

Sacramento Regional County Sanitation District

Interceptor Sequencing Study

Technical Memorandum 13
Hydraulic Model Evaluation

June 2010

Sacramento Regional County Sanitation District

Interceptor Sequencing Study

**TECHNICAL MEMORANDUM
NO. 13**

Hydraulic Model Evaluation

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	13-3
2.0 SYSTEM OVERVIEW	13-3
3.0 HYDRAULIC MODEL DEVELOPMENT	13-5
3.1 Existing System Model	13-5
3.2 Near-term (2010) System Model	13-9
3.3 Buildout System Model	13-10
4.0 HYDRAULIC MODEL EVALUATION	13-14
4.1 Near-term (2010) System Evaluation	13-14
4.2 Buildout System Evaluation	13-17

LIST OF TABLES

Table 13.1	Flow Generation Criteria	13-5
Table 13.2	Existing Capacities of the SRCSD Pump Stations.....	13-7
Table 13.3	Buildout Capacities of the SRCSD Pump Stations	13-10
Table 13.4	Summary of Modeling Results for the Options C1 and C2.....	13-21
Table 13.5	Summary of Modeling Results for the Option C3.....	13-27

LIST OF FIGURES

Figure 13.1	ISS Modeled Area	13-4
Figure 13.2	SRCSD Existing Interceptor System.....	13-7
Figure 13.3	SASD Calibrated Areas	13-9
Figure 13.4	Modeling Results for Various Boundary Conditions at the IJS.....	13-13
Figure 13.5	Modeled Rainfall Event	13-14
Figure 13.6	Near-term Model - PWWF Results.....	13-16
Figure 13.7	Back-up Surge caused by the -5.5 ft IJS Boundary Condition.....	13-17
Figure 13.8	Eastern and South Portions of the SRCSD Service Area	13-18
Figure 13.9	Option C1 Map	13-20
Figure 13.10	Option C1 – Buildout PWWF Results.....	13-21
Figure 13.11	Option C2 Map	13-23
Figure 13.12	Option C2 – Buildout PWWF Results.....	13-24

Figure 13.13	Option C3 Map	13-25
Figure 13.14	Option C3 – Buildout PWWF Results.....	13-26

1.0 INTRODUCTION

This Technical Memorandum (TM) describes the hydraulic model development and the hydraulic analysis for the Sacramento Regional County Sanitation District (SRCSD)'s Interceptor Sequencing Study (ISS). The ISS models were used to evaluate the existing interceptor system capacity and to determine future system needs.

