

VARIANCE JUSTIFICATION

The City of Minneapolis has requested a variance cover above the proposed sanitary sewer crossing at Irving Ave S. Barr Engineering reviewed the application on Behalf of BCWMC and provided comments in a memo dated 6-23-2020. Additional information was requested about the constraints in the downstream sewer system in an email and discussion on 7-6-2020.

Comments from Barr Engineering on behalf of BCWMC

Original Comment - *Applicant must evaluate lowering the crown of the sanitary pipe to maximize the cover at the Bassett Creek crossing.*

Request for Additional Information - *We need to better understand the constraints at the creek crossing and potential adjustment at Irving and Currie and the effects on the cover.*

Sewer System Background

The Irving Ave Sewer connects to a downstream Metropolitan Council (MCES) Interceptor on Currie Ave. The sewers were originally constructed as combined sewers in the late 1800s and early 1900s. The combined sewer system originally carried both storm and sanitary flow and discharged to the Mississippi river without treatment. Minneapolis has worked to separate the systems to eliminate Combined Sewer Overflows (CSOs) in large rainfall events. New storm drains were constructed to separate the sewer system leaving the sanitary sewer flow in the existing pipe network. Sanitary flow remained in these pipes, because of the depth that is needed for house connections. The combined sewers are typically very oversized for sanitary flow and can often be too flat to provide self-cleaning velocity with the flow that remains.

In the early 2000s MCES constructed a new interceptor sewer on Cedar Lake Rd to replace the Interceptors on Currie Ave and vacated Dupont Ave between Cedar Lake Rd and Highway 55. A significant amount of flow from Minneapolis and upstream communities was redirected to the new interceptor. The old lines on Currie and Dupont Aves now only carry flow from a few neighborhoods in Minneapolis. The Dupont Ave leg of the sewer is also located underneath the overflow storm tunnel for Bassett Creek. MCES plans to rehabilitate the interceptor and transfer ownership to Minneapolis, since it no longer carries regional flow.

