City of Roseville
Cirby Trunk A Alternatives Modeling Results Technical Memorandum

Date: April 6, 2023
Prepared by: Brett Husa, EIT
Checked by: Kristina Alacon, PE
Mike Fisher, PE

Table of Contents

Background 3
Objective 4
Summary of Work to Date 5
Received Materials 5
Model Geometry Updates 5
Review of Available Information 6
Existing Sewer Infrastructure 6
2022 Coloma Relief Sewer 6
I-80 Crossings 6
Site Reconnaissance 7
Alternatives Analysis 7
Option A 7
Option A1 7
Option B 7
Option C 7
Option D 8
Option E 9
Option F 9
Workshop with City 9
Proposed Alternatives 9
Alternative #1: 2022 Coloma Relief Sewer with Modifications 9
Alternative #2: Upsizing Existing 15” on Coloma Way and Reconnecting Cirby Trunk B 9
Alternative #3: Modified 2022 Coloma Relief Sewer and PS25 Modifications 10
Alternative #4: Upsizing Existing 15” on Coloma Way, Reconnecting Cirby Trunk B, and PS25 Modifications 10
Conceptual Cost Estimates 10
Appendix 1.1: Buildout with Commercial Corridors Loading – Existing Sewer Infrastructure 11
Appendix 1.2: Buildout with Commercial Corridors Loading – 2022 Coloma Relief Sewer 14
Appendix 1.3: I-80 Crossing “A” and “B” 16
Appendix 2.1: Alternative #1 – 2022 Coloma Relief Sewer with Modifications 19
Appendix 2.2: Alternative #2 – Upsize Existing and Reconnect Cirby Trunk B 22

Appendix 2.3: Alternative #3 – Modified 2022 Coloma Relief Sewer + PS25 Modifications 25
Appendix 2.4: Alternative #4 – Upsize Existing, Reconnect Cirby Trunk B, and PS25 Modifications..... 29
Appendix 3: Conceptual Cost Estimates..... 31
Appendix 4: 2022 Assessment..... 37

Table 1: Cirby Trunk A Surcharge Mitigation Alternatives 4
Table 2: Alternatives Cost Summary 10

Figure 1 – Cirby Trunk A and B 3
Figure 2 – Miner's Ravine Alignment 8

Background

In April 2022, the City of Roseville (City) conducted a study resulting in the Commercial Corridors Specific Plans Sewer Evaluation TM (2022 Assessment), a technical memorandum for the assessment of sewer flows to support development in three commercial areas: Atlantic Street, Douglas-Harding, and Douglas-Sunrise corridors and attached in **Appendix 4** for reference. This necessitated updates to the 2017 City of Roseville sewer model including changes in flow projections from the South Placer Wastewater Authority's (SPWA) 2020 Systems Evaluation of its trunk sewers as well as changes due to redevelopment which estimated potential future flows and identified capacity deficiencies due to new residential and commercial mixed-use zones, as well as an increase in multi-family residential units.

For the 2022 Assessment, the Existing Scenario plus Drought Rebound, the Buildout Scenario, and the Buildout-Sensitivity Scenario were all used to evaluate the impacts of the proposed specific plan developments in the three commercial areas. Furthermore, the following projects were included in the Buildout Network to capture the City's ongoing proactive repair, rehabilitation, and replacement improvement program:

- Capacity improvements at Pump Station (PS) 26 and downstream gravity sewers
- Improvements along Eureka Road, E. Roseville Parkway, and capacity improvements to PS 25

The updated modeling results indicated increased surcharge in the Douglas-Sunrise Corridor, but no significant surcharge in the Douglas-Harding and Atlantic Street Corridors. In the Douglas-Sunrise Corridor, particular attention was brought to two trunk sewers, Cirby Creek Trunk A and B shown in **Figure 1 below**, which help convey flows from the City and South Placer Municipal Utility District (SPMUD) to the Dry Creek Wastewater Treatment Plant (Dry Creek WWTP). These trunks are the primary conveyance for the Douglas-Sunrise Corridor before it crosses Interstate I-80.

Figure 1 – Cirby Trunk A and B

Note: Figure is taken from 2022 Assessment

In the Buildout scenario at peak conditions, the Douglas-Sunrise Corridor surcharging fails to meet the 5-foot minimum criteria for manhole (MH) freeboard, set by the 2020 Systems Evaluation, applied in the 2022 assessment, and used again in this analysis. This was of particular concern in the vicinity of Warren T. Eich Middle

school, as those manholes are known to be shallow. The maximum surcharge depth of 4 feet is also exceeded in Trunk A during peak buildout flows. The increase in surcharging is attributed to the assumed future planned growth in flows and is exacerbated by the recently abandoned connection between Trunk A and Trunk B discussed further in the Model Geometry Updates Section.

The 2022 Assessment identified a mitigation option to relieve surcharging in Cirby Trunk A. The potential improvement project would provide additional capacity to the system in the vicinity of the most critical surcharging by adding a 21" sewer along Coloma Way. In theory, this sewer would convey excess flows out of Trunk A and reintroduce flows into the trunk sewer downstream, further away from the shallow manholes.

Objective

Water Works Engineers (Water Works) was tasked by the City to develop additional alternatives to relieve surcharging in Cirby Trunk A identified by the 2022 Assessment in the City's sewer system model. Water Works originally presented the following alternatives, shown in **Table 1** below:

Table 1: Cirby Trunk A Surcharge Mitigation Alternatives

Option	Type	Description	Discussion
A[(1)]	Relief Sewer[(2)]	3,600 LF of 21" sewer on Coloma Way	Provide new relief sewer to relieve low lying manholes
A1	Relief Sewer[(2)]	Larger diameter sewer on Coloma Way	Provide new relief sewer to relieve low lying manholes and reduce surcharging of Cirby Trunk A
B	New Wet Weather Lift Station[(2)]	Lift station in addition to relief sewer or Force Main (FM)	Lift station to raise elevation of relief sewer or extend as FM downstream of capacity deficiency
C	Trunk B Connection	Restore connection to Trunk B	Provide a new direct connection to Cirby Trunk B
D	Upstream Basin Transfers	Cross Connections	Move flow into another Basin or operate upstream systems to move more flow off of Cirby Trunk A before the deficiency
E	Sewer Realignment	New sewer alignment	Realignment of the existing sewer to eliminate shallow manholes
F	Replace in Place		Provide excess future capacity and extend useful life of Cirby Trunk A

(1) Per Commercial Corridors Specific Plans Sewer Evaluation TM, Woodard & Curran, April 2022.

(2) The relief sewer or PS & FM options could also provide a bypass alignment such that flows from the existing Cirby Trunk Sewer A could be pumped into the bypass (during low flow season) allowing for condition assessment of the Cirby Trunk Sewer A sewer, the providing a more cost-effective way to evaluate and extend the useful life of the existing trunk sewer through trenchless rehabilitation methods at such time as its condition dictates, not in advance of that need.

The purpose of this TM is to summarize Water Works' work to date providing a narrative of the steps taken to arrive at the alternative options presented herein. An overview of Water Works' approach is as follows:

- Review available information and conduct site reconnaissance

- Assess proposed alternatives and modify or eliminate alternatives based on additional gathered information
- Present alternatives to City and garner feedback
- Make final adjustments to alternatives and present in a tech memo

Summary of Work to Date

Received Materials

Water Works received the following materials from the City:

- Commercial Corridors Specific Plans Sewer Evaluations draft and update tech memos dated August 18th, 2021 and April 25th, 2022 (2022 assessment) respectively by Woodard and Curran, Inc. (W&C)
- Innovyze Transportable Database file titled "Commercial_Corridors" on December 12th, 2022
- Innovyze Transportable Database file titled "Commercial_Corridors_9Jan2023" on January 13th, 2023

After an initial review and confirmation by the City, it was discovered that the first database did not have modifications that the City made to two creek crossings near Cirby Trunk A. Thus, the City reached out to W&C and obtained the second database for Water Works. This model had been further revised to include one of the City's creek crossing modifications, the abandonment of a gravity sewer crossing Cirby Creek near Sunrise Avenue which connected into Cirby Trunk B. As such, Water Works proceeded with the 2nd model database received as the basis for modeling scenarios. However, Water Works still had to update the model to include the second creek crossing modification, discussed in the Model Geometry Updates Section.

The model contained the following loading/physical geometry scenarios:

- Scenario 1: Buildout with Commercial Corridors Design Storm
- Scenario 2: CC – Improvements near Cirby Creek and Sunrise Ave Design Storm

The first scenario contains the City's existing sewer infrastructure subjected to Buildout with Commercial Corridors loading. The second scenario also contains the Buildout with Commercial Corridors loading and additionally includes the 21" Coloma relief sewer discussed in the W&C tech memos.

Model Geometry Updates

Before Water Works could analyze alternatives, additional changes needed to be made to the model geometry to reflect the City's existing sewer system physical geometry. The following changes were made after discussions with the City:

- The deletion of a 15" gravity sewer pipe connecting SMH B06-352 to SMH B06-416 that crossed Linda Creek near Rocky Ridge Rd and Blue Jay Drive
- The upsizing of a 10" gravity sewer pipe to 16" that crossed Linda Creek near Tiffany Circle from SMH B06-211 to SMH B06-212

With these changes in place, Water Works established a base model to reference in the subsequent alternative development and analysis.

Review of Available Information

Existing Sewer Infrastructure

Water Works took the base model of the existing sewer infrastructure and subjected it to the "Buildout with Commercial Corridors Design Storm" loading scenario. The results are summarized and themed with maximum pipe surcharge state and maximum manhole freeboard depth to quickly identify the problem areas over the Douglas-Sunrise Corridor in **Appendix 1.1: Buildout with Commercial Corridors Loading – Existing Sewer Infrastructure.** Appendix 1.1 contains two figures. The first is a zoomed-out extent that shows the whole city of Roseville. The second has an extent that focuses on Cirby Trunk A.

The results show significant surcharging along the Cirby Creek trunk A that will be the objective of relief in Water Works' analysis. In addition to the focus area, figure 1 of Appendix 1.1 shows another basin to the north that collects in Miner's Ravine and does not experience as much surcharging. This basin collects flow and crosses I-80 connecting with the Altantic Street Corridor. A figure highlighting this basin is included in **Appendix 1.3: I-80 Crossing "A" and "B"**. Water Works will explore this basin in the alternatives analysis discussed later.

2022 Coloma Relief Sewer

Water Works reviewed the base model of the existing sewer infrastructure with the proposed 21" Coloma relief sewer and subjected it to the "Buildout with Commercial Corridors Design Storm" loading scenario. The results are summarized and themed with maximum pipe surcharge state and maximum manhole freeboard depth to quickly identify how much relief the proposed Coloma sewer provided to Cirby Trunk A. The results are in **Appendix 1.2: Buildout with Commercial Corridors Loading – 2022 Coloma Relief Sewer** and will serve as one of the baseline references for relieving surcharge with the alternatives presented herein.

I-80 Crossings

Water Works identified two major locations where flow crossed Interstate I-80 after which it would merge with the flows from the west side of the City and ultimately end up at the wastewater treatment plant. These locations are identified in **Appendix 1.3: I-80 Crossing "A" and "B"**. The appendix contains two figures, the first highlights crossing "A" and all the pipes connected upstream. The second figure serves the same function for crossing "B". Crossing "B" contains the basin with the Doulgas-Sunrise Corridor and Cirby Trunk A.

These crossings effectively delineate two major basins upon which flow collects but additionally act as bottlenecks for all the flow from the East side of the City. Water Works deduced that since Cirby Trunk A is immediately upstream of crossing "B", flow could be transferred from Crossing "B" to "A" and possibly relieve surcharge from Cirby Trunk A. Additionally, Crossing "A" is the crossing point for the basin that collects in Miner's Ravine with relatively less surcharge discussed previously and could potentially accept the increase in flow without significant surcharge.

Site Reconnaissance

Water Works and City staff conducted site reconnaissance at two locations. First, staff visited a weir on Coloma Way that the City operates to divert flow into the Cirby Trunk A. City staff also made Water Works aware of a sewer spill on Trimble Court that occurred during the back to back storm events around New Year's 2023.

Next, Water Works investigated PS25 to determine better how the city operates the PS currently, how its operation compares to what is in the model, and how, if possible, more flow could be diverted into the PS. The City supplied Water Works with as-built drawings, pump information, and electrical drawings for review.

Alternatives Analysis

With a better understanding of the existing sewer system, Water Works revisited the mitigation alternatives shown in **Table 1** above. This analysis led Water Works to disqualify some off the initially proposed alternatives. A summary of the analysis for each option is presented below.

Option A

The figure in **Appendix 1.2** shows that the 2022 Coloma relief sewer reduces the surcharge on Cirby Trunk A and the vicinity. However, at maximum buildout conditions, it only relieves approximately 3 million gallons per day (MGD) of flow from Cirby Trunk A. This amount of flow underutilizes the 21" Coloma relief sewer as it should be able to handle 3.5 MGD, therefore upsizing would not provide any additional benefit. Furthermore, Water Works identified constructability issues with how the 21" sewer connects to existing infrastructure on the upstream side. To this end, Water Works further assessed the feasibility of diverting more flow through the 2022 Coloma relief sewer by modifying how it ties into existing infrastructure.

Option A1

Option A1 would explore upsizing existing sewer lines on Coloma Way and/or the proposed 21" Coloma Relief sewer. Based on the analysis in Option A Water Works determined that upsizing the 21" Coloma Relief Sewer provided no benefit. The 21" was already underutilized for its size and increasing it would not provide any additional surcharge relief to Cirby Trunk A.

Upsizing the existing 15" to 18" on Coloma Way did provide additional capacity and relieve surcharge immediately upstream however without diverting flow from Cirby Trunk A it does not provide relief to Cirby Trunk A. As a result, this option would need to be combined with others to prove effective.

Option B

Water Works determined that the construction of a new wet weather lift station to provide relief of the capacity deficiency in Cirby Trunk A would likely result in similar or greater capital costs than the 21" Coloma relief sewer and have higher O&M costs. Additionally, the lack of utilization of the lift station (which would only be utilized during wet weather events) led Water Works to the conclusion that this option was not worth pursuing further.

Option C

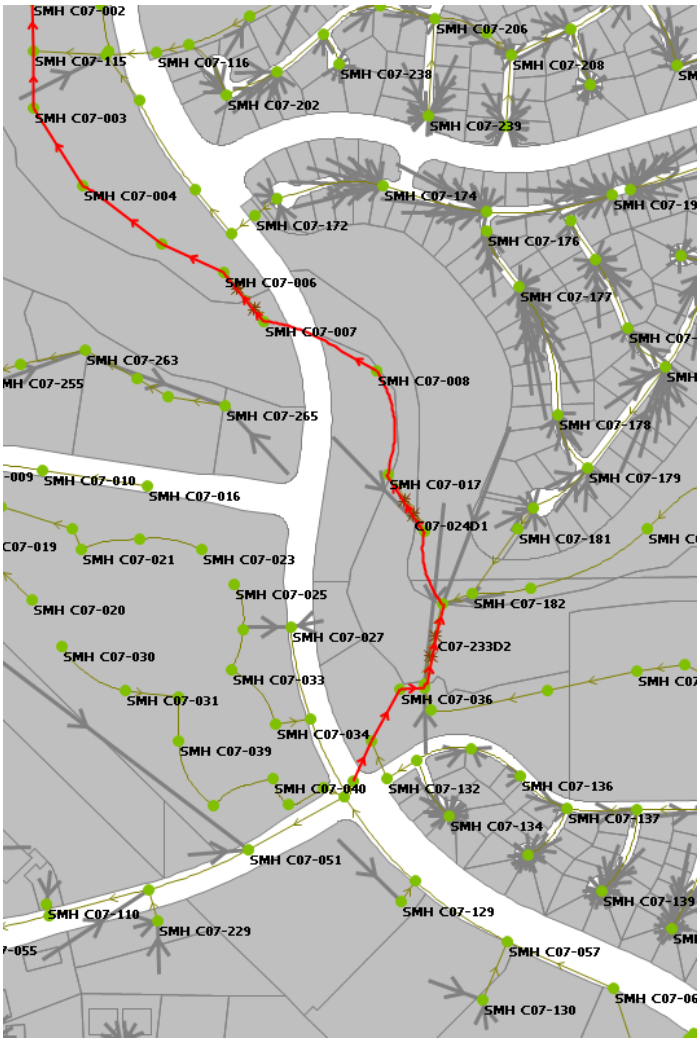
Based on observations regarding the I-80 crossings, restoring the connection to Cirby Trunk B was explored further. Water Works identified that a relief sewer could connect to an existing manhole in the intersection of Sunrise and Coloma and be routed through the dentist's offices on Coloma finally connecting to the Cirby Trunk B

on the Coloma side of Cirby Creek shown in **Figure 1 of Appendix 2.2** and explained further in the Alternative #2 section below. This alignment would avoid the deep construction necessary near SMH B05-423 on Coloma for the 2022 Coloma relief sewer.

Option D

Based on its analysis, Water Works determined that the crossing "A" (**shown in Appendix 1.3 – Figure 1**) had extra capacity under the Buildout with Commercial Corridors loading scenario. To get more flow to this basin, Water Works identified that Pump Station #25 (PS25) could be modified by extending the force main, severing the branch that would allow flow back towards Cirby Trunk A, and adjusting the pump station inlets to divert more flow into the pump station. The modifications would divert more flow through the Miner's Ravine alignment shown in **Figure 2** below, which consists of a 24" trunk with several siphons before ultimately crossing I-80 at crossing "A".