2.0 SYSTEM OVERVIEW

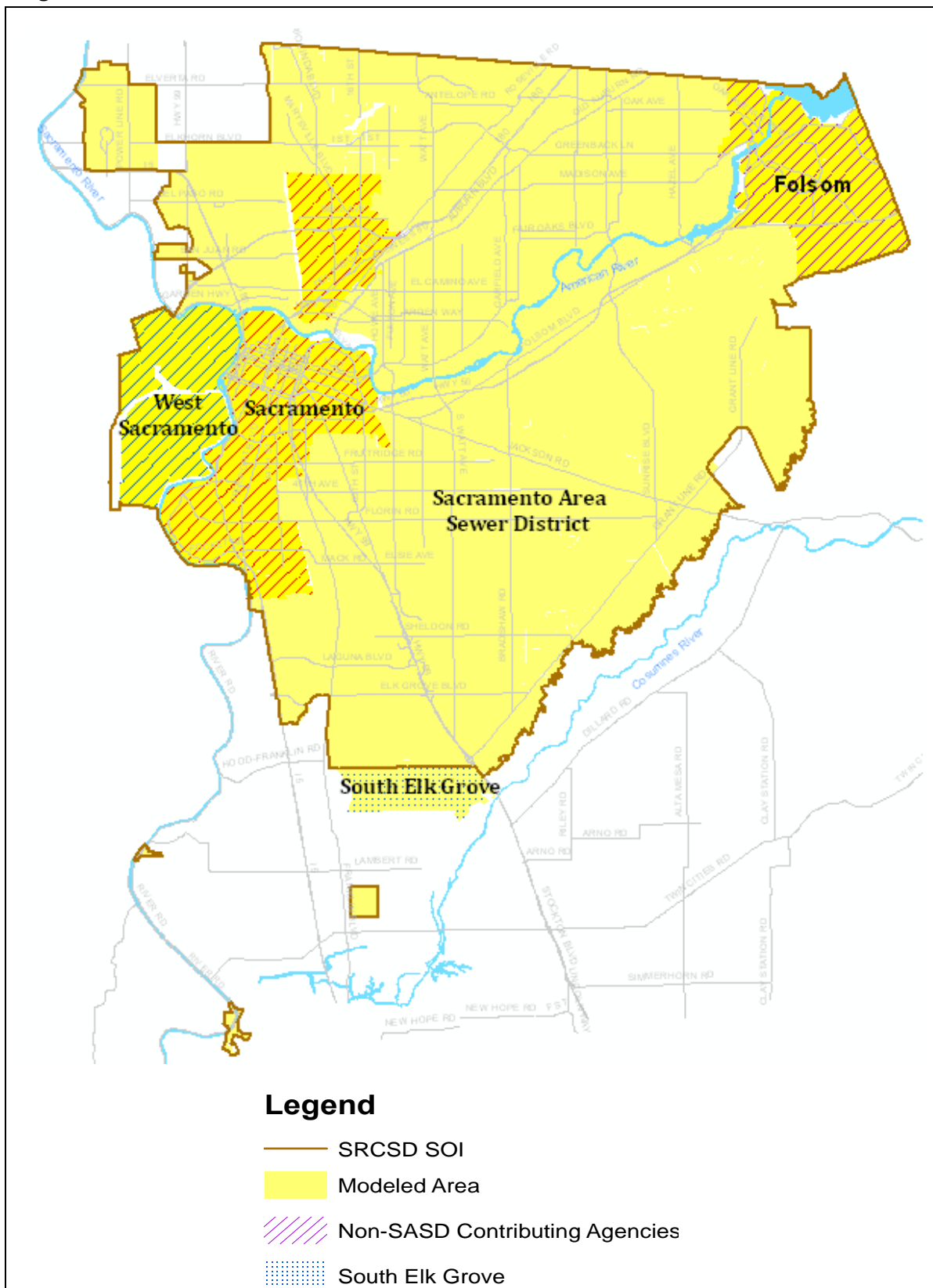
SRCSD provides wastewater conveyance and treatment for four contributing agencies:

- Sacramento Area Sewer District (SASD)
- City of Sacramento
- City of West Sacramento
- City of Folsom.

Wastewater from these contributing agencies are conveyed through the SRCSD interceptor system and treated at the Sacramento Regional Wastewater Treatment Plant (SRWTP).

The ISS study area, defined in TM 1, included all of the areas within the existing SRCSD's Sphere of Influence (SOI) and the potential future developments outside the existing SOI such as the South Elk Grove, Sutter Pointe, Natomas Joint Vision, East County, and West Sacramento Expansion Area. The ISS models, however, only focus on the areas within the SRCSD's existing SOI and the South Elk Grove since the purposes of the ISS models were to evaluate capacities of the existing interceptors and to develop conveyance-only alternatives for future interceptors. For other developments outside the SOI (besides the South Elk Grove), the project considered sewer service using satellite treatment plants or storage facilities. Figure 13.1 depicts the areas included in the ISS models.

Figure 13.1 ISS Modeled Area



3.0 HYDRAULIC MODEL DEVELOPMENT

The ISS models were created using InfoWorks, a dynamic hydraulic program developed by Wallingford Software. The model data consist of three basic components:

