. This included saturating the material with resin, wrapping, and curing in place.

This advanced solution created a monolithic, leak-proof seal that resists H2S gas and corrosion, so the newly rehabilitated 66-inch sewer can operate reliably for decades to come.

## SCHEDULE AND COST CONTROL

Managing the schedule and costs for this important project required extensive coordination throughout design and construction. During pre-construction, B&F completed a detailed scheduling analysis and provided a cost-loaded schedule that linked activities with budget and resource allocations. To maintain progress, multiple construction activities needed to occur simultaneously, including the CIPP lining, manhole excavation, and surface restorations. Meticulous pre-construction planning of this work sequence prepared the way for success. During construction, the team tracked daily production rates and held weekly construction meetings, as well as monthly program meetings to keep the project on track. As the project progressed, the team utilized Procore, a detailed construction management software program. This helped the team provide consistent change management procedures to evaluate changes to scope, RFIs, submittals, cost changes and schedule impacts.

This advanced solution created a monolithic, leak-proof seal that resists H2S gas and corrosion, so the newly rehabilitated 66-inch sewer can operate reliably for decades to come.

## CONCLUSION

The city's 66-inch sewer rehabilitation demonstrates how trenchless technology can efficiently extend the service life of large-diameter infrastructure. Through collaborative CMAR delivery, this project addressed multiple challenges with minimal interruptions to service. The team successfully bypassed 20 MGD of flow during construction and achieved long-term resilience. Innovative design solutions including CIPP liner, polymer concrete manholes, a custom polymer concrete junction structure, and FRP termination seals provide lasting value with corrosion resistance. This case sets a benchmark for large-diameter sewer rehabilitation in high traveled, high visibility metropolitan areas.

## REFERENCES

Nelson, J., (2022). Memo: Assignment 3 – 66-inch Diameter Price Road Sewer Hydraulic Capacity Analysis, Dibble, December 15, 2022

Nelson, M., (2024). Price Road 66-inch Sewer Interceptor Rehabilitation, Construction Plans for City of Chandler Project No. WW2302.401, Dibble, August 29, 2024.