Figure 2 – Miner's Ravine Alignment



Option E

Water Works explored alternative alignments for the 21" Coloma sewer that could provide relief to Cirby Trunk A. However, all alternatives explored failed to be more cost effective or feasible. The vicinity surrounding Cirby Trunk A has several sensitive areas including a middle school and a creek that contribute to project constraints. Additionally, alignment routing options were limited by the I-80 crossings. As such, no alternative alignment was explored further or proposed herein.

Option F

The final option Water Works considered was the replace-in-place of Cirby Trunk A. Cirby Trunk A's alignment is located along Cirby Creek and crosses Linda Creek. These constraints would likely lead to project difficulties and resulting cost escalations for replace-in-place. As such, Water Works did not pursue this option further.

Workshop with City

Water Works presented its work to date to the City in a workshop meeting on February 14, 2023. The City provided feedback on the presented options and analysis and direction as to which alternatives they would like to pursue. The City also provided additional as-built drawings for the Miner's Ravine siphons for Water Works to review. Water Works then proceeded to refine the options and propose the following alternatives.

Proposed Alternatives

Alternative #1: 2022 Coloma Relief Sewer with Modifications

This alternative, based on Option A, culminated in the extension of the 2022 Coloma relief sewer further east approximately 500 feet on Coloma Way connecting to SMH B06-159 to allow more flow to be diverted through the relief sewer (**Appendix 2.1: Alternative #1 – 2022 Coloma Relief Sewer with Modifications)**. Figure 1 of the appendix is a zoomed in extent that outlines the proposed modifications to the upstream end. Figure 2 is an overall zoomed out extent that shows the surcharge relief that the modification provides. The modifications better utilize the 2022 Coloma relief sewer, allowing more flow through (an additional +5.6MG over the course of loading scenario) and relieving more surcharge from Cirby Trunk A (an additional +0.25MGD at peak flow).

Alternative #2: Upsizing Existing 15" on Coloma Way and Reconnecting Cirby Trunk B

This alternative, a combination of Options A1 and C, involves upsizing the existing 15" sewer on Coloma to 18" and reconnecting Cirby Trunk B at the intersection of Coloma and Sunrise. The proposed 18" sewer would connect to an existing manhole in the intersection (SMH B05-169) and be routed through the parking lot of dentists' offices on Coloma, finally connecting to the existing 18" Cirby Trunk B with the construction of a new manhole on the Coloma side of Cirby Creek. The Figures are displayed in **Appendix 2.2: Alternative #2 – Upsize Existing and Reconnect Cirby Trunk B.** Figure 1 shows the extent of the upsize and extension alignment that would connect to Cirby Trunk B. Figure 2 is an overall zoomed out extent that shows the surcharge relief that Alternative #2 provides. This alternative reduces surcharge in Cirby Trunk A (2.5 MGD Peak flow and 5MG cumulative flow) and has a reduced footprint and cost compared to the 2022 Coloma Relief Sewer see Table 2 below for conceptual cost estimates. It does, however, introduce flow back into Cirby Trunk B, a sewer the City recently abandoned due to access constraints for Operations and Maintenance given its close proximity to Cirby Creek and residential back yards.

Alternative #3: Modified 2022 Coloma Relief Sewer and PS25 Modifications

Through a sensitivity analysis of the Miner's Ravine Alignment, Water Works determined that approximately +1.4 MGD of flow could be diverted through PS25 without causing a manhole spill. These modifications are documented in Figure 1 and 2 of **Appendix 2.3: Alternative #3 – Modified 2022 Coloma Relief Sewer + PS25 Modifications**. Since only +1.4 MGD could be diverted (compared to the 3MGD of the 21" Coloma relief sewer), Water Works determined that PS25 modifications were not enough to relieve the Cirby Trunk A. Therefore, this proposed alternative entails the combination of both the PS25 modifications as well as the modified Coloma relief sewer from Alternative #1. Figure 3 of **Appendix 2.3: Alternative #3 - Modified 2022 Coloma Relief Sewer + PS25 Modifications** is an overall zoomed out extent that shows the surcharge relief that Alternative #2 provides. This alternative gives the City additional surcharge relief compared to Alternative #1. However, it is the costliest of the proposed alternatives.

Alternative #4: Upsizing Existing 15" on Coloma Way, Reconnecting Cirby Trunk B, and PS25 Modifications

Finally, Alternative #4 combines Alternative #2 with the PS25 modifications discussed in Alternative #3. The Figure is displayed in **Appendix 2.4: Alternative #4 – Upsize Existing, Reconnect Cirby Trunk B, and PS25 Modifications**.

Conceptual Cost Estimates

Water Works has prepared a conceptual Association for the Advancement of Cost Engineering (AACE) Class 5 Opinion of Probable Construction Cost (OPCC) for the four proposed alternatives shown in **Table 2** below. Alternative #0 represents the original 2022 Coloma relief sewer adjusted for current pricing conditions. These estimates are prepared based on limited site information and are considered Water Works' best approximation of what will be required to meet industry standards and best practices. Unit costs utilized for the cost estimates are based off existing pipeline project analogues (including the W&C cost estimate), overall pipeline experience, and an approximation of current market conditions.

Table 2: Alternatives Cost Summary

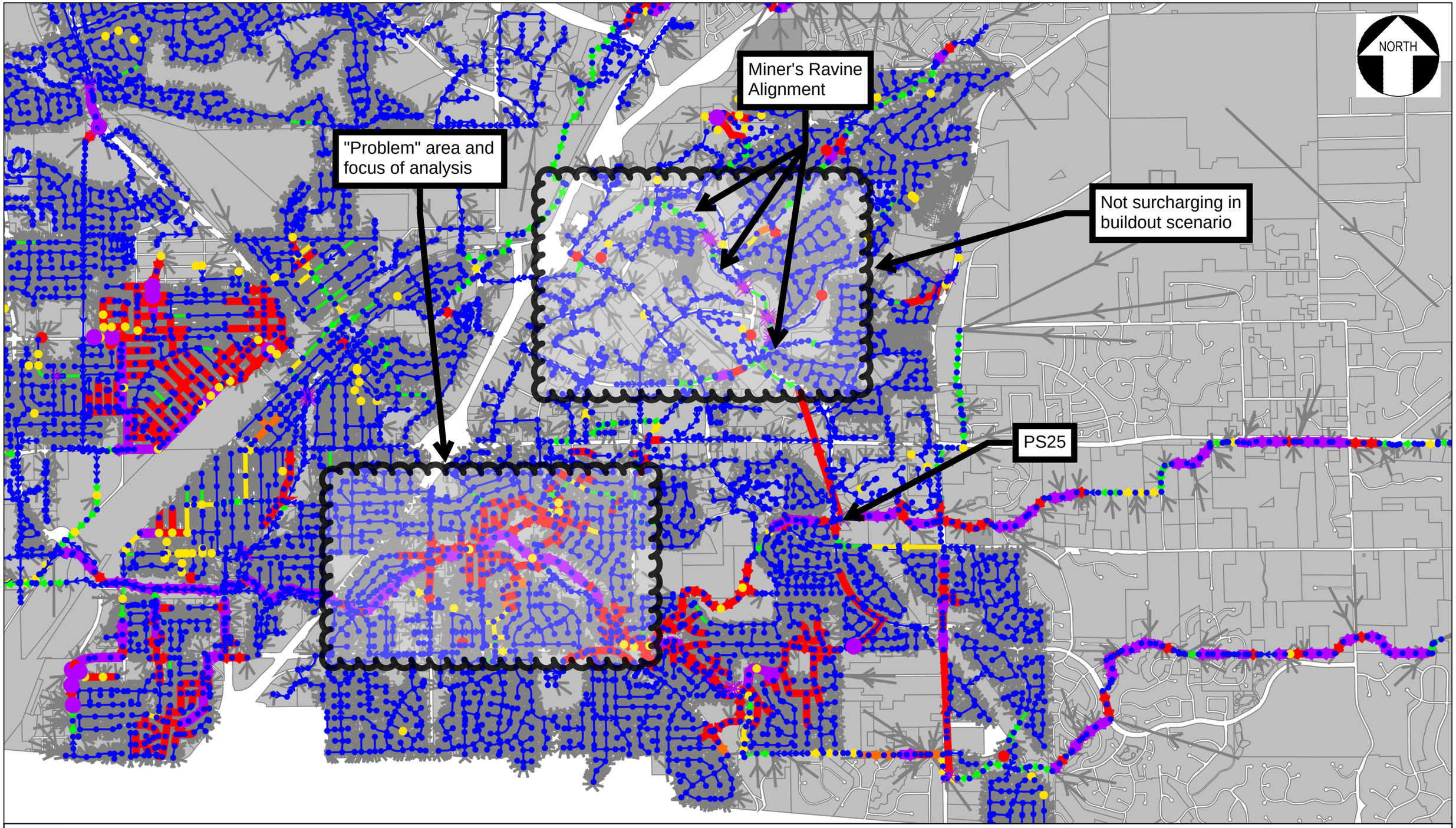
Total Project Cost Estimate

Alternative #0	Alternative #1	Alternative #2	Alternative #3	Alternative #4
$ 12,776,000	$13,357,000	$2,648,000	$14,807,000	$4,402,000

(1) Rounded to nearest $10,000

A detailed breakdown of the cost estimates for each alternative are provided in **Appendix 3: Conceptual Cost Estimates**. Some costs associated with capacity increases at PS25 may overlap with existing future capacity improvements mentioned in the 2022 assessment. Water Works was unable to determine the exact extent of the mentioned improvements and thus left some capacity improvement costs conditionally. The City should determine whether or not these costs are redundant.

Appendix 1.1: Buildout with Commercial Corridors Loading – Existing Sewer Infrastructure



LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT

Appx. 1.1 - Figure 1: Buildout with Commercial Corridors Loading - Existing Sewer Infrastructure

WATERWORKS ENGINEERS

Area experienced spill during storms of 12/15/22-1/15/23

Area with shallow MHs

NORTH

Abandonment of existing creek crossings exacerbates surcharge of trunk line

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT

Appx. 1.1 - Figure 2: Buildout with Commercial Corridors Loading - Existing Sewer Infrastructure - Cirby Trunk A Focus Area

WATERWORKS ENGINEERS

Appendix 1.2: Buildout with Commercial Corridors Loading – 2022 Coloma Relief Sewer

2022 Coloma relief sewer underutilized, surcharge still present on Cirby Trunk A

NORTH

Creek Crossing abandonment was not factored into initial analysis which exacerbates surcharge on 33" sewer

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

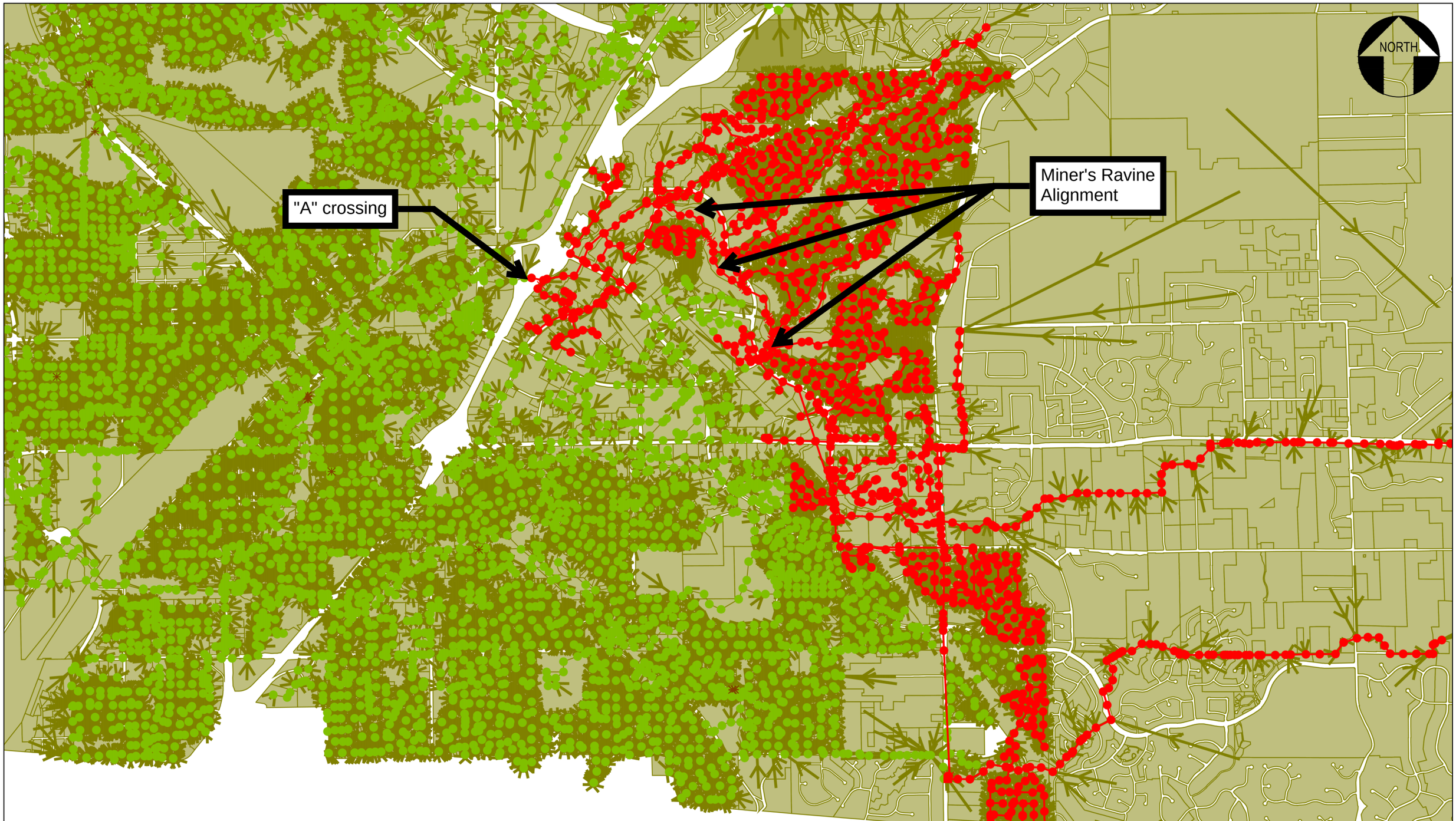
OTHER

SUBCATCHMENT

Appx. 1.2 - Figure 1: Buildout with Commercial Corridors Loading - 2022 Coloma Relief Sewer

WATERWORKS ENGINEERS

Appendix 1.3: I-80 Crossing "A" and "B"



LEGEND

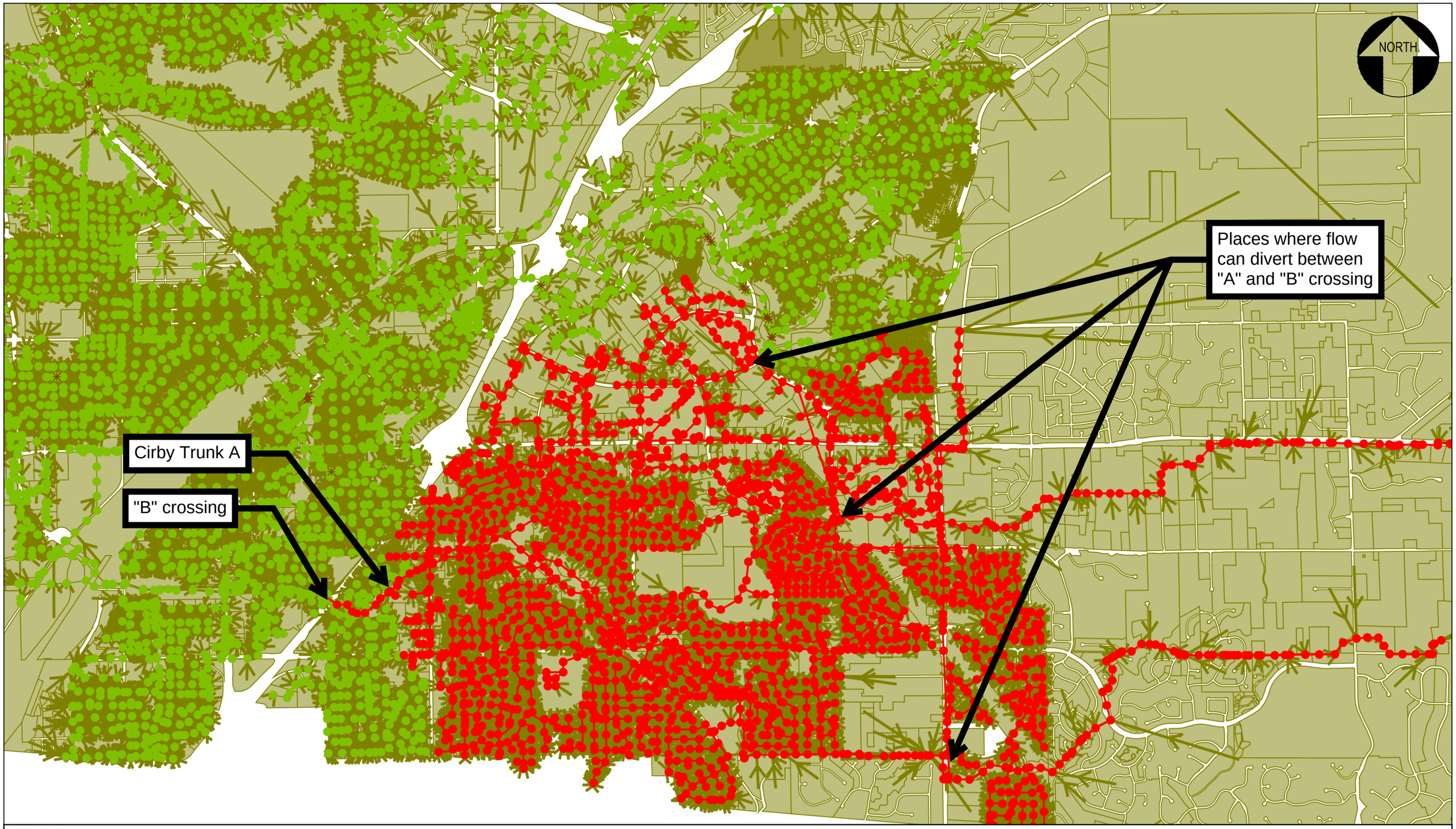
Sewer Mainline
- Selected
- All other

Sewer MH
- Selected
- All other

OTHER
- SUBCATCHMENT

Appx. 1.3 - Figure 1: I-80 Crossing "A"
Upstream Trace

WATERWORKS ENGINEERS



LEGEND

Sewer Mainline
- Selected
- All other

Sewer MH
- Selected
- All other

OTHER
- SUBCATCHMENT

Appx. 1.3 - Figure 2: I-80 Crossing "B" Upstream Trace

WATERWORKS ENGINEERS

Appendix 2.1: Alternative #1 – 2022 Coloma Relief Sewer with Modifications

Alternative #1- 2022 Coloma Relief Sewer with Modifications

NORTH

Extend 2022 Coloma Relief Sewer

Remove Previous Tie-in

2022 Proposed Coloma Relief Sewer

Crossing very close, may need new MH

Other Tie-in alternatives likely feasible, outside of project scope.
Main Takeaway: 2022 Coloma Relief Sewer can be utilized with some modifications