- **Nodes:** These components include manholes and pump station (PS) wet wells. The primary data for nodes is ground elevation. PS wet wells also have other attribute data like chamber roof elevations, chamber floor elevations, and cross sectional areas.
- **Links:** InfoWorks represents physical connections between two nodes as links. Links are mostly pipes but also include flow control structures such as pumps, weirs, sluice gates, and orifices. A link in the model requires an upstream and a downstream node. Attribute data for pipes also include pipe type (gravity or force main), length, diameter, upstream and downstream invert elevations, Manning's roughness coefficient, and headloss coefficient. To model pump operation requires discharge rate data (or head-discharge curves) and pump on and off levels. For other flow control structures, the model also requires dimensional inputs.
- **Subcatchments:** These are the sewer sheds tributary to a node. Attribute data for subcatchments include loading node ID, ESDs, contributing acreage, and land use ID. Land use ID information are specific wastewater diurnal flow pattern, ESD flow factor, groundwater infiltration (GWI), and rainfall dependent inflow/infiltration (RDI/I) parameters assigned to a particular shed. Wastewater flows in the ISS models were generated according to the flow generation criteria presented in TM 3. The criteria are summarized in Table 13.1 below.

Table 13.1 Flow Generation Criteria

ESD Density <ul style="list-style-type: none">• Actual ESD Densities for Existing Development• Consolidated Land Use Categories with Realistic and Conservative Densities for New Development & Redevelopment	ESD Flow Factor <ul style="list-style-type: none">• By Model Calibration for Existing Development• 250 gpd/ESD for New Development & Redevelopment	Diurnal Flow Pattern <ul style="list-style-type: none">• By Model Calibration for Existing Development• Typical Patterns for New Development & Redevelopment
Rainfall Dependent I/I By Model Calibration with min 0.6% Realistic and with min 1.0% Conservative	Groundwater Infiltration By Model Calibration or Typical Values from Similar Areas	Design & Performance Storm December 31, 2005 Storm Event

3.1 Existing System Model

3.1.1 Existing Model Construction

An overview of the existing SRCSD system including interceptors, regional PSs, and force mains is shown in Figure 13.2. Manholes and pipes within the existing interceptor system were imported from the SRCSD GIS data. The imported GIS data were carefully reviewed

and quality-checked for missing information, inconsistency and network disconnectivity. Missing or questionable data were corrected using available as-builts information. Wet well dimensions were also entered into the model from as-built drawings. Headloss coefficients were automatically calculated for the pipe segments using an inferred headloss query function built into the InfoWorks program.

Next, the regional PS information was incorporated into the piping network. The model was evaluated assuming that inflows to the PS equaled to the outflows, with pre-set pumping capacities for each of the stations. The existing pumping capacities for each SRCSD PS are summarized in Table 13.2. In the model, the Sump 2 PS (N29) was evaluated with a maximum discharge rate limitation of 60 mgd to the City Interceptor (based on SRCSD's operating agreement with the City).

The model also includes other regional flow control structures such as the:

- Folsom East 1B structure
- Multiple-gate structures at the Van Maren PS site
- Bradshaw/Central junction structures
- Upper Northwest Interceptor (UNWI) 4/5 junction structure (manually added to the network based on as-built drawings).

The Folsom East 1B structure splits flow between the Folsom East and the Folsom interceptors. Similarly, the multiple-gate structures upstream of the Van Maren PS allow the Northeast flows to be divided between the Mission Trunk and the UNWI to relieve the surcharging in the Mission Trunk. The two Bradshaw/Central junction structures on Elk Grove Florin Road balance flows between the Bradshaw and Central interceptors. The UNWI 4/5 junction structure diverts all of the flow from the UNWI section 5 and the Upper Dry Creek to the Lower Dry Creek interceptor until the downstream UNWI sections 1-4 are in operation.