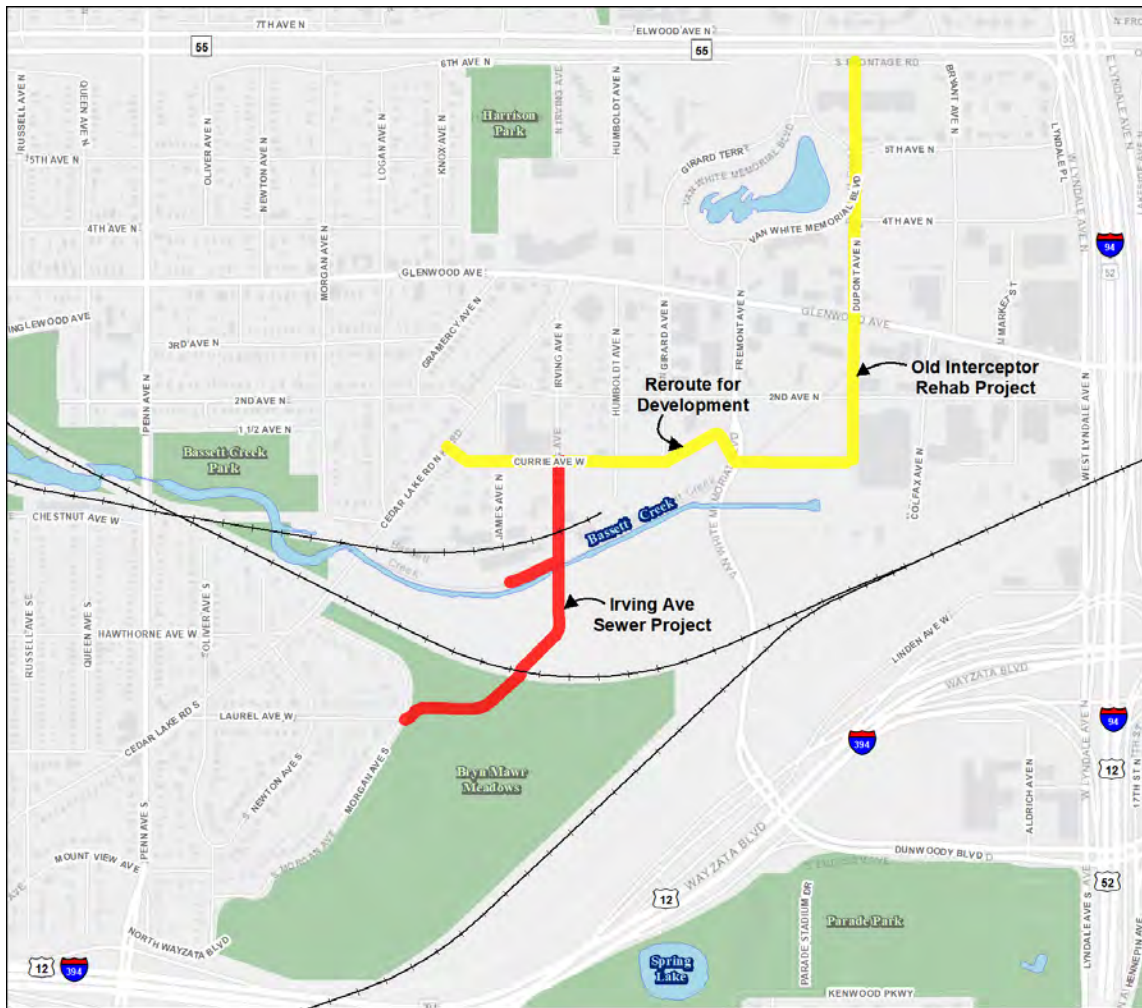


Figure 1 - Sewer System Projects

Minneapolis Community Planning (CPED) is working to redevelop the area surrounding Bassett Creek Valley. CPED has interest in rerouting parts of the old interceptor on Currie Ave to provide uninterrupted parcels for development. Preliminary plans to realign the sewer were prepared by TKDA (See Attached file Currie Ave Sewer Replacement Alignment Alts - Mar2020 (003) by TKDA). The plans were developed to maximize the available slope in the system provided the constraints of the downstream system and upstream connections.

Design Standards and Practices

Ten State Standards for gravity sewer systems is a design velocity of 2 ft/s. We have observed from metering the system that a significant amount of the sewer network operates with velocities closer to 1 ft/s. In practice pipes that operate at velocities of 1 ft/s do have some silt, but also require significantly less maintenance than lift stations. It is our design practice to install gravity systems wherever possible.

The service areas that are tributary to the Irving Ave sewer and old interceptor also have significant inflow and infiltration to the sewer from storm water and groundwater. A lift station for these systems would be costly and would have more risk of backups into homes than a gravity system would.

Design Constraints

The Irving Ave sewer was designed to balance the best overall slope in the Irving Ave sewer and proposed sewers for Currie Ave from Irving Ave to Dupont and from vacated Dupont Ave between Currie Ave and Highway 55. The existing Irving Ave sewer connects to the bottom of the interceptor on Currie Ave. That connection is the constraint for the Currie leg of the system. The Dupont Ave leg of the system is constrained by the downstream connection at highway 55, the connection from Currie Ave and the connection from vacated Dupont south of Currie Ave.