LEGEND

Sewer Mainline
- Selected
- All other

Sewer MH
- Selected
- All other

OTHER
- SUBCATCHMENT

Appx 2.1 - Figure 1: Water Works Modifications Extending the 2022 Coloma Relief Sewer

WATERWORKS ENGINEERS

Alternative #1- 2022 Coloma Relief Sewer with Modifications

NORTH

2022 Coloma Relief Sewer (yellow)

Water Works extended 2022 relief sewer to accept more flow. However, surcharge still present in 33" upstream

LEGEND

CONDUIT MAX SURCHARGE STATE

- <0.5
- 0.5
- 0.75
- 0.95
- 1
- 2

MH FREEBOARD DEPTH

- > 3ft
- 1ft< x<3ft
- 0ft< x<1ft
- <0ft

OTHER

- SUBCATCHMENT

Appx 2.1 - Figure 2: Buildout with Commercial Corridors loading scenario - Alternative #1

WATERWORKS ENGINEERS

Appendix 2.2: Alternative #2 – Upsize Existing and Reconnect Cirby Trunk B

Alternative #2- Upsizing Existing 15" on Coloma Way and Reconnection Cirby Trunk B

NORTH

Avoids deep alignment in 2022 Coloma Relief Sewer

Upsize existing sewer from 15" to 18"

Modify to send more flow through existing upsized sewer

Install new 18" sewer connecting existing MHs

LEGEND

Sewer Mainline
- Selected
- All other

Sewer MH
- Selected
- All other

OTHER
- SUBCATCHMENT
- Flow

Appx 2.2 - Figure 1: Existing Coloma 15" Sewer Upsize and New Cirby Trunk B Connection

WATERWORKS ENGINEERS

Alternative #2- Upsizing Existing 15" on Coloma Way and Reconnection Cirby Trunk B

NORTH

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT

Appx 2.2 - Figure 2: Buildout with Commercial Corridors Loading Scenario - Alternative #2

WATERWORKS ENGINEERS

Appendix 2.3: Alternative #3 – Modified 2022 Coloma Relief Sewer + PS25 Modifications

Alternative #3- Modified 2022 Coloma Relief Sewer and PS25 Modifications

Currently branches allowing flow back towards focus area and crossing "B" or Miner's Ravine alignment and crossing "A"

PS25 recognized as means to relieve Cirby focus area by sending more flow to crossing "A"

Towards Crossing B and focus area

NORTH

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT | Flow

Appx 2.3 - Figure 1: Buildout with Commercial Corridors Loading Scenario - Existing PS25 Operation Overview

WATERWORKS ENGINEERS

Alternative #3- Modified 2022 Coloma Relief Sewer and PS25 Modifications

NORTH

Extend force main to intersection and abandon branch

Preliminary sensitivity analysis indicates miner's ravine alignment and crossing A can accept ~1.4MGD with PS25 modifications

Towards Crossing B and focus area

LEGEND

Sewer Mainline
- Selected
- All other

Sewer MH
- Selected
- All other

OTHER
- SUBCATCHMENT
- Flow

Appx 2.3 - Figure 2: PS25 modifications

WATERWORKS ENGINEERS

Alternative #3- Modified 2022
Coloma Relief Sewer and PS25
Modifications

NORTH

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT

Appx 2.3 - Figure 3: Buildout with Commercial Corridors Loading Scenario - Alternative #3

WATERWORKS ENGINEERS

Appendix 2.4: Alternative #4 – Upsize Existing, Reconnect Cirby Trunk B, and PS25 Modifications

Alternative #4- Upsize Existing 15" on Coloma Way, Reconnect Cirby Trunk B, and PS25 Modifications

NORTH

LEGEND

CONDUIT MAX SURCHARGE STATE

<0.5 | 0.5 | 0.75 | 0.95 | 1 | 2

MH FREEBOARD DEPTH

> 3ft | 1ft< x<3ft | 0ft< x<1ft | <0ft

OTHER

SUBCATCHMENT

Appx 2.4 - Figure 1:Buildout with Commercial Corridors Loading Scenario - Alternative #4

WATERWORKS ENGINEERS

Appendix 3: Conceptual Cost Estimates

City of Roseville Corridors Modeling
Conceptual Opinion of Probable Construction Cost
Alternative #0 - Coloma Relief Sewer
3/22/2023

Prepared: **Brett Husa, EIT**
Checked: **Kristina Alacon, PE**
Mike Fisher, PE

Item No.	Description	Unit	Estimated Quantity	Eng. Est. Unit Price	Eng. Est. Construction Cost
1	Coloma Relief Sewer Baseline Construction Cost[1]	LS	1	$ 6,153,906	$ 6,153,906
3	Dewatering	LS	1	$ 103,009	$ 103,009
4	Bypass Pumping	LS	1	$ 615,391	$ 615,391
5	Traffic Control	LS	1	$ 615,391	$ 615,391
				Subtotal	**$ 7,487,697**
6	Mob/Demob (5% of subtotal)				$ 374,385
				Estimated Construction Cost Subtotal	**$ 7,862,082**
7	Construction Contingency (30% of Construction subtotal)				$ 2,358,624
				Conceptual OPCC	**$ 10,220,706**
8	Engineering, Administration, Legal (25% of OPCC)				$ 2,555,177
				Total Project Cost[2]	**$ 12,776,000**

(1) Adjusted to February 2023 ENR 20-City CCI
(2) Rounded to nearest $10,000

City of Roseville Corridors Modeling
Conceptual Opinion of Probable Construction Cost
Alternative #1 - Modified Coloma Relief Sewer
4/6/2023

Prepared: **Brett Husa, EIT**
Checked: **Kristina Alacon, PE**
Mike Fisher, PE

Item No.	Description	Unit	Estimated Quantity	Eng. Est. Unit Price	Eng. Est. Construction Cost
1	W&C 21" Proposed Relief sewer to SMH Coloma Way-11[1]	LS	1	$ 6,136,931	$ 6,136,931
2	WWE 21" proposed relief sewer Extension via open cut (avg. depth 12ft)	LF	477	$ 630	$ 300,510
3	Dewatering	LS	1	$ 103,009	$ 103,009
4	Bypass Pumping	LS	1	$ 643,744	$ 643,744
5	Traffic Control	LS	1	$ 643,744	$ 643,744
				Subtotal	**$ 7,827,939**
6	Mob/Demob (5% of subtotal)				$ 391,397
				Estimated Construction Cost Subtotal	**$ 8,219,336**
7	Construction Contingency (30% of Construction subtotal)				$ 2,465,801
				Conceptual OPCC	**$ 10,685,137**
8	Engineering, Administration, Legal (25% of OPCC)				$ 2,671,284
				Total Project Cost[2]	**$ 13,357,000**

(1) Adjusted to February 2023 ENR 20-City CCI. Does not include 40ft segment to SMH B05-164

(2) Rounded to nearest $10,000

City of Roseville Corridors Modeling
Conceptual Opinion of Probable Construction Cost
Alternative #2 - Reduced relief and existing upsize
4/6/2023

Prepared: **Brett Husa, EIT**
Checked: **Kristina Alacon, PE**
Mike Fisher, PE

Item No.	Description	Unit	Estimated Quantity	Eng. Est. Unit Price	Eng. Est. Construction Cost
1	18" Relief sewer through dentist offices via open cut (avg. depth 14ft)	LF	600	$ 630	$ 378,000
2	Upsize existing 15" along Coloma to 18" via pipe bursting (avg. depth 12ft)	LF	1340	$ 540	$ 723,600
3	Install new MH	LS	1	$ 30,000	$ 30,000
4	Dewatering	LS	1	$ 200,000	$ 200,000
5	Bypass Pumping	LS	1	$ 110,160	$ 110,160
6	Traffic Control	LS	1	$ 110,160	$ 110,160
				Subtotal	**$ 1,551,920**
7	Mob/Demob (5% of subtotal)				$ 77,596
				Estimated Construction Cost Subtotal	**$ 1,629,516**
8	Construction Contingency (30% of Construction subtotal)				$ 488,855
				Conceptual OPCC	**$ 2,118,371**
9	Engineering, Administration, Legal (25% of OPCC)				$ 529,593
				Total Project Cost[1]	**$ 2,648,000**

(1) Rounded to nearest $10,000

City of Roseville Corridors Modeling
Conceptual Opinion of Probable Construction Cost
Alternative #3 - Modified Coloma Relief
+ PS25 Modifications
4/6/2023

Prepared: Brett Husa, EIT
Checked: Kristina Alacon, PE
Mike Fisher, PE

Item No.	Description	Unit	Estimated Quantity	Eng. Est. Unit Price	Eng. Est. Construction Cost
1	W&C 21" Proposed Relief sewer baseline[1]	LS	1	$ 6,136,931	$ 6,136,931
2	WWE 21" proposed relief sewer Extension via open cut (avg. depth 12ft)	LF	477	$ 630	$ 300,510
3	12" DIP FM via Open Cut	LF	1000	$ 250	$ 250,000
4	Dewatering	LS	1	$ 103,009	$ 103,009
5	Pump Station upgrades[2]	LS	1	$ 500,000	$ 500,000
6	Bypass Pumping	LS	1	$ 718,744	$ 718,744
7	Traffic Control	LS	1	$ 668,744	$ 668,744
				Subtotal	**$ 8,677,939**
8	Mob/Demob (5% of subtotal)				$ 433,897
				Estimated Construction Cost Subtotal	**$ 9,111,836**
9	Construction Contingency (30% of Construction subtotal)				$ 2,733,551
				Conceptual OPCC	**$ 11,845,387**
10	Engineering, Administration, Legal (25% of OPCC)				$ 2,961,347
				Total Project Cost[3]	**$ 14,807,000**

(1) Adjusted to February 2023 ENR 20-City CCI. Does not include 40ft segment to SMH B05-164
(2) May overlap with other/existing capacity improvements
(3) Rounded to nearest $10,000

City of Roseville Corridors Modeling
Conceptual Opinion of Probable Construction Cost
Alternative #4 - Reduced relief and existing upsize + PS25 Modifcations
4/6/2023

Prepared: **Brett Husa, EIT**
Checked: **Kristina Alacon, PE**
Mike Fisher, PE

Item No.	Description	Unit	Estimated Quantity	Eng. Est. Unit Price	Eng. Est. Construction Cost
1	18" Relief sewer through dentist offices via open cut (avg. depth 14ft)	LF	600	$ 630	$ 378,000
2	Upsize existing 15" along Coloma to 18" via pipe bursting (avg. depth 12ft)	LF	1340	$ 540	$ 723,600
3	Install new MH	LS	1	$ 30,000	$ 30,000
4	Dewatering	LS	1	$ 200,000	$ 200,000
5	12" DIP FM via Open Cut	LF	1000	$ 250	$ 250,000
6	Pump Station upgrades[1]	LS	1	$ 500,000	$ 500,000
7	Bypass Pumping	LS	1	$ 338,160	$ 338,160
8	Traffic Control	LS	1	$ 160,160	$ 160,160
				Subtotal	**$ 2,579,920**
9	Mob/Demob (5% of subtotal)				$ 128,996
				Estimated Construction Cost Subtotal	**$ 2,708,916**
10	Construction Contingency (30% of Construction subtotal)				$ 812,675
				Conceptual OPCC	**$ 3,521,591**
11	Engineering, Administration, Legal (25% of OPCC)				$ 880,398
				Total Project Cost[2]	**$ 4,402,000**

(1) May overlap with other capacity improvements

(2) Rounded to nearest $10,000

Appendix 4: 2022 Assessment

TECHNICAL MEMORANDUM

TO: Lauren Hocker, City of Roseville

PREPARED BY: Dylan Merlo, Woodard & Curran
Chris van Lienden, CA PE 75034, Woodard & Curran

REVIEWED BY: Gisa Ju, CA PE 31823, Woodard & Curran
Dave Richardson, Woodard & Curran

DATE: April 25, 2022

RE: Commercial Corridors Specific Plans Sewer Evaluation

The City of Roseville is proposing new specific plans to support development in three adjacent commercial corridors: Atlantic Street Corridor, Douglas-Harding Corridor, and the Douglas-Sunrise Corridor. The specific plans anticipate new residential and commercial mixed-use zones in each commercial corridor, with a significant increase in the number of multi-family residential units. **Figure 1** shows the conceptual land uses proposed for these areas.

Sewer flows from the three specific plan areas are conveyed through local sewers to the South Placer Wastewater Authority (SPWA) Dry Creek Sewer Interceptor and two trunk sewers (referred to as Cirby Creek Trunk A and B in this evaluation) near south of Douglas Blvd, which carry flows from the City and South Placer Municipal Utility District (SPMUD) to the Dry Creek Wastewater Treatment Plant (Dry Creek WWTP). The purpose of this study is to identify any potential capacity deficiencies in the sewers that the specific plan developments would cause, and develop potential improvements to mitigate those deficiencies.

This Technical Memorandum (TM) describes the approach used for the assessment, the criteria applied to estimate potential flows and identify capacity deficiencies, and the results of the modeling. To conservatively estimate potential future flows, the specific plans were evaluated collectively; that is, it has been assumed that all three specific plans will be implemented concurrently.

1. MODEL NETWORKS

A sewer model including all of the sewers in the City was recently developed as part of the 2017 City of Roseville Sewer Model Update (2017 Model Update). Subsequently, a capacity evaluation of the SPWA trunk sewers was also conducted for the 2020 South Placer Wastewater Authority Systems Evaluation (2020 Systems Evaluation), which also updated flow projections from Placer County and SPMUD (the City indicated that flow projections from the 2017 Model Update were sufficiently up to date). In addition, the 2020 Systems Evaluation proposed capacity improvements that could increase flows through the Dry Creek Sewer Interceptor under future design storm conditions. As the model used in the 2020 Systems Evaluation included only trunk sewers (including the Dry Creek Interceptor), the all-pipe model from the 2017 Model Update was updated to reflect updates from the 2020 Systems Evaluation, and used as the basis for the evaluation for this study. The modeled network, including the location of the proposed capacity improvement projects and the specific plan areas, are shown in **Figure 2**.