Figure 13.2 SRCSD Existing Interceptor System

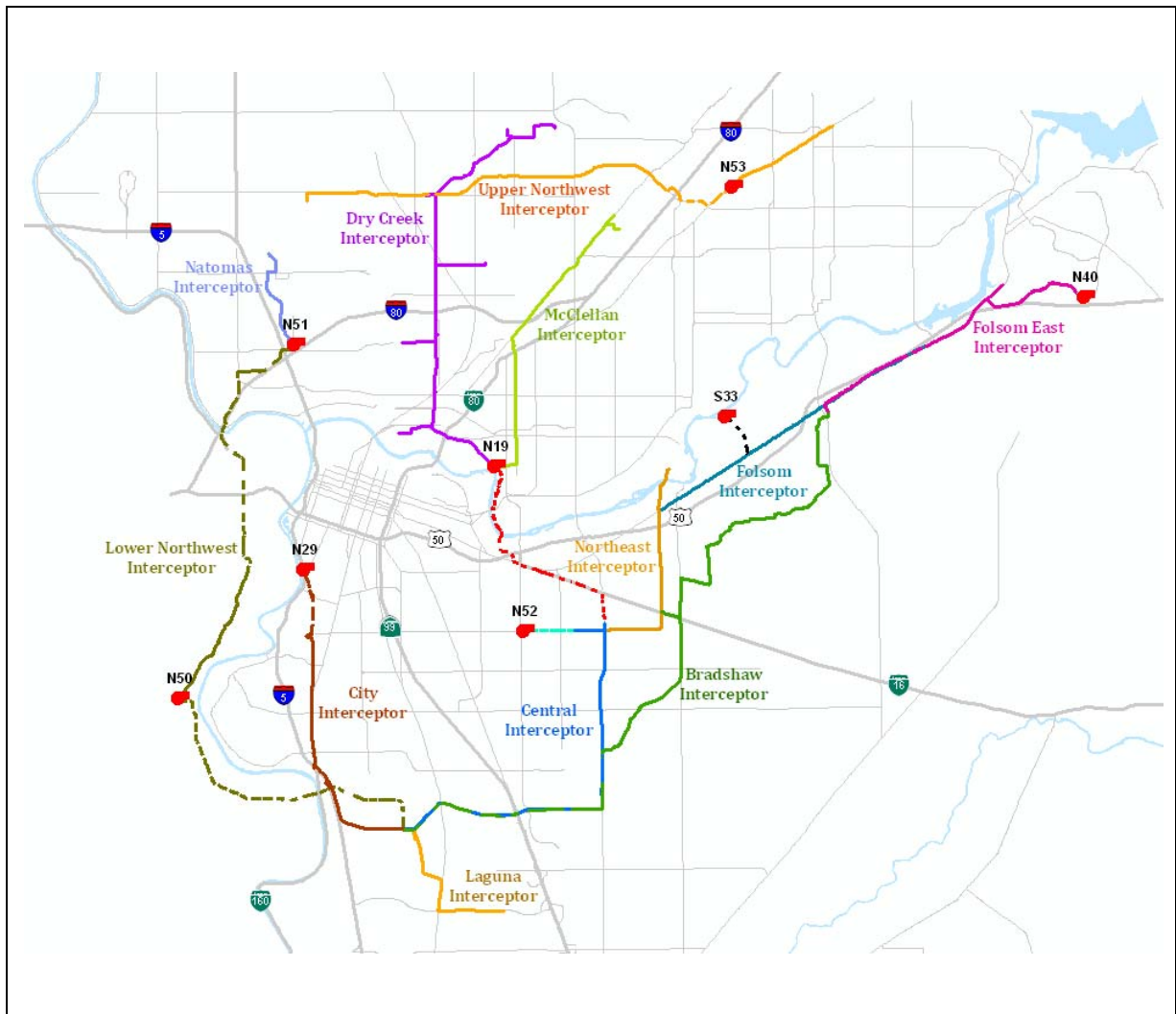


Table 13.2 Existing Capacities of the SRCSD Pump Stations

PS Name	Existing Capacity (mgd)
Arden (N19)	105
Iron Point (N40)	10.3
South River (N50)	80
New Natomas (N51)	58
Power Inn (N52)	22.4
Van Maren (N53)	14
Cordova (S33)	11

The next step of constructing the existing interceptor model was to integrate the interceptor loadings from the four contributing agencies.

SASD Contributing Agency

The existing SASD trunk model, including trunk manholes, pipes, flow control structures, and sewer sheds were added to the SRCSD Interceptor model network. Subcatchments in the existing SASD trunk model consisted of actual parcels loaded to the nearest downstream trunk manholes. These parcels contained the ESD and contributing area information, the basis for calculating wastewater flow generated. ESD data were obtained from the County's utility billing system, while the contributing area of each parcel was determined based on the parcel size and the assigned ESDs. The contributing area was calculated using the following logic.