Effect of Lowering the Irving Sewer at Bassett Creek

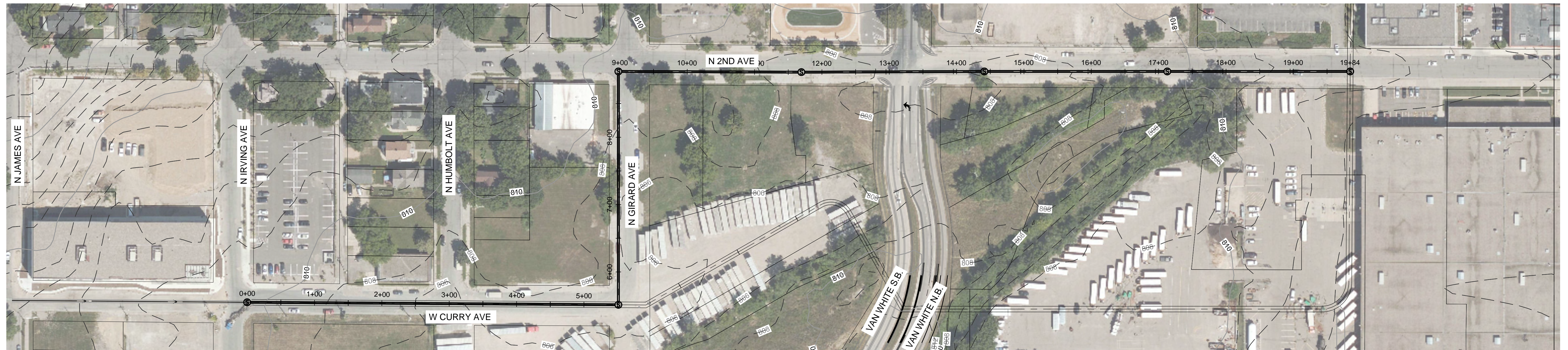
The plans developed by TKDA for rerouting the Currie Ave sewer consider the design constraints in the overall system from Currie Ave and Irving Ave to Vacated Dupont Ave and Hwy 55. Existing flow was estimated based on a combination of metered flow data tributary to Irving Ave and water use records for the parcels tributary to the Currie Ave sewer. The Projected flow was estimated a 2010 Study completed by SEH. Projected flow rates are consistent with the development projects that are scheduled to be constructed within the next 5 years.

Slope and velocities were calculated for existing and projected flows. The proposed invert connection at 2nd Ave N and Dupont is at 795.0 feet.

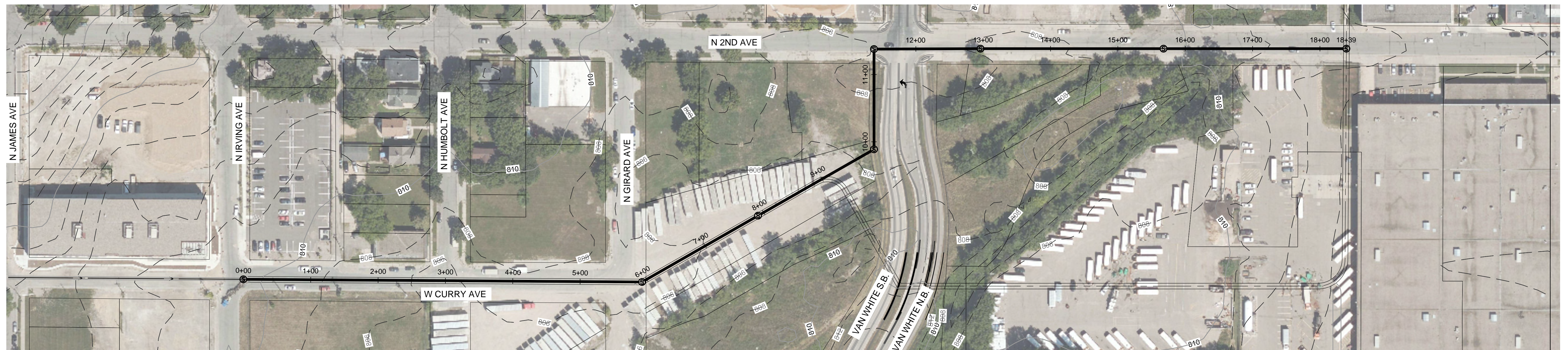
Irving Alternative - 90% plan invert	System Constraints			Existing Flow		2030 Projected Flow	
	Length	Irving Invert	Slope	DWF (gpm)	Velocity (ft/s)	DWF (gpm)	Velocity (ft/s)
MN320 Gravity Alternative							
Route 1 - North on Girard	1984	797	0.001	80	0.78	184	1.03
Route 2 - North along diagonal section and Van White	1839	797	0.0011	80	0.8	184	1.07
Irving Alternative - Lower invert 0.5ft for ~ 2.5ft	System Constraints			Existing Flow		2030 Projected Flow	
	Length	Irving Invert	Slope	DWF (gpm)	Velocity (ft/s)	DWF (gpm)	Velocity (ft/s)
MN320 Gravity Alternative							
Route 1 - North on Girard	1984	796.5	0.0008	80	0.73	184	0.95
Route 2 - North along diagonal section and Van White	1839	796.5	0.0008	80	0.73	184	0.95
Irving Alternative - Lower invert 1ft for ~3ft cover	System Constraints			Existing Flow		2030 Projected Flow	
	Length	Irving Invert	Slope	DWF (gpm)	Velocity (ft/s)	DWF (gpm)	Velocity (ft/s)
MN320 Gravity Alternative							
Route 1 - North on Girard	1984	796	0.0005	80	0.61	184	0.74
Route 2 - North along diagonal section and Van White	1839	796	0.0005	80	0.61	184	0.74