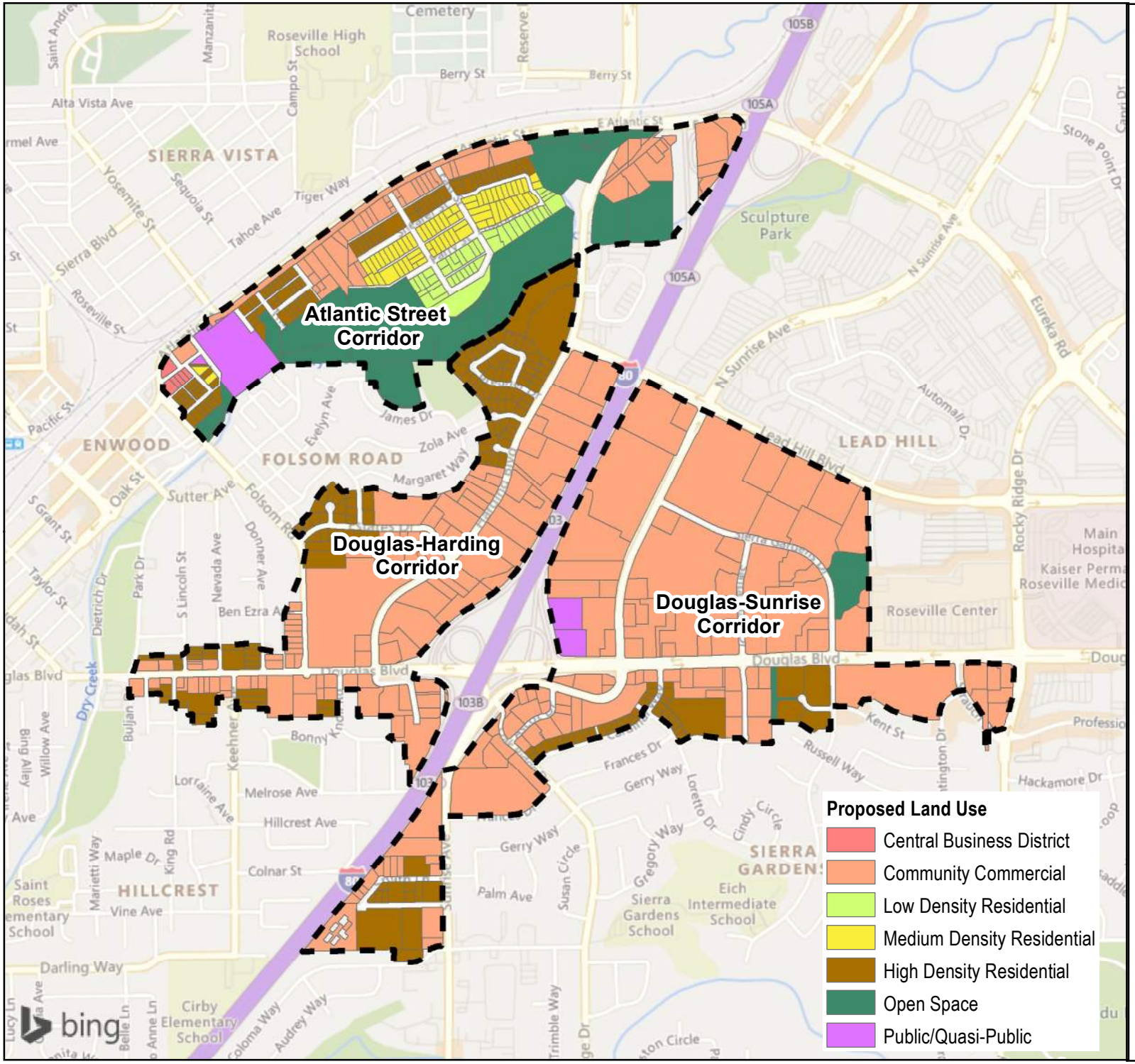


Figure 1 Conceptual Proposed Land Uses

City of Roseville
Commercial Corridors
Specific Plans
Sewer Evaluation

CITY OF ROSEVILLE CALIFORNIA

WOODARD & CURRAN

Project #: 001967.00
Map Created: August 2021

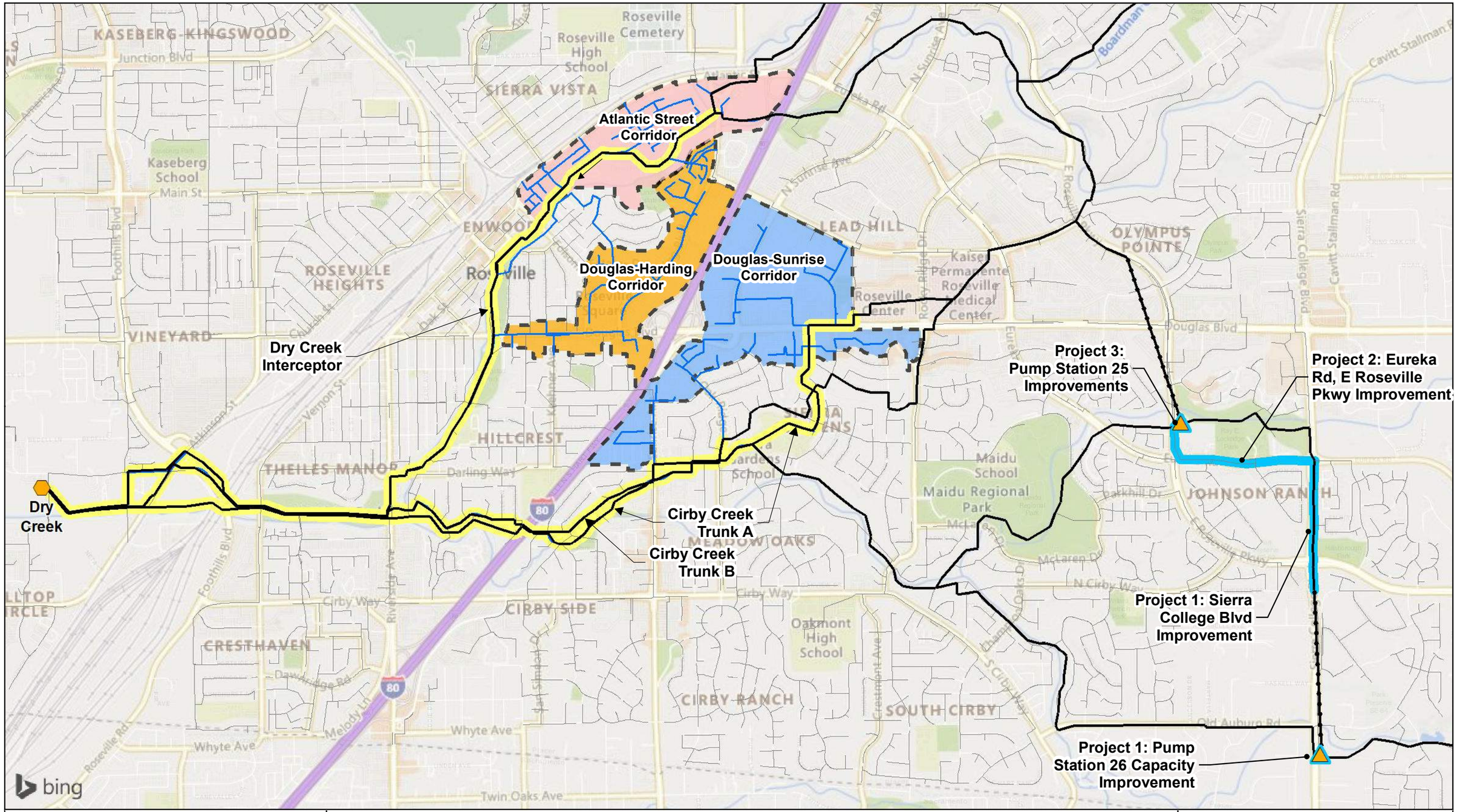


Figure 2
Proposed Specific Plans and Sewer System

City of Roseville
Commercial Corridors Specific Plans
Sewer Evaluation

- Pump station
- Wastewater treatment plant
- Regional gravity sewer
- Regional force main
- City sewer with Specific Plan flows
- Other City sewer
- Regional sewer with Specific Plan flows
- 2020 Systems Evaluation identified improvement projects
- Atlantic Coridor
- Douglas-Harding Corridor
- Douglas-Sunrise Corridor

0 500 1,000 2,000 3,000 4,000 Feet

N

Project #: 001967.00

Map Created: August 2021

CITY OF ROSEVILLE CALIFORNIA

WOODARD & CURRAN

Figure Exported: 8/18/2021 By: cvanlienden Using: \\woodardcurran.net\shared\Projects\0011967.00 Roseville Com Corridors Sewer Model Support\wip\C. GIS\MXDs\2 - Specific Plan Areas & Sewer System.mxd

Note that the model includes the proposed projects from the 2020 Systems Evaluation. These improvements divert flow from the trunk sewers on Old Auburn Road and Sierra College Boulevard to the north, upstream of the proposed Corridor developments. Project 1, capacity improvements at Pump Station 26 and downstream gravity sewers, was identified as an improvement needed under existing conditions. The project is anticipated to be completed in the near future and was included in the Existing Network for this study to conservatively represent flows. Projects 2 and 3, which include improvements along Eureka Road, and E. Roseville Parkway, as well as capacity improvements to Pump Station 25, were identified as improvements needed under buildout conditions, and were included in the Buildout Network.

2. BASIS OF FLOW ESTIMATES

This section describes the wastewater flow components used in the hydraulic model and the existing and projected future land uses for the service area, which form the basis for generating base wastewater flows. Design flow estimates were developed based on criteria developed for each flow component: base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration and inflow (RDI/I), and confirmed through model calibration as part of the 2017 City of Roseville Sewer Model Update.

2.1 Loading Scenarios

The model network includes four loading scenarios developed for the 2017 Model Update and updated for the 2020 Systems Evaluation:

- Existing Scenario – representing sewer flows based on model calibration.
- Existing Scenario plus Drought Rebound – representing sewer flows in the existing system that would be expected after water consumption is no longer affected by drought-induced conservation.
- Buildout Scenario – representing sewer flows incorporating currently anticipated development density.
- Buildout-Sensitivity Scenario – a theoretical scenario representing higher density development in Placer County, plus intensification and redevelopment in the downtown Roseville area.

For this study, the Existing Scenario plus Drought Rebound, the Buildout Scenario, and the Buildout-Sensitivity Scenario were used to evaluate the impacts of the proposed specific plan developments. Note that the Buildout-Sensitivity Scenario assumed redevelopment and intensification of portions of all three proposed specific plan areas (**Figure 3**), based on parcel-based classifications developed for the 2009 Systems Evaluation. Unit flow factors for the parcels in the redevelopment area are summarized in **Table 1**. More detailed information on the redevelopment land uses inside the City is included in TM 9C of the 2009 Systems Evaluation. For the purpose of the Buildout-Sensitivity Scenario evaluation, the projected flows based on the specific plan land uses were compared to projected flows based on redevelopment for these areas, and the larger flows were used. Based on this comparison (see section 2.2), the Buildout-Sensitivity Scenario used the redevelopment flow projections for these areas.

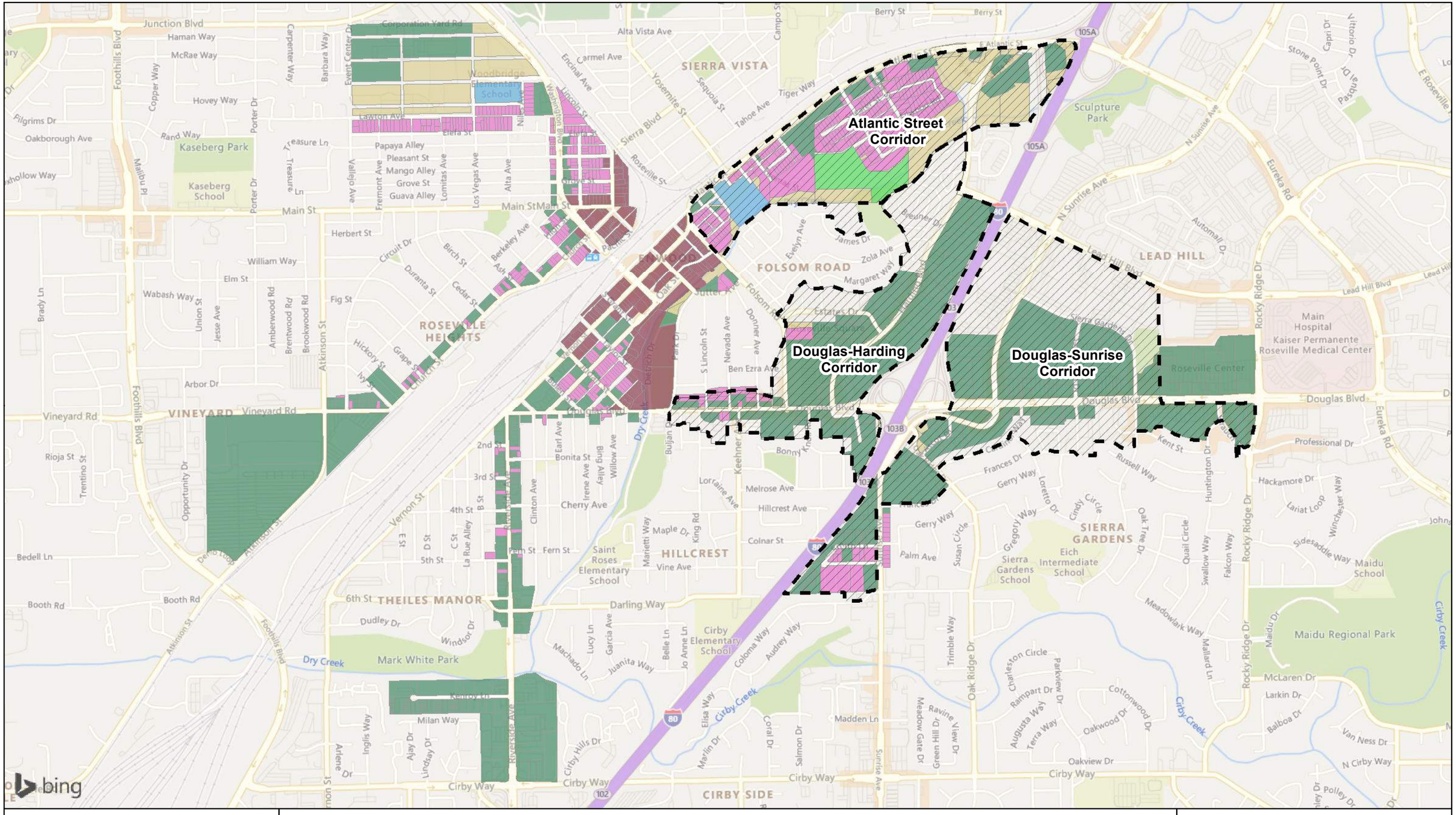


Figure 3
Buildout-Sensitivity Scenario Land Uses

City of Roseville
Commercial Corridors Specific Plans
Sewer Evaluation

Specific Plan Area

Redevelopment Land Use

- Open Space
- Parks
- Schools
- Residential Multi-Family
- Intense Commercial
- Very Intense Commercial

0 500 1,000 2,000 Feet

N

Project #: 001967.00

Map Created: August 2021

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. Data Sources: City of Roseville, RMC Water & Environment

CITY OF ROSEVILLE CALIFORNIA

WOODARD & CURRAN

Figure Exported: 8/18/2021 By: cvanlienden Using: \\woodardcurran.net\shared\Projects\001967.00 Roseville Com Corridors Sewer Model Support\wip\C. GIS\MXDs\3 - Buildout-Sensitivity Land uses.mxd

Table 1: Redevelopment Land Use Flow Factors

Corridor	Unit Flow Factor[a]
Multi-Family Residential	2,040 gpd/acre[b] OR 130 gpd/unit
Intense Commercial	2,720 gpd/acre
Very Intense Commercial	10,200 gpd/acre
Open Space	0 gpd/acre
Parks > 10 Acres	10 gpd/acre
Vacant	0 gpd/acre
Multi-Family Residential	2,040 gpd/acre[b] OR 130 gpd/unit

Footnotes:

a. Flow factors based on the 2009 *SPWA Systems Evaluation*
b. Equivalent to 17 multi-family dwelling units per acre

2.2 Flow Projection Updates

The flows for the three specific plan areas were estimated based on the projected units summarized in Table 2 below. Note that 500 of the 600 additional residential units in the Douglas-Sunrise Corridor were assigned to a proposed development at 201 North Sunrise Avenue. The additional proposed residential units were estimated using the unit factor 130 gallons per day per dwelling unit (gpd/DU) used for multi-family units in the 2017 Model Update. These loads were distributed amongst the identified residential development parcels in proportion to parcel area (acreage).

Table 2: Commercial Corridor Development

Corridor	Additional Residential Units
Atlantic Street Corridor	50
Douglas-Harding Corridor	200
Douglas-Sunrise Corridor[a]	600

Footnotes:

a. 500 of the additional residential units were assigned to a proposed development at 201 North Sunrise Avenue.

The specific plans envision redevelopment and reinvestment of commercial uses, rather than adding additional square footage. Therefore, the model does not include additional estimated commercial flows beyond what is already included for commercial development in the loading scenarios.

The sewer flows from each specific plan area for each of the modeled scenarios are summarized in Table 3.

Table 3: Modeled Dry Weather Sewer Flows

Corridor	Existing + Specific Plans (mgd)	Buildout + Specific Plans (mgd)	Buildout-Sensitivity[a] (mgd)
Atlantic Street Corridor	0.06	0.08	0.17
Douglas-Harding Corridor	0.23	0.25	0.34
Douglas-Sunrise Corridor	0.33	0.34	0.49

Footnotes:

a. Incorporates redevelopment land uses and flow factors described in Section 2.1.

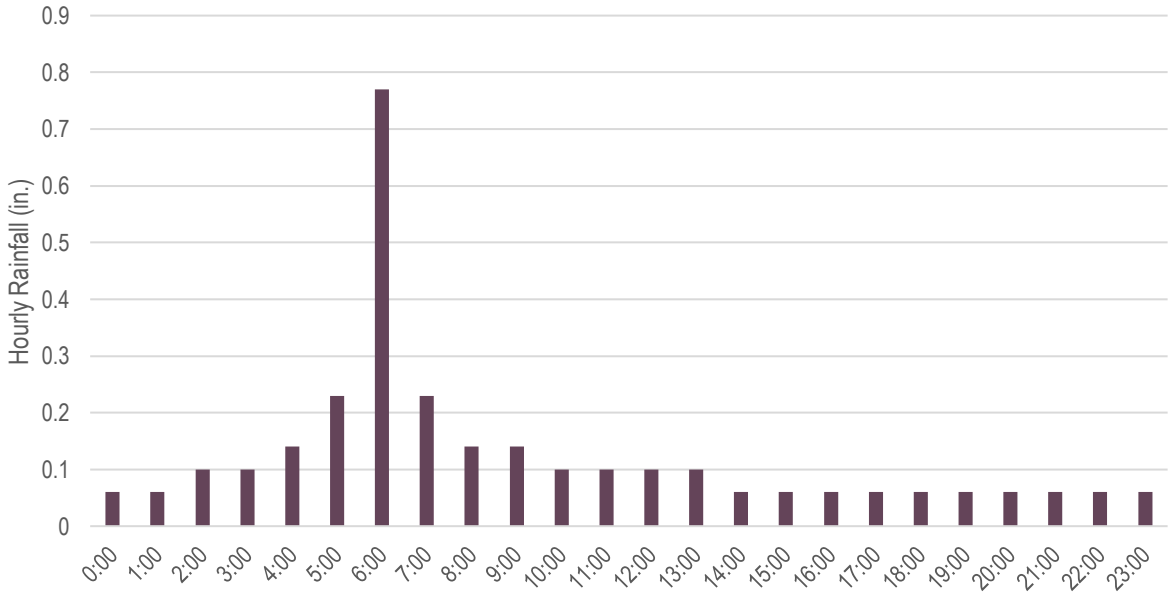
3. DESIGN CRITERA

Evaluation of system capacity was based on the design flow and capacity criteria applied in the 2020 Systems Evaluation, and summarized below. It should be noted that this methodology differs somewhat from the flow and capacity criteria in the City's design standards, which are intended for evaluation of sewers 15 inches and smaller and generally used for areas without an existing hydraulic model.