- If parcel acreage \leq ESDs, contributing area = parcel acreage
- If parcel acreage $>$ ESDs, contributing area = ESDs

The wastewater flow generated from the subcatchments was routed through the SASD trunk systems before discharging into the interceptors.

Non-SASD Contributing Agencies

Unlike the SASD portion of the ISS model, the non-SASD contributing areas were broken down into much larger sewer sheds tributary to the interceptor connection points. Sewer flows calculated from each shed were point loaded directly into the interceptors at their connection points. The trunk systems within the Cities of Sacramento and West Sacramento were not modeled (by the Consultant) due to their unavailable or inadequate GIS data. The Consultant used modeling results from the City of Folsom's InfoWorks hydraulic model. Detailed information on the model development is presented in TM 14 (Development of Model Loads for Non-SASD Contributing Agencies).

3.1.2 Existing Hydraulic Boundary Conditions

The water surface elevations at the SRWTP's influent junction structure (IJS) were considered to be the hydraulic boundary conditions in the ISS model. The IJS's water surface elevations of -5.5 ft and -11.0 ft (provided by SRWTP staff) were used as the hydraulic boundary conditions for wet weather and dry weather simulations of the existing ISS model, respectively.

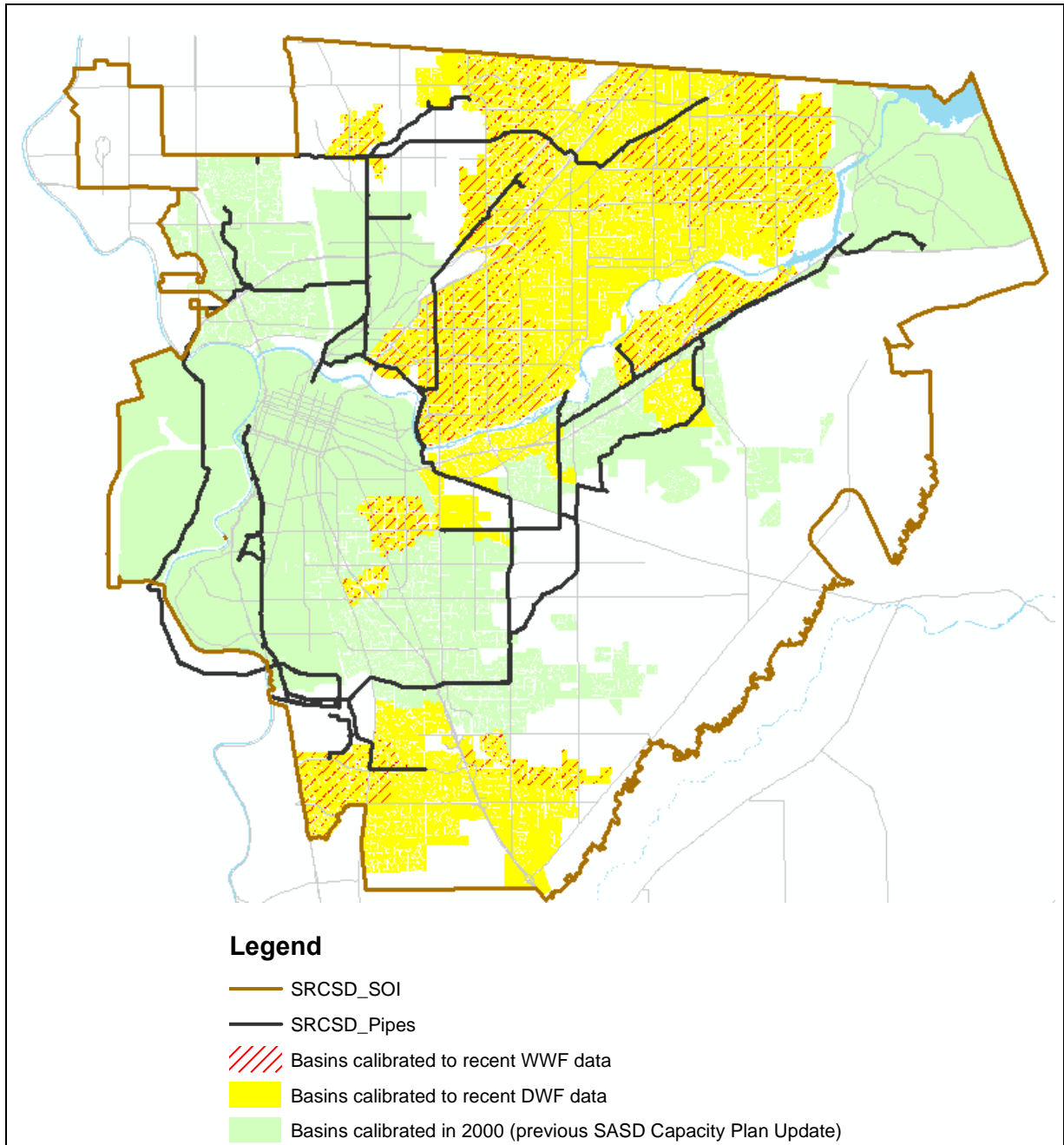
3.1.3 Existing Model Calibration

SASD Contributing Area

Portions of the SASD trunk model were calibrated to the recent flow monitoring or pump station flow data (periods of data between 2005 through 2008). Figure 13.3 shows the SASD trunk systems calibrated to recent dry weather flow data and the systems calibrated to recent dry and wet weather flow data. For the SASD trunk systems not calibrated to the recent data, the model used the RDII percentages and GWI factors from the 2000 SASD System Capacity Plan's calibrated model and the 250 gpd/ESD flow factor for the dry weather flow generation. The SASD trunk model will be calibrated and updated as more

flow data is available to calibrate the model to reflect the actual flows. The latest SASD trunk model will be used to construct the ISS model as part of the ISS update.

Figure 13.3 SASD Calibrated Areas



Non-SASD contributing area