Conclusions

Barr Engineering asked for additional Information to better understand the constraints at the creek crossing and potential adjustment at Irving and Currie and the effects on the cover. Minneapolis designed the Irving sewer to tie into a downstream system and provide an adequate slope for a gravity system. In practice Minneapolis can maintain a sewer with velocities of 1 ft/s for average flow. Our analysis shows that the 90% plan invert provides a velocity of less than 1 ft/s for existing flow and 1 ft/s for planned development. Lowering the invert at Currie Ave to increase the cover at the Bassett Creek crossing would reduce the slope and corresponding velocity to less than 1 ft/s.



1 ALTERNATIVE ROUTE 1



2 ALTERNATIVE ROUTE 2

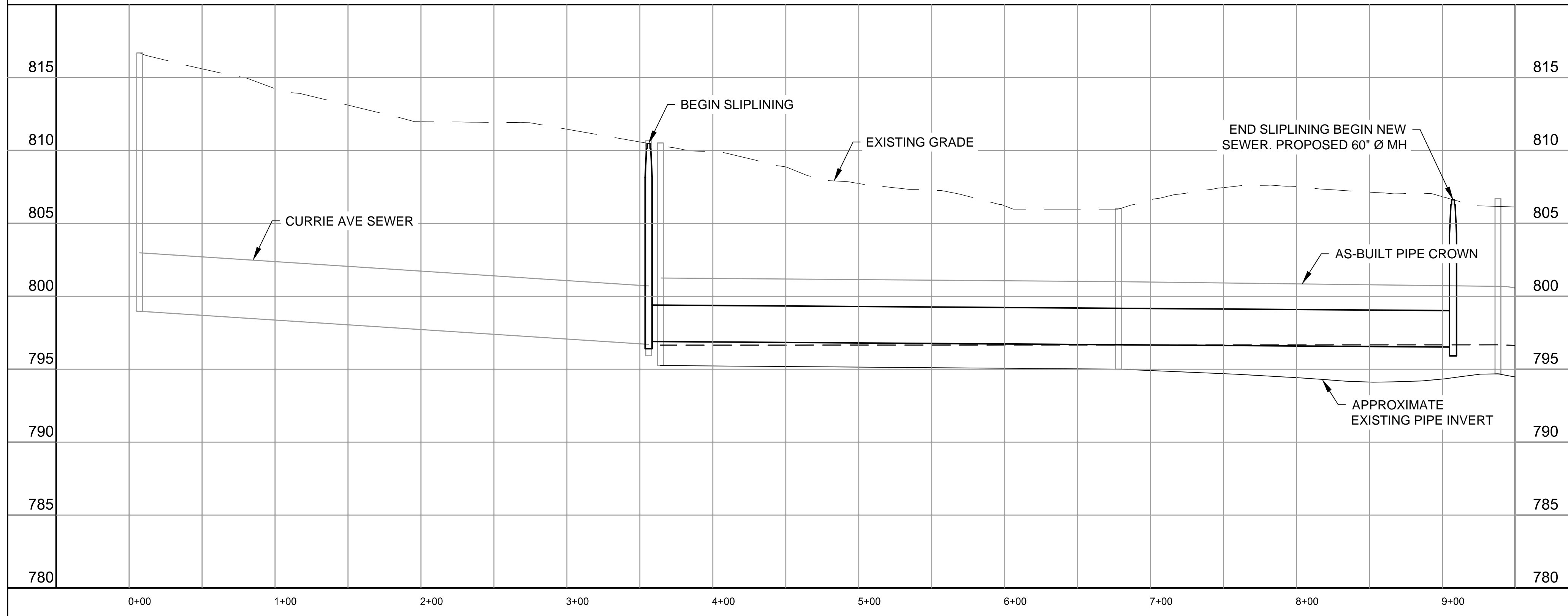
CURRIE AVENUE SEWER RELOCATION



ALTERNATIVE 1 & 2

DRW: AMP	DATE: ---
CHK: RSQ	DATE: ---
APP: RJP	DATE: ---

CURRIE AVE SANITARY SEWER



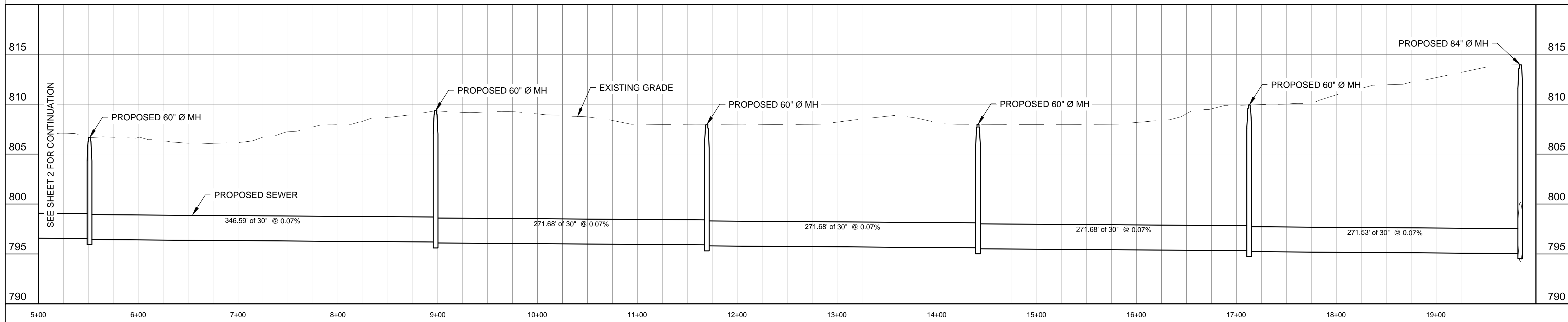
CURRIE AVENUE SEWER RELOCATION



ALTERNATIVE 1

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APP: RJP	DATE: ---

CURRIE AVE SANITARY SEWER