3.1.1 Design Flow Criteria

Design flows for sewer systems consist of BWF, GWI, and RDI/I. Criteria for computing existing and future BWF, GWI, and RDI/I (developed as part of model calibration) were discussed in the 2020 Systems Evaluation Report. Design RDI/I is based on a 10-year, 24-hour synthetic rainfall pattern that occurs uniformly across the entire SPWA service area. The intensity and timing of the design storm is presented in Figure 4.

Figure 4: SPWA 10-year Design Storm Event



3.1.2 Hydraulic Capacity Criteria

Capacity deficiency or performance criteria are used to determine when the capacity of a sewer pipeline or pump station is exceeded to the extent that a capacity improvement project (e.g., a relief sewer or larger replacement sewer or pump station upgrade) is required. Capacity deficiency criteria are sometimes called "trigger" criteria in that they trigger the need for a capacity improvement project. These criteria may differ from "design criteria" that are applied to determine the size of a new facility, which may be more conservative than the performance criteria. The 2020 Systems Evaluation used the following hydraulic capacity criteria:

- Surcharging up to within 5 feet of the manhole rims (ground surface) is considered acceptable under 10-year design storm peak wet weather flow (PWWF), as long as the surcharge (flow height in the manhole) does not exceed 4 feet above the top of the pipe.

- Pump stations are considered capacity deficient if the design storm PWWF exceeds the pump station capacity with the largest pumping unit out of service (firm capacity).
- Force mains with velocities exceeding 7 feet per second under PWWF may require further investigation, although would not trigger a project unless the pump station required additional capacity.

For the current study, the same criteria have been applied.

4. MODEL RESULTS

Model results indicating the locations of model-predicted surcharge are shown in Figure 4 (existing with drought rebound) and Figure 5 (buildout). Note that Figure 5 shows the results for both the Buildout and Buildout-Sensitivity senarios (i.e. there is no difference in modeled surcharge between the scenarios). Hydraulic profiles of the trunk sewers downstream of the proposed specific plan areas are presented in Appendix A.

The results indicate no significant surcharge in the sewers downstream of the Douglas-Harding and Atlantic Street Corridors, but some surcharge is predicted downstream of the Douglas-Sunrise Corridor in Cirby Creek trunk sewer A. Table 4 summarizes the surcharge extent, depth, and freeboard. As summarized in Table 4, the surcharge exceeds the criteria described above for some sewers in the Buildout and Buildout-Sensitivity scenarios. These results indicate somewhat increased surcharge compared to the surcharge reported in the 2020 Systems Evaluation. This difference is because the City recently abandoned a connection that moved sewer flow from Cirby Trunk A into Cirby Trunk B, resulting in additional flow in Cirby Trunk A.

It should be noted that four manholes on Cirby Creek trunk sewer A (B06-340, B06-341, B06-343, and B06-344) on an 18-inch sewer following a creek and adjacent to the Warren T. Eich Middle School are shallow (crown of pipe is less than 5 feet below the manhole rim). Under buildout conditions (with or without the proposed Douglas-Sunrise Corridor), the model predicts that the backup surcharge would extend to these manholes, exceeding the minimum freeboard criterion. The surcharge also exceeds maximum surcharge criteria and minimum freeboard within Cirby Trunk A. The shallow manholes are indicated in Figure 5 and indicated on the profile in Appendix A. While the Douglas-Sunrise Corridor does not trigger the capacity deficiency in any of the loading scenarios, the development would slightly increase the extent of surcharge in all scenarios.

Table 4: Surcharge downstream of Douglas-Sunrise Corridor

	Length of Throttle Surcharge (ft)	Maximum Surcharge Depth (ft) (4 ft max criterion)	Minimum Freeboard (ft) (5 ft minimum criterion)
Existing (plus Drought Rebound)	1,670	1.8	8.8
Buildout	4,250	6.2	1.0 at 4 shallow manholes (see text) 3.3 elsewhere
Buildout-Sensitivity	4,250	6.6	0.3 at 4 shallow manholes (see text) 4.4 elsewhere

5. CONCLUSIONS AND RECOMMENDATIONS

Mitigating the deficiency identified above would require relieving Cirby Trunk A. A potential improvement project has been developed that would alleviate the deficiency by installing a relief sewer to convey excess flows into Cirby Trunk B. A description of the project and an estimated capital cost of the project is included in Appendix B. As indicated, the project is estimated to cost approximately $12.4 million. The relatively high cost of the project is partially due to the depth of the sewer needed (up to 37 feet) along part of Caloma Way, likely requiring trenchless construction techniques. It is possible that project alternatives could be considered that would reduce the cost of the project and/or provide additional benefits (such as allowing abandonment of backyard sewers). Additional alternatives have not been evaluated in this study, but we recommended further study prior to implementation.

The proposed project is required due to flows from the sewershed upstream, which includes development both in the City of Roseville as well as the other SPWA partner agencies. As noted above, the improvement is not needed for existing flows, but will be required to meet buildout flows. The proposed Commercial Corridors specific plans would not by themselves trigger the need for the project but would contribute to the overall flows at buildout. Table 5 summarizes the Equivalent Dwelling Units (EDUs) contributing to the project deficiency.

Table 5: Equivalent Dwelling Units in Upstream Sewershed Contributing to Deficiency

	Equivalent Dwelling Units	Increase from Existing
Existing	19,000	
Existing + Douglas-Sunrise Commercial Corridor	19,600	+600
Buildout	23,020	+4,020
Buildout + Douglas-Sunrise Commercial Corridor	23,620	+4,620
Buildout-Sensitivity	24,334	+5,334
Buildout-Sensitivity + Douglas-Sunrise Commercial Corridor	24,994	+5,934

The model indicates that the project would be needed when the units upstream of the project reach approximately 20,700 EDUs, or about 1,700 EDUs more than existing. Note that, this will depend on I&I rates of future growth areas within Placer County. We recommended that the City perform additional studies to evaluate potential project alternatives and implement a project prior to development of 1,700 units of additional growth, or perform additional flow monitoring as development occurs to confirm the need for the project.

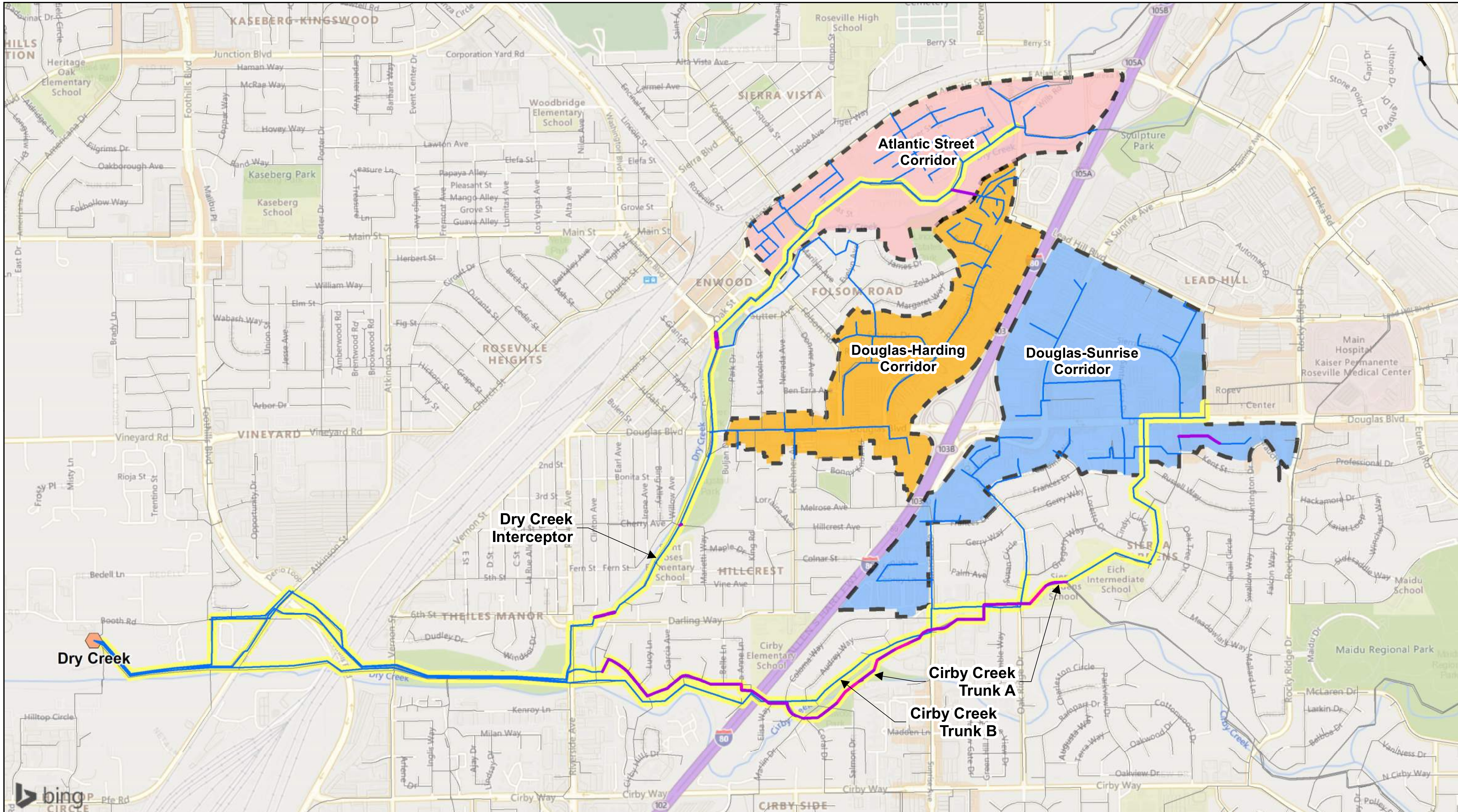


Figure 4
Model Results (Existing PWWF)

City of Roseville
Commercial Corridors Specific Plans
Sewer Evaluation

Modeled Results (sewers with Specific Plan flows only)

- Model predicted overflow
- Backwater surcharge
- Throttle surcharge
- Not surcharged
- Wastewater Treatment Plant
- Trunk sewers downstream of proposed specific plans
- Sewer not downstream of proposed specific plans
- Atlantic Coridor
- Douglas-Harding Corridor
- Douglas-Sunrise Corridor

0 375 750 1,500 2,250 3,000 Feet

N

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. Data Sources: SPWA Agencies, ESRI, W&C

CITY OF ROSEVILLE CALIFORNIA
WOODARD & CURRAN

Figure Exported: 2/11/2022 By: dmerlo Using: \\woodardcurran.net\shared\Projects\0011967.00 Roseville Com Corridors Sewer Model Support\wip\C. GIS\MXDs\4 - Rebound Model Results.mxd

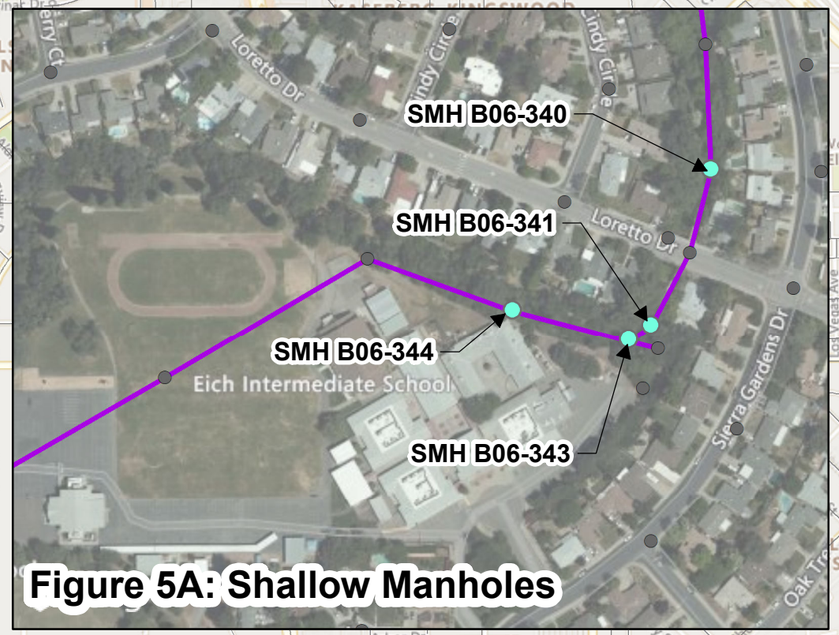


Figure 5A: Shallow Manholes

Atlantic Street Corridor

Douglas-Harding Corridor

Douglas-Sunrise Corridor

Dry Creek Interceptor

See Figure 5A

Dry Creek

Cirby Creek Trunk A

Cirby Creek Trunk B

Figure 5
Model Results (Buildout PWWF)

City of Roseville
Commercial Corridors Specific Plans
Sewer Evaluation

Modeled Results (sewers with Specific Plan flows only)

- Model predicted overflow
- Backwater surcharge
- Throttle surcharge
- Not surcharged
- Wastewater Treatment Plant
- Trunk sewers downstream of proposed specific plans
- Sewer not downstream of proposed specific plans
- Atlantic Coridor
- Douglas-Harding Corridor
- Douglas-Sunrise Corridor

0 375 750 1,500 2,250 3,000 Feet

N

Figure Exported: 2/11/2022 By: dmerlo Using: \\woodardcurran.net\shared\Projects\0011967.00 Roseville Com Corridors Sewer Model Support\wip\C. GIS\MXDs\5 - Sensitivity Model Results.mxd

APPENDIX A – HYDRAULIC PROFILES

Figure A-1: Dry Creek Interceptor Hydraulic Profile (Existing plus Specific Plans Design Storm Results)

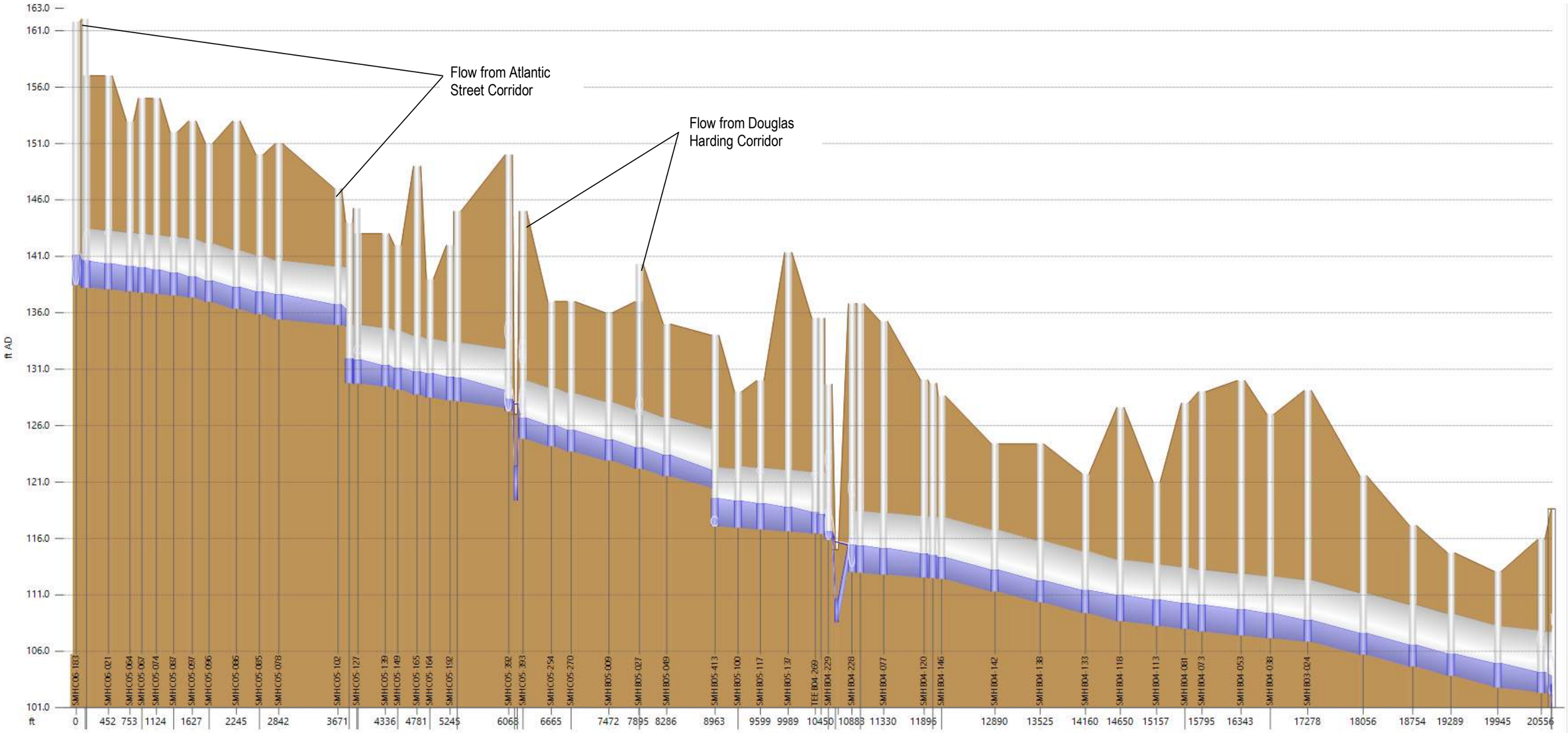


Figure A-2: Cirby Creek Trunk A Hydraulic Profile (Existing plus Specific Plans Design Storm Results)