Refer to TM 14 (Development of Model Loads for Non-SASD Contributing Agencies).

3.2 Near-term (2010) System Model

The near-term interceptor model was created from the updated existing model. Interceptors currently under construction and anticipated to be in operation by 2010 (e.g., the UNWI sections 1 & 2 and Bradshaw section 7C) were added to the existing model to reflect SRCSD's "near-term" system. The UNWI 4/5 junction structure was modified accordingly in the model to route flows from the UNWI section 5 and the Upper Dry Creek interceptor to the downstream UNWI and ultimately to the New Natomas PS. To activate the upstream portion of the Bradshaw Interceptor due to the completion of the Bradshaw section 7C, the Folsom East 1B junction structure was modified in the model to divert the Folsom East flow to the Bradshaw Interceptor hence relieving the surcharging in the Folsom Interceptor. The ARD-2 and ARD-3 trunk relief projects were also incorporated since the projects re-routed flow to the UNWI and therefore reduced the amount of flow going to the McClellan Interceptor.

3.3 Buildout System Model

3.3.1 Buildout Model Construction

Starting with the near-term model, the preliminary buildout model was created by incorporating the future interceptor systems identified in the:

- SRCSD Master Plan 2000
- Subsequent Reconciliation Report
- Latest PDP projects.

Three future interceptors that were decided by the ISS team to be included in all project alternatives are the:

- Sunrise
- Rio Linda
- Dry Creek Relief interceptors.

The need for the Sunrise interceptor to relieve the SASD's Northeast trunks will be re-evaluated in the 2010 SASD Capacity Plan Update. Flow in the Upper Dry Creek interceptor has been monitored to determine when Dry Creek Relief will be needed. The Rio Linda interceptor project will be re-visited when developments in the Rio Linda area start to rise again.

It was also decided to include in the ISS buildout model the McClellan Interceptor relief project's alternative 3 from the North Watt Corridor PDP-1. Another conservative assumption incorporated into the buildout model was the full diversion at the Van Maren PS to divert 100% flow from the UNWI-9 and the upstream trunks to downstream UNWI to provide maximum relief to the Mission Trunk.