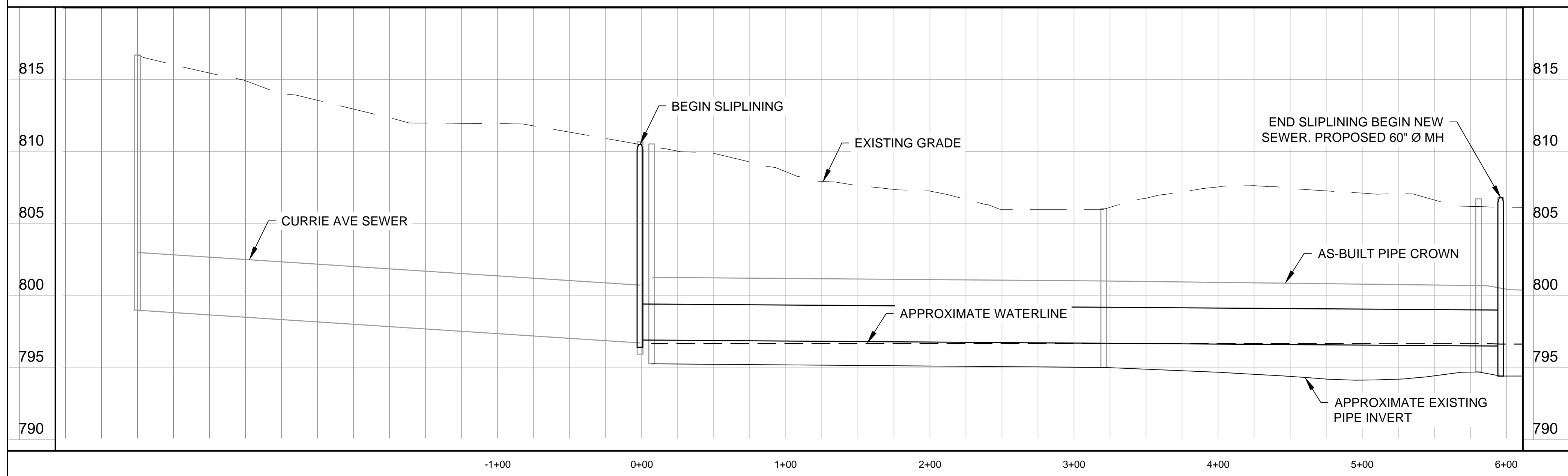
CURRIE AVENUE SEWER RELOCATION



ALTERNATIVE 1

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CURRIE AVE SANITARY SEWER



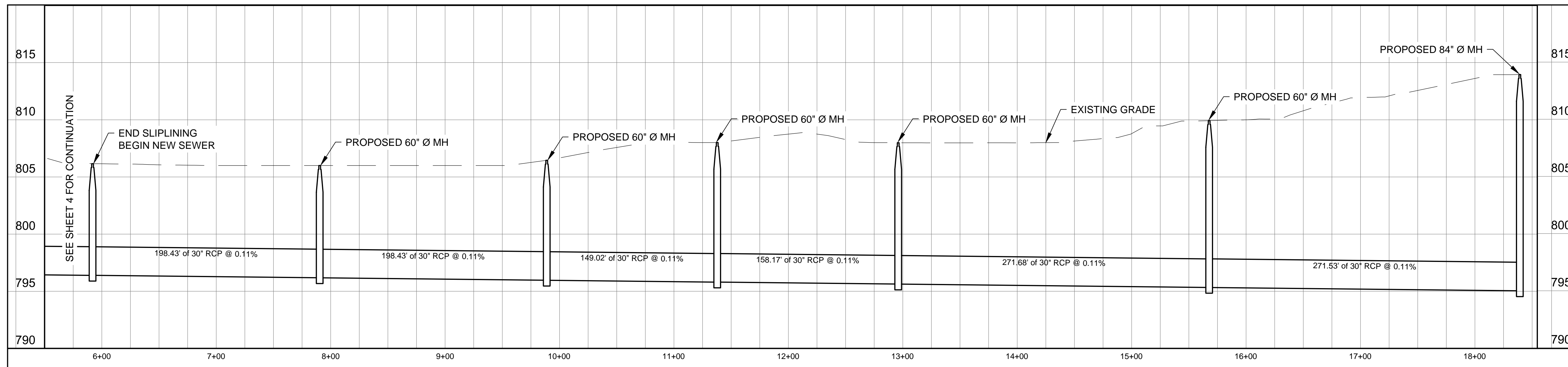
CURRIE AVENUE SEWER RELOCATION



ALTERNATIVE 2

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APP: RJP	DATE: ---

CURRIE AVE SANITARY SEWER



CURRIE AVENUE SEWER RELOCATION



ALTERNATIVE 2

DRW: AMP	DATE: ---
CHK: RSQ	DATE: ---
APP: RJP	DATE: ---

CURRIE AVE SANITARY SEWER

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