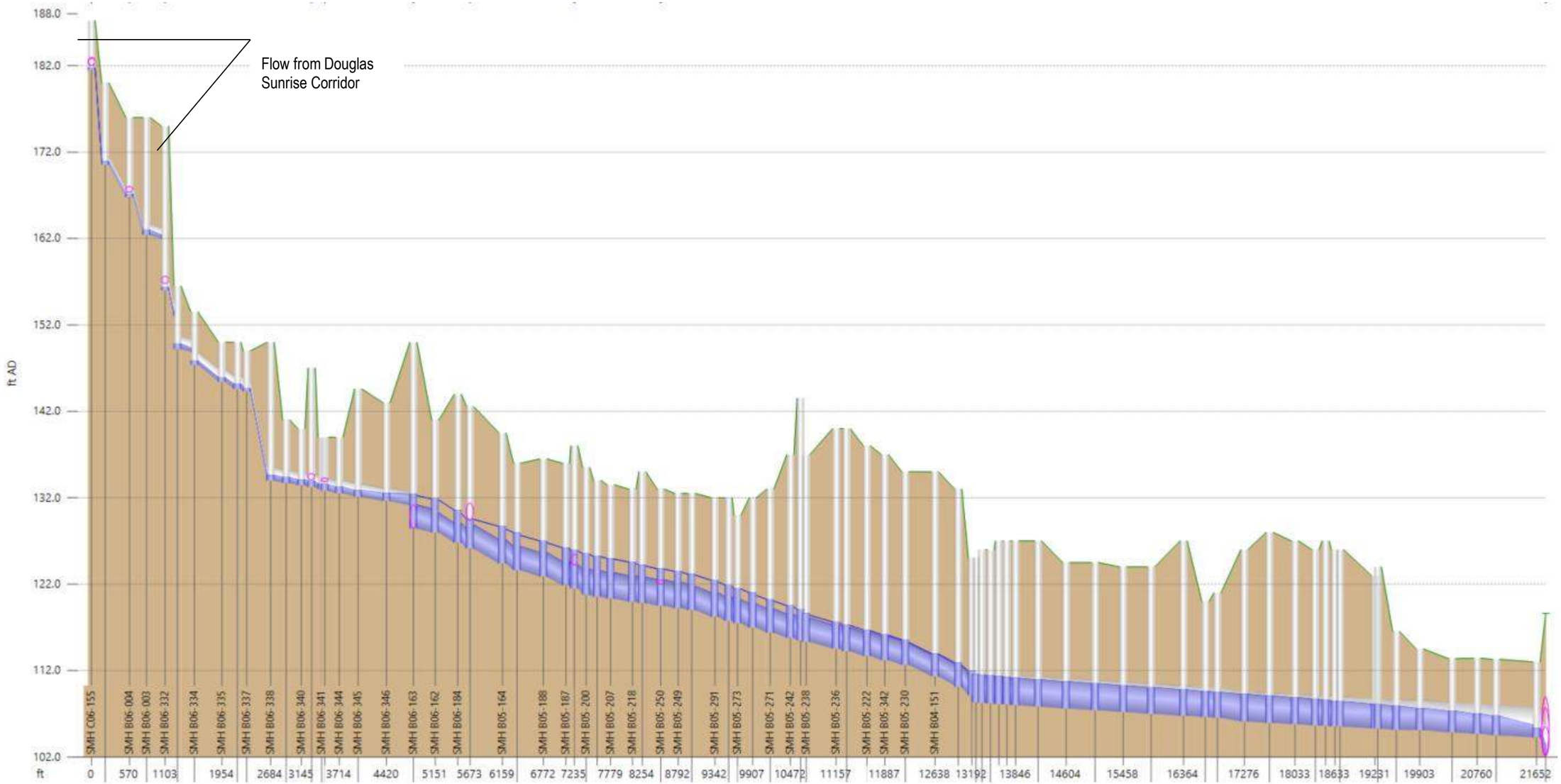


Figure A-3: Cirby Creek Trunk B Hydraulic Profile (Existing Rebound plus Specific Plans Design Storm Results)

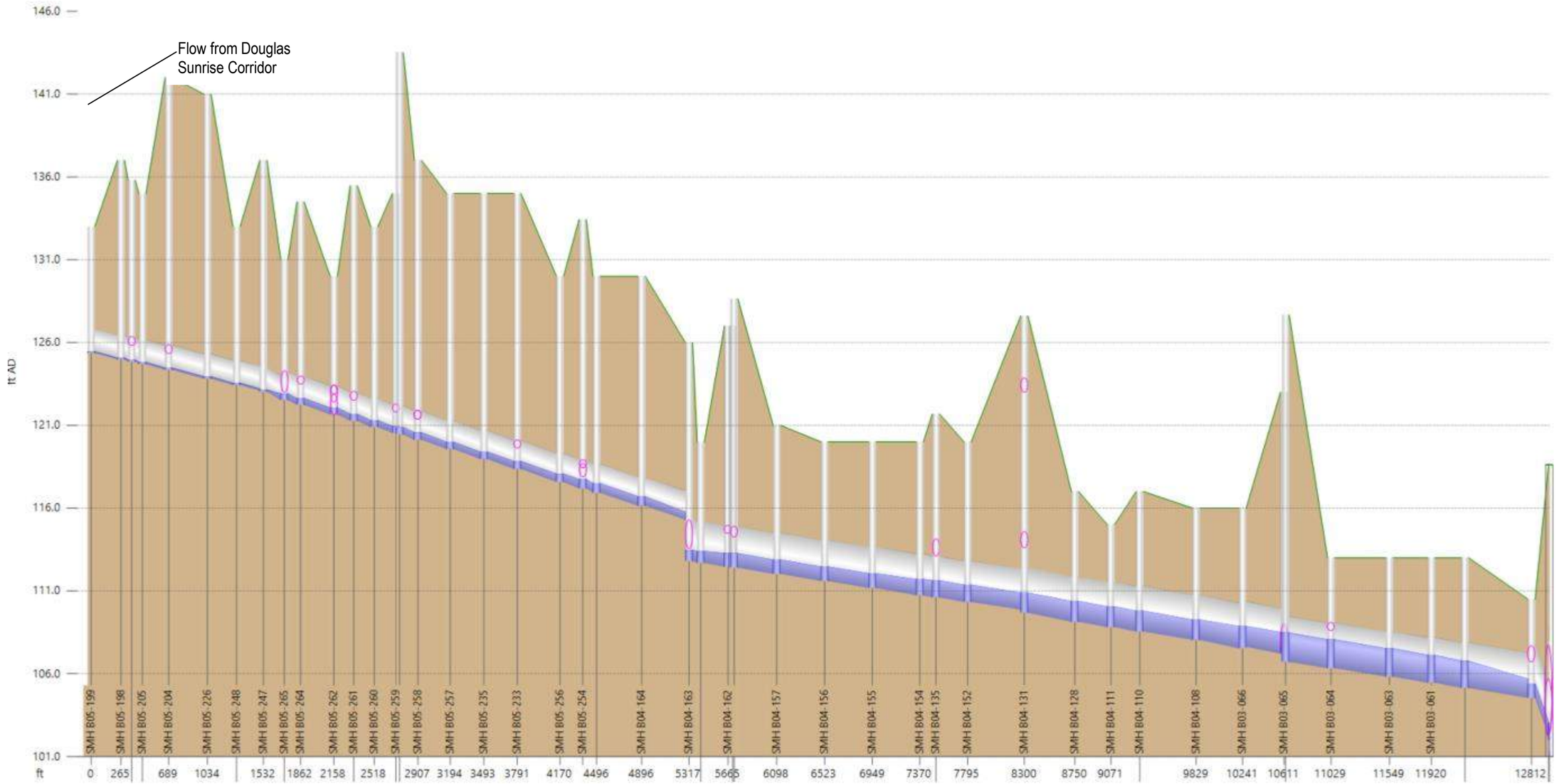


Figure A-4: Dry Creek Interceptor Hydraulic Profile (Buildout plus Specific Plans and Buildout-Sensitivity Design Storm Results)

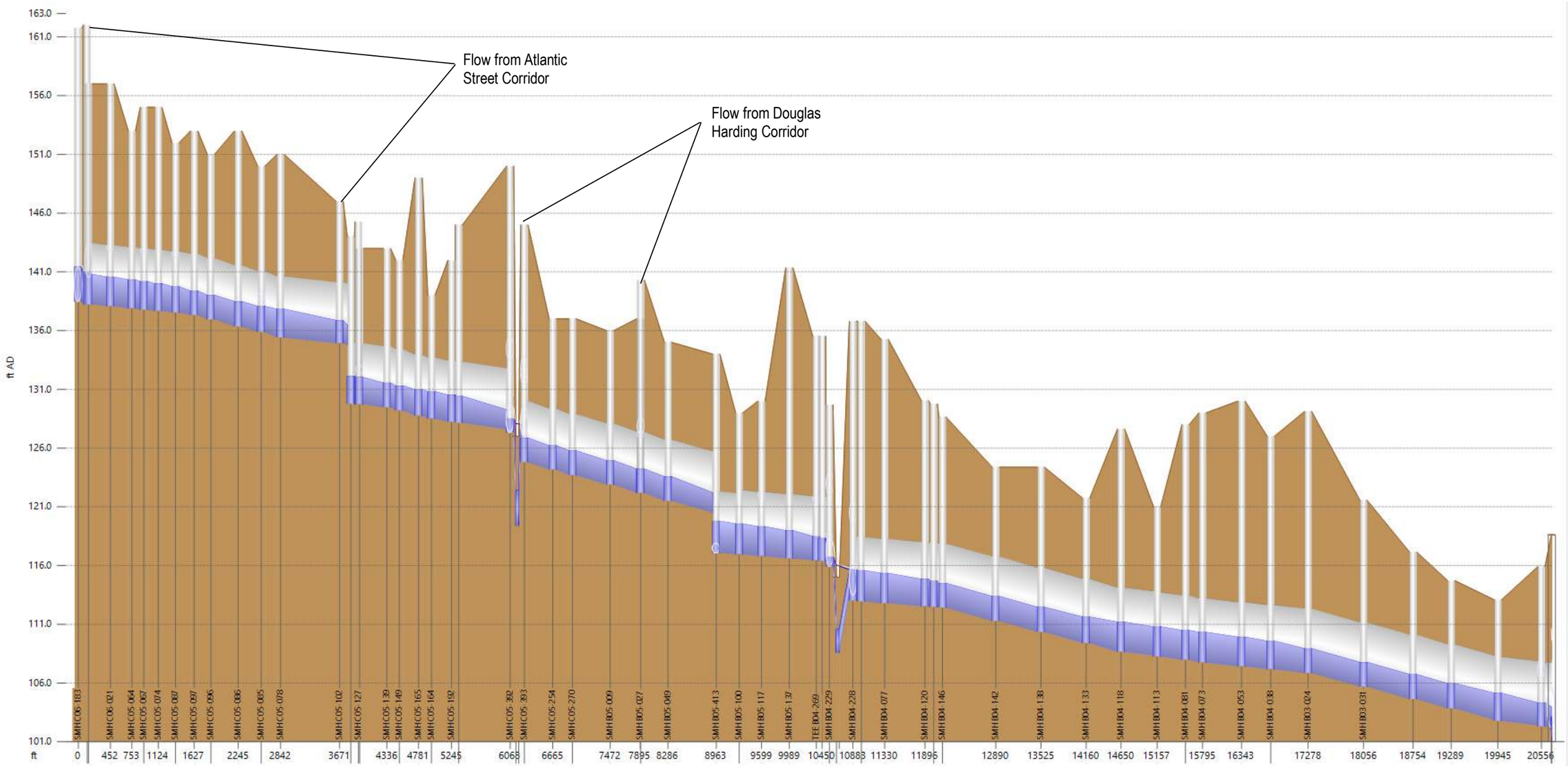


Figure A-5: Cirby Creek Trunk A Hydraulic Profile (Buildout Design Storm Results)

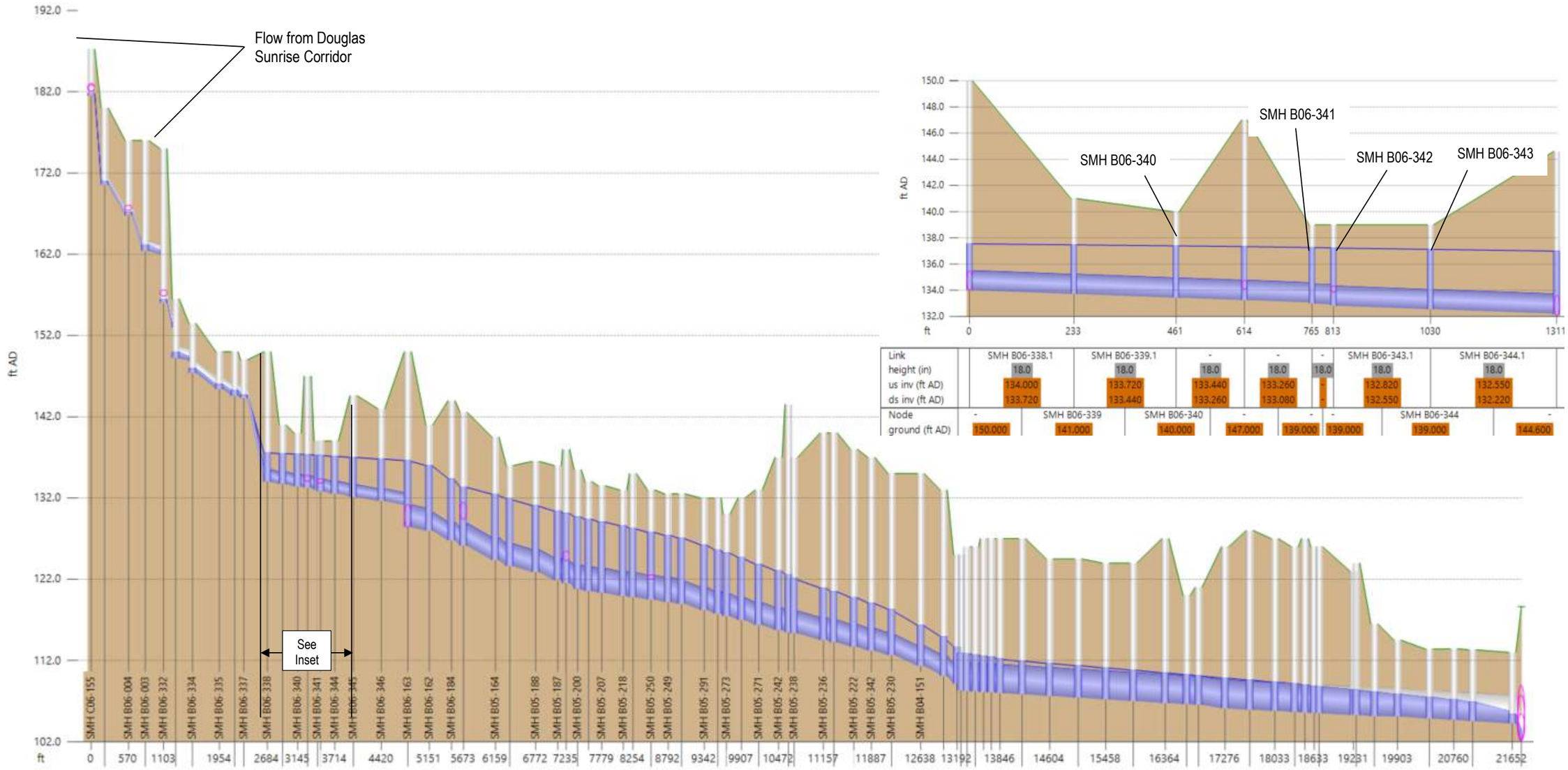
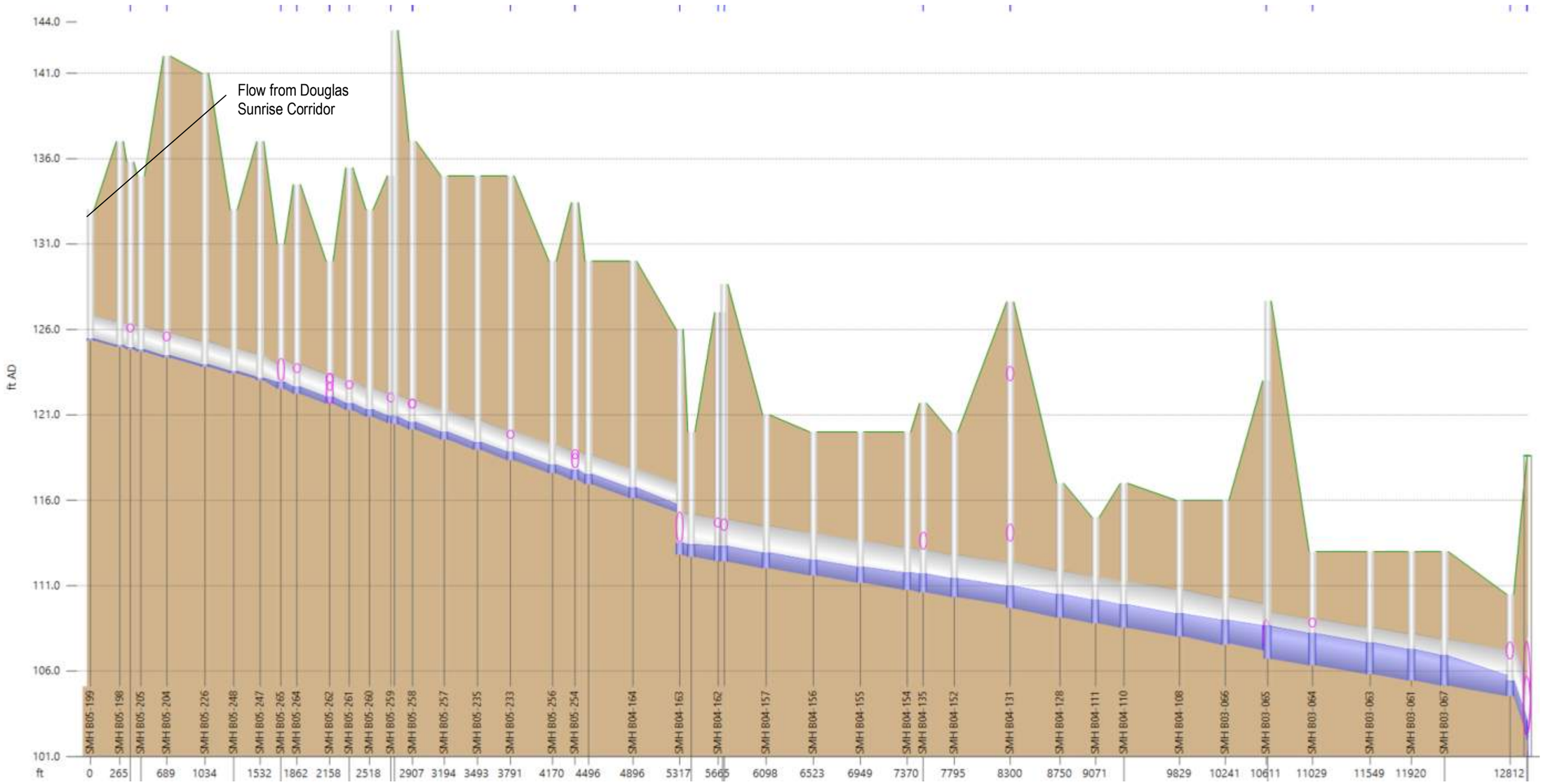