The existing SRCSD PSs were modified in the model to reflect their buildout pumping capacities, which are presented in Table 13.3.

Table 13.3 Buildout Capacities of the SRCSD Pump Stations

PS Name	Buildout Capacity (mgd)
Arden (N19)	105
Iron Point (N40)	10.3
South River (N50)	221
New Natomas (N51)	168
Power Inn (N52)	22.4
Van Maren (N53)	40.7
Cordova (S33)	11

The next step was to incorporate the expansion areas from the SASD and non-SASD contributing agencies and calculate the buildout ESDs and acreage in the model.

SASD Contributing Agency

The 2006 SASD Master Plan expansion trunk models, including future trunk sewers and their tributary sewer sheds, were incorporated into the interceptor model. The South Elk Grove shed outside of the existing SRCSD SOI was also added to the preliminary buildout model. The existing areas except the redevelopment areas such as corridors remain unchanged, meaning they were not densified in the buildout model.

As discussed in TM 3, two land use assumptions were used to estimate buildout flows in the ISS model:

- Realistic Land Use
- Conservative Land Use

To calculate the realistic and conservative ESDs for the redevelopments and new developments within SASD, these shed areas were exported to a GIS shape file to be overlaid on top of the consolidated land use layer in ArcView, a GIS software developed by Environmental Systems Research Institute (ESRI). The realistic and conservative ESD density information was transferred from the consolidated land use layer to the sewer shed layer, and the shed ESDs were calculated from the ESD densities and the shed acreage. The calculated ESD data were then imported back into InfoWorks to create two buildout models, the realistic and the conservative ISS models.

One redevelopment area whose ESDs were not calculated from the consolidated land use map was the McClellan Business Park (MBP). The MBP's ESD information was obtained from a more detailed sewer study called the "*McClellan Park Sewer Replacement Project Sewer System Study*" by Tetra Tech, Inc. dated May 2004. The MBP's realistic ESDs were derived from its current planning, which stated that portions of the air force base will retain their existing development characteristics in the future due to current operations and environmental constraints. The MBP's conservative ESDs were obtained from the McClellan Air Force Base's 2002 Sanitary Sewer Master Plan, which assumed all land excluding the airfield would be redeveloped at 6 ESD/ac.

Contributing areas of the redevelopment and new development were determined from the parcel size and the assigned ESDs using the logic presented in section 3.1.1 for the existing area. Other flow generation parameters such as wastewater diurnal flow pattern, ESD flow factor, GWI, and RDI/I were assigned to the redevelopment and new development areas based on the criteria summarized in Table 13.1.

It was anticipated that the generated buildout flows may cause capacity problems in some existing trunks. In order to relieve any capacity constraints in the upstream trunks and to efficiently route flows to the downstream interceptors, the Category 1 and 2 trunk relief projects (identified in the 2006 SASD Sewer System Capacity Plan Update) were added to the realistic and conservative ISS models.

Non-SASD Contributing Agencies

Similar to the existing non-SASD development sheds, the non-SASD future development sheds were point loaded directly to the interceptors. The loading manhole for the Delta Shore development was corrected to reflect the new interceptor tie-in at manhole N21-MH0008A on the Central Interceptor instead of the original City Interceptor tie-in.

Detailed information on the buildout model development is presented in TM 14 (Development of Model Loads for Non-SASD Contributing Agencies).