Figure A-6: Cirby Creek Trunk B Hydraulic Profile (Buildout plus Specific Plans and Buildout-Sensitivity Design Storm Results)



APPENDIX B – PROJECT DESCRIPTION AND COST ESTIMATE

Project: 1 - Cirby Creek Sewer Relief

PROJECT DESCRIPTION

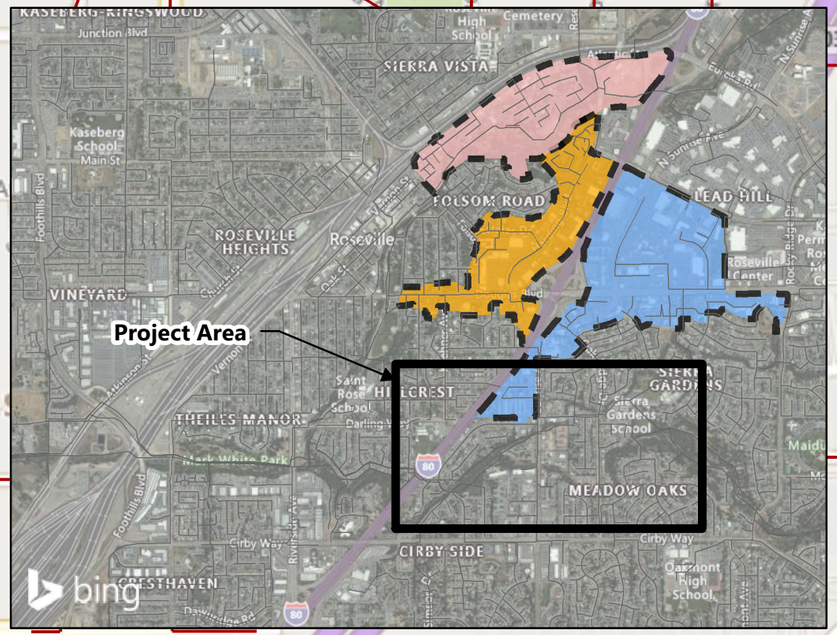
Project ID	1 - Cirby Creek Sewer Relief
Project Location	Coloma Way from east of the intersection at Sunrise Ave. to the intersection at Elisa Way
Description	Install approximately 3600 linear feet of new relief sewer to relieve capacity deficiencies associated with low lying manholes near Cirby Creek at Sierra Gardens Park and also west of Sunrise Ave and south of Coloma Way.
Estimated Capital Improvement Cost	$12,403,000
Comments	(i) Pipes are listed in order from upstream to downstream.
Assumptions	(i) Pipes deeper than 25-feet are assumed to be installed using trenchless methods. Pilot tube guided auger boring (PTGAB) was selected as the trenchless method for estimating purposes. PTGAB requires a rigid pipe to jack into place so for this reason the unit cost shown includes the estimated cost of a 24" steel casing with a 21" PVC pipe set on center and grouted in place.
	(ii) New diameter based on sizing criteria per the City of Roseville's design standards
	(iii) Cost estimates are based on CCI of 13959.14, an average of the San Francisco and 20 Cities Average for the March 2022 ENR.
Alternatives	1. Upsize existing line or parallel sewer.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	New Diameter (inches)[1]	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Pipe Capacity (mgd)	Installation Technology	Unit Cost ($/LF)	Total Cost ($)
SMH B05-164	Coloma Way-11	15	40	0.15%	10	1.61	Open-Cut	$413	$ 16,479
SMH B05-173	Coloma Way-11	15	14	7.26%	10	11.17	Open-Cut	$413	$ 5,782
Coloma Way-11	Coloma Way-10	21	319	0.12%	20	3.52	Open-Cut	$553	$ 176,309
Coloma Way-10	Coloma Way-9	21	245	0.12%	17	3.52	Open-Cut	$553	$ 135,358
Coloma Way-9	Coloma Way-8	21	225	0.12%	15	3.52	Open-Cut	$553	$ 124,457
Coloma Way-8	Coloma Way-7	21	245	0.12%	20	3.52	Open-Cut	$553	$ 135,580
Coloma Way-7	Coloma Way-6	21	488	0.12%	37	3.52	PTGAB	$1,650	$ 804,540
Coloma Way-6	Coloma Way-5	21	420	0.12%	35	3.52	PTGAB	$1,650	$ 693,000
Coloma Way-5	Coloma Way-4	21	238	0.12%	30	3.52	PTGAB	$1,650	$ 393,030
Coloma Way-4	Coloma Way-3	21	517	0.12%	27	3.52	PTGAB	$1,650	$ 853,050
Coloma Way-3	Coloma Way-2	21	543	0.12%	25	3.52	PTGAB	$1,650	$ 895,125
Coloma Way-2	Coloma Way-1	21	277	0.12%	15	3.52	Open-Cut	$553	$ 153,288
Coloma Way-1	SMH B05-262	21	20	0.12%	8	3.52	Open-Cut	$509	$ 10,386

Jacking Shaft, Assume 3	$	660,000
Receiving Shaft, Assume 4	$	680,000
Total Baseline Pipe Construction Cost	$	5,714,122
Modify Existing Manholes, Approx. 2	$	50,000
Install New Manhole, Approx. 11	$	210,000
Baseline Construction Cost:	**$**	**5,974,122**
Dewatering	$	100,000
Bypass Pumping (10% of baseline construction cost)	$	597,412
Traffic Control (10% of baseline construction cost)	$	597,412
Subtotal:	**$**	**7,268,946**
Mobilization/Demobilization (5% of subtotal)	$	363,447
Estimated Construction Cost Subtotal:	**$**	**7,632,394**
Contingencies (30% of construction subtotal)	$	2,289,718
Estimated Construction Cost:	**$**	**9,922,112**
Engineering, Administration, Legal (25% of construction cost)	$	2,480,528
Estimated Capital Improvement Cost:	**$**	**12,403,000**

(Note: Cost estimates are based on March 2022 ENR CCI of 13959.14)



Project 1 - Cirby Creek

City of Roseville
Commercial Corridors Specific Plans
Sewer Evaluation

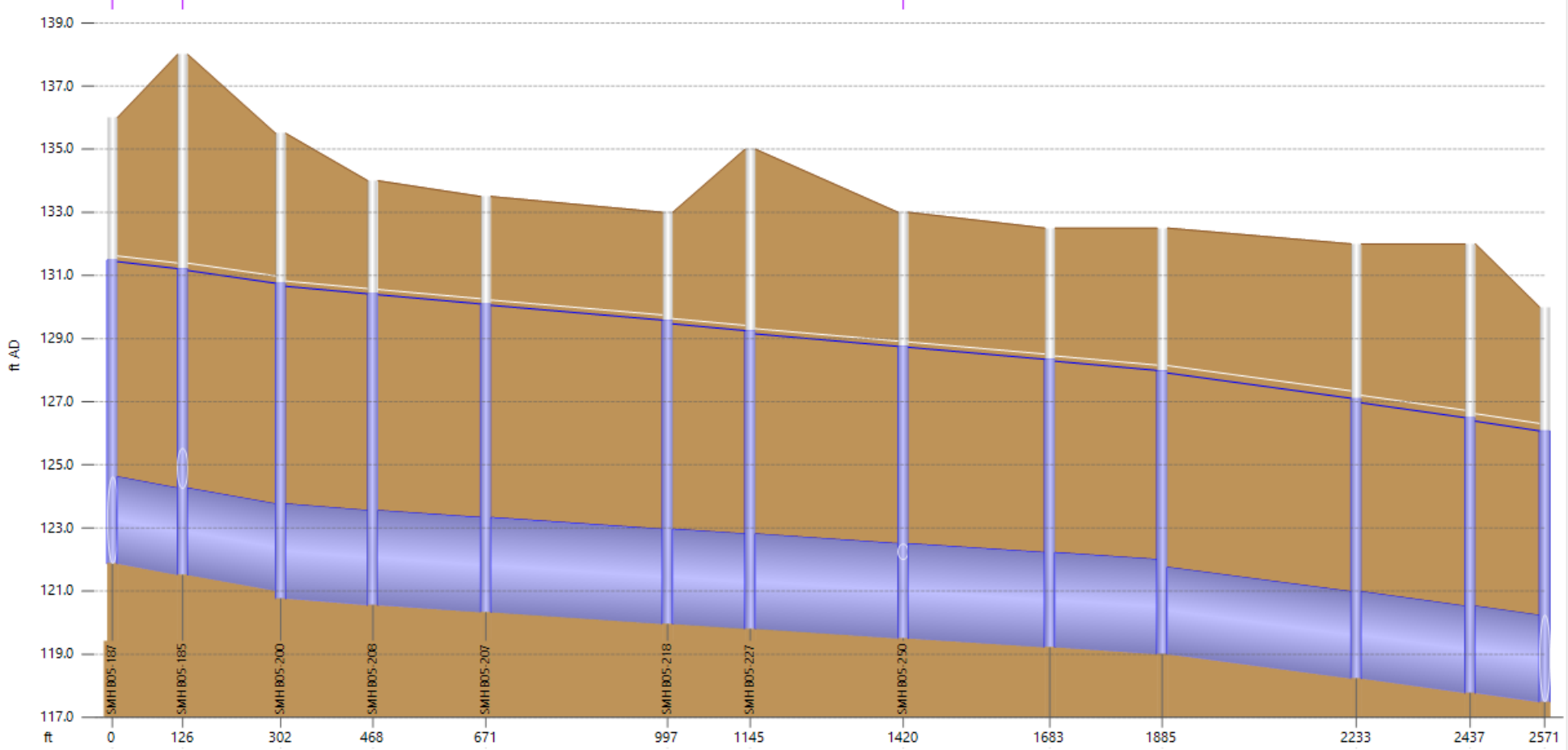
Proposed Manholes
Deficient Sewers
Proposed Relief Sewer

0 115 230 460 690 920 Feet

N

CITY OF ROSEVILLE CALIFORNIA
WOODARD & CURRAN

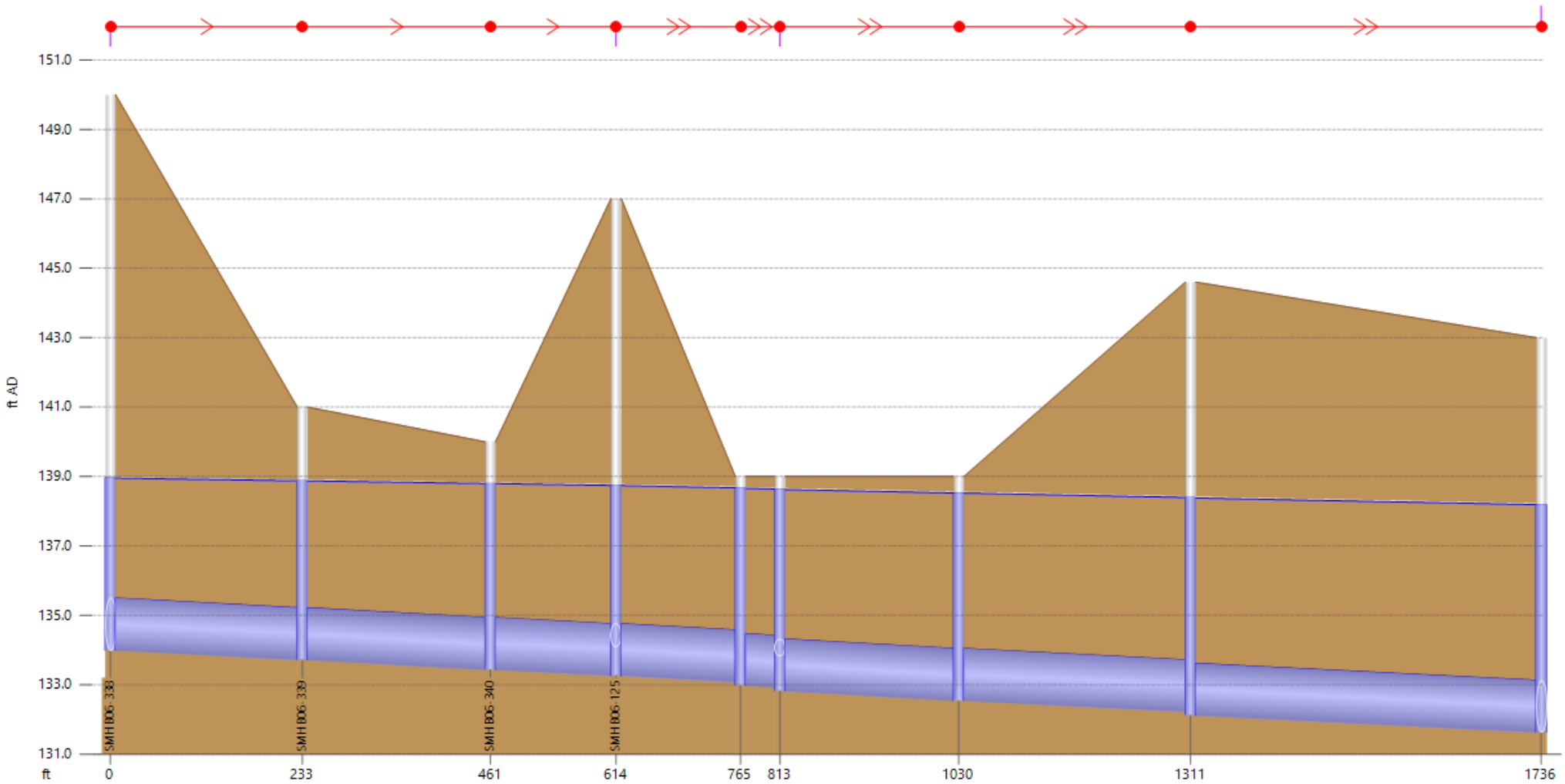
Figure Exported: 4/21/2022 By: dmerlo Using: \\woodardcurran.net\shared\Projects\0011967.00 Roseville Com Corridors Sewer Model Support\wip\C. GIS\MXDs\Appendix B - Project 1.mxd



Link	-	-	-	SMH B05-208.1	SMH B05-207.1	-	SMH B05-227.1	SMH B05-250.1	SMH B05-249.1	SMH B05-266.1	SMH B05-291.1	-
length (ft)	126.4	176.0	165.7	202.7	326.1	148.3	274.6	263.3	201.7	348.2	204.6	133.6
width (in)	33.0	33.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	33.0	33.0	33.0
us inv (ft AD)	121.870	121.510	120.760	120.550	120.330	119.960	119.810	119.500	119.220	119.000	118.230	117.770
ds inv (ft AD)	121.510	121.010	120.550	120.330	119.960	119.810	119.500	119.220	119.000	118.230	117.770	117.480
grad (%)	0.285	0.284	0.127	0.109	0.113	0.101	0.113	0.106	0.109	0.221	0.225	0.217
surc	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
US flow (MGD)	14.5381	16.2992	16.2991	16.2991	16.3018	16.3013	16.3011	16.3144	16.3159	16.3156	16.3154	16.3152

Node	-	-	-	-	SMH B05-207	SMH B05-218	SMH B05-227	SMH B05-250	SMH B05-249	SMH B05-266	SMH B05-291	-	-
ground (ft AD)	-	138.000	135.500	134.000	133.500	133.000	135.000	133.000	132.500	132.500	132.000	132.000	-
level (ft AD)	-	131.212	130.742	130.415	130.094	129.574	129.244	128.750	128.339	127.986	127.096	126.485	-
flood dep (ft)	-	-6.788	-4.758	-3.585	-3.406	-3.426	-5.756	-4.250	-4.161	-4.514	-4.904	-5.515	-

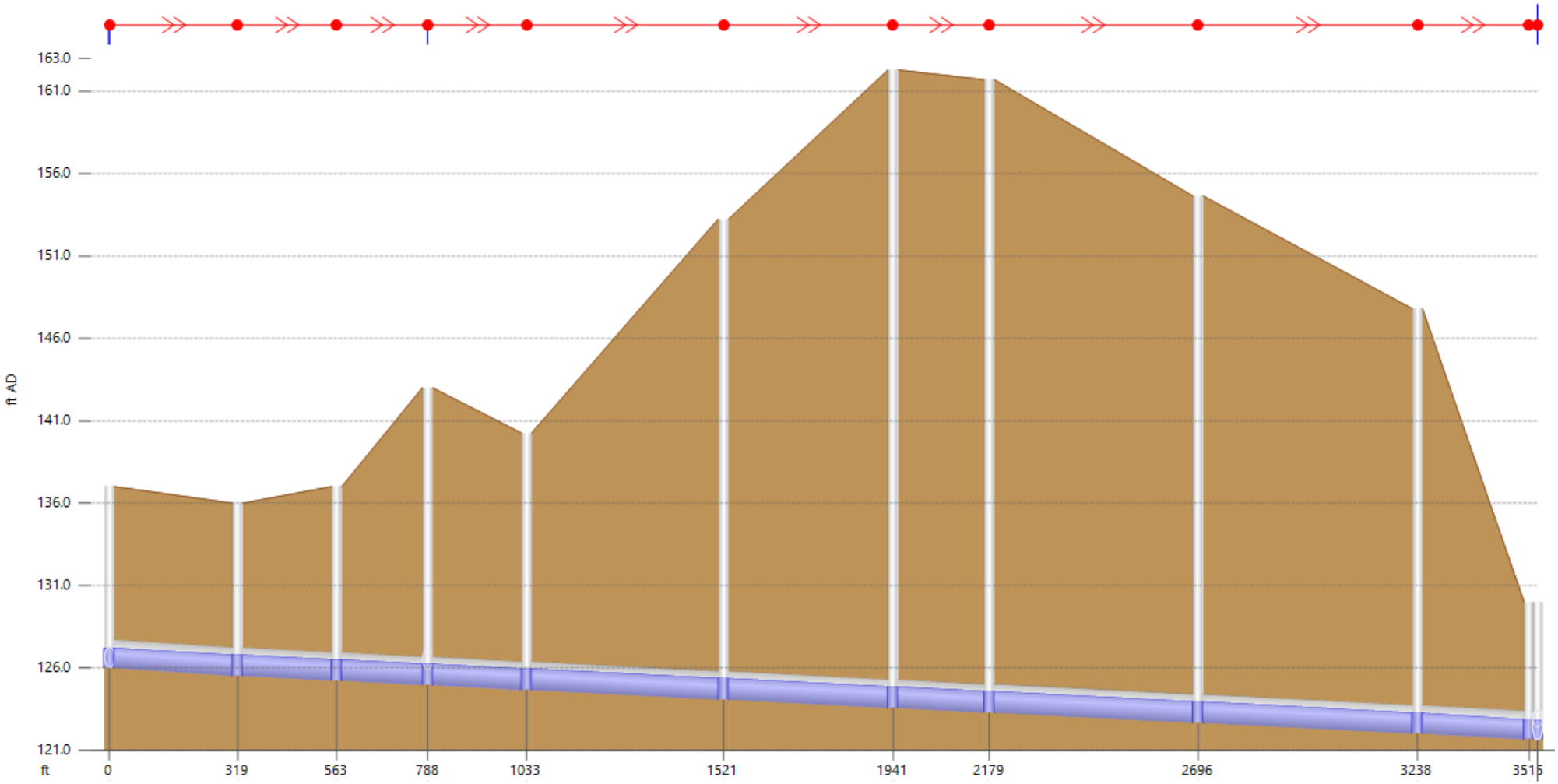
Shallow Manholes



Link	SMH B06-338.1	SMH B06-339.1	SMH B06-340.1	SMH B06-125.1	-	SMH B06-343.1	SMH B06-344.1	SMH B06-345.1
length (ft)	233.2	228.0	152.6	150.9	48.0	216.8	281.3	425.4
width (in)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
us inv (ft AD)	134.000	133.720	133.440	133.260	-	132.820	132.550	132.120
ds inv (ft AD)	133.720	133.440	133.260	133.080	-	132.550	132.220	131.630
grad (%)	0.120	0.123	0.118	0.119	0.125	0.125	0.117	0.115
surc	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
US flow (MGD)	1.2590	1.2580	1.2562	1.4268	-	1.4420	1.4407	1.4394

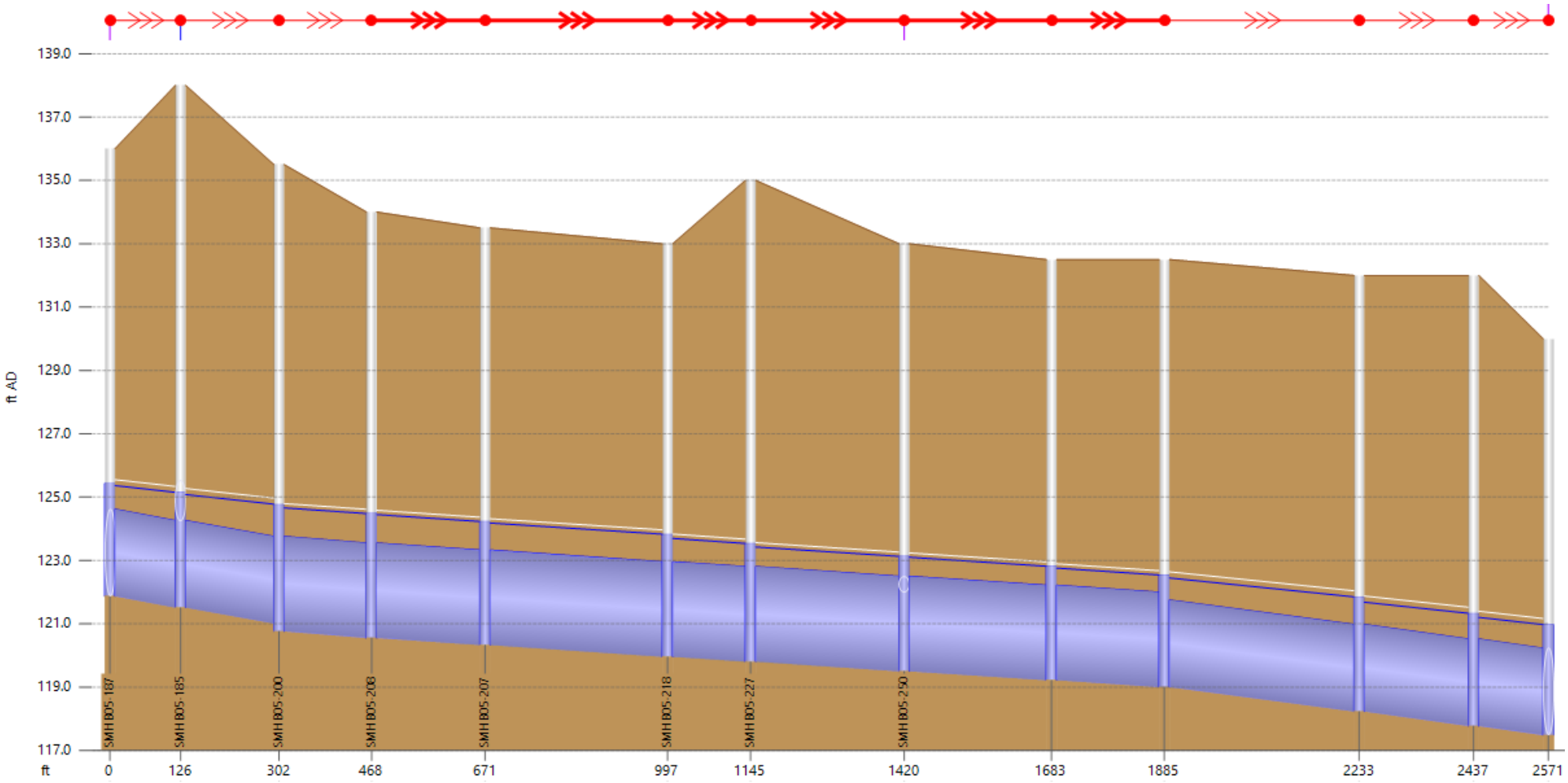
Node	-	SMH B06-339	SMH B06-340	SMH B06-125	-	SMH B06-343	SMH B06-344	SMH B06-345	SMH B06-346
ground (ft AD)	150.000	141.000	140.000	147.000	139.000	139.000	139.000	144.600	143.000
level (ft AD)	138.966	138.879	138.801	138.746	138.674	138.642	138.530	138.398	138.193
flood dep (ft)	-11.034	-2.121	-1.199	-8.254	-0.326	-0.358	-0.470	-6.202	-4.807

Project 1 - Cirby Creek (Proposed Relief Sewer)



Link		Coloma Way-11.1	-	-	-	Coloma Way-7.1	Coloma Way-6.1	-	Coloma Way-4.1	Coloma Way-3.1	Coloma Way-2.1	
length (ft)		318.6	244.6	224.9	245.0	487.6	420.0	238.2	517.0	542.5	277.0	
width (in)		21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
us inv (ft AD)		126.000	125.520	125.230	124.960	124.660	124.080	123.570	123.290	122.670	122.020	
ds inv (ft AD)		125.520	125.230	124.960	124.660	124.080	123.570	123.290	122.670	122.020	121.680	
grad (%)		0.151	0.119	0.120	0.122	0.119	0.121	0.118	0.120	0.120	0.123	
surc		0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.72	0.70	
US flow (MGD)		3.0105	3.0104	3.0102	3.1211	3.1209	3.1205	3.1202	3.1200	3.1198	3.1195	
Node	-	-	-	-	Coloma Way-7	Coloma Way-6	Coloma Way-5	Coloma Way-4	Coloma Way-3	Coloma Way-2	-	
ground (ft AD)	-	136.000	137.000	143.000	140.263	153.238	162.286	161.702	154.637	147.807	-	
level (ft AD)	-	126.777	126.490	126.231	125.936	125.351	124.849	124.562	123.938	123.255	-	
flood dep (ft)	-9.813	-9.223	-10.510	-16.769	-14.327	-27.886	-37.437	-37.140	-30.699	-24.552	-7.155	

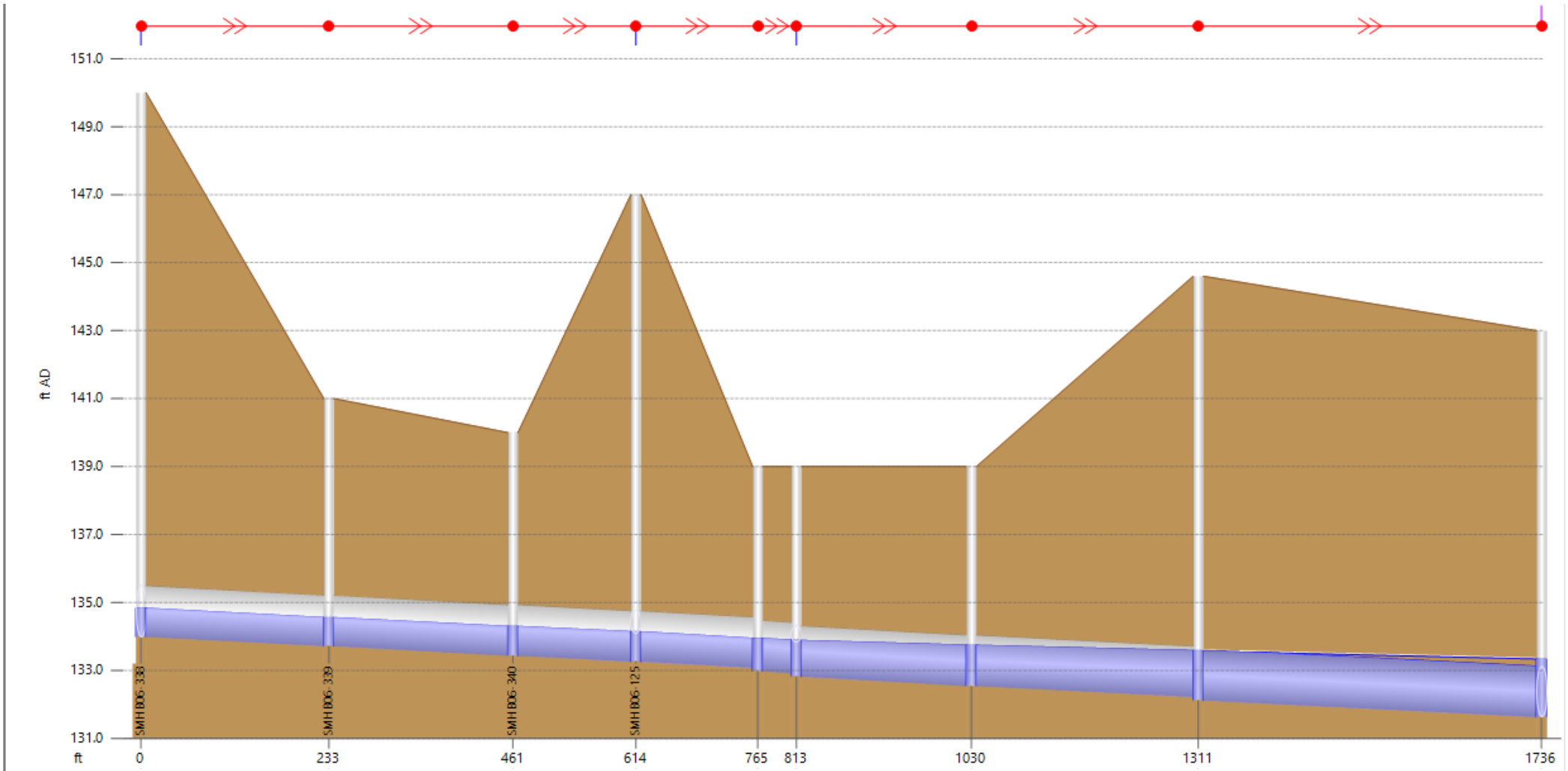
Cirby Trunk A (with proposed relief sewer)



Link	-	-	-	SMH B05-208.1	SMH B05-207.1	-	SMH B05-227.1	SMH B05-250.1	SMH B05-249.1	SMH B05-266.1	SMH B05-291.1	-
length (ft)	126.4	176.0	165.7	202.7	326.1	148.3	274.6	263.3	201.7	348.2	204.6	133.6
width (in)	33.0	33.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	33.0	33.0	33.0
us inv (ft AD)	121.870	121.510	120.760	120.550	120.330	119.960	119.810	119.500	119.220	119.000	118.230	117.770
ds inv (ft AD)	121.510	121.010	120.550	120.330	119.960	119.810	119.500	119.220	119.000	118.230	117.770	117.480
grad (%)	0.285	0.284	0.127	0.109	0.113	0.101	0.113	0.106	0.109	0.221	0.225	0.217
surc	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00
US flow (MGD)	14.7792	14.8873	14.8530	14.8231	14.7886	14.7245	14.6874	14.6246	14.5446	14.4729	14.3969	14.3584

Node	-	-	-	-	SMH B05-207	SMH B05-218	SMH B05-227	SMH B05-250	SMH B05-249	SMH B05-266	SMH B05-291	-	-
ground (ft AD)	-	138.000	135.500	134.000	133.500	133.000	135.000	133.000	132.500	132.500	132.000	132.000	-
level (ft AD)	-	125.145	124.763	124.479	124.227	123.819	123.528	123.128	122.813	122.537	121.836	121.320	-
flood dep (ft)	-	-12.855	-10.737	-9.521	-9.273	-9.181	-11.472	-9.872	-9.686	-9.963	-10.164	-10.680	-

Shallow Manholes (with proposed relief sewer)



Link		SMH B06-338.1		SMH B06-339.1		SMH B06-340.1	SMH B06-125.1	-	SMH B06-343.1		SMH B06-344.1		SMH B06-345.1	
length (ft)		233.2		228.0		152.6	150.9	48.0	216.8		281.3		425.4	
width (in)		18.0		18.0		18.0	18.0	18.0	18.0		18.0		18.0	
us inv (ft AD)		134.000		133.720		133.440	133.260	-	132.820		132.550		132.120	
ds inv (ft AD)		133.720		133.440		133.260	133.080	-	132.550		132.220		131.630	
grad (%)		0.120		0.123		0.118	0.119	0.125	0.125		0.117		0.115	
surc		0.56		0.57		0.59	0.59	0.65	0.80		0.91		1.00	
US flow (MGD)		1.3680		1.3699		1.3707	1.5719	-	1.5924		1.5979		1.6058	
Node	-		SMH B06-339		SMH B06-340	SMH B06-125	-	SMH B06-343		SMH B06-344		SMH B06-345		SMH B06-346
ground (ft AD)	150.000		141.000		140.000	147.000	139.000	139.000		139.000		144.600		143.000
level (ft AD)	134.838		134.558		134.299	134.146	133.949	133.898		133.749		133.587		133.339
flood dep (ft)	-15.162		-6.442		-5.701	-12.854	-5.051	-5.102		-5.251		-11.013		-9.661