3.3.2 Buildout Hydraulic Boundary Conditions

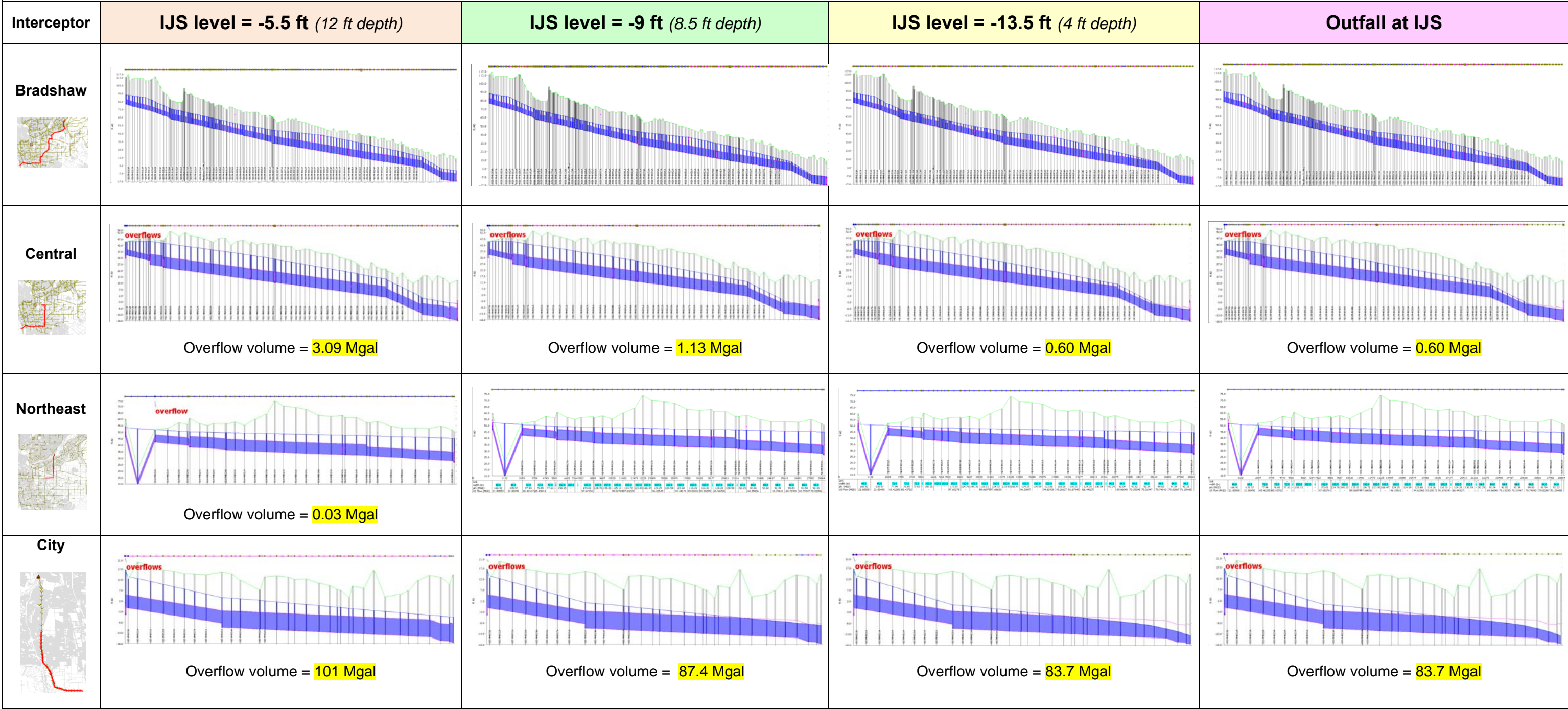
A sensitivity analysis was performed to select the hydraulic boundary condition at the SRWTP to be used for the wet weather, buildout flow simulations. The analysis was done using the conservative buildout ISS model with the future interceptor system identified in the conveyance-only option 3, which is described later in section 4.2.3. Four different boundary conditions were modeled at the IJS to evaluate their potential impacts on the contributing interceptor systems.

1. IJS's water surface elevation = -5.5 ft (equivalent to a 12-ft depth in the IJS)
2. IJS's water surface elevation = -9.0 ft (equivalent to a 8.5-ft depth in the IJS)
3. IJS's water surface elevation = -13.5 ft (equivalent to a 4-ft depth in the IJS)
4. Outfall at the IJS

Impacts on the Bradshaw, Central, Northeast, and City interceptors due to various boundary conditions at the IJS are presented in Figure 13.4. The predicted surcharging was primarily due to the capacity deficiencies within the interceptors themselves, not the SRWTP boundary conditions, since the HGLs in the interceptors for the outfall scenario were not much different than for the other three cases with pre-set IJS's water levels. However, lowering the IJS's level from -5.5 ft to -9 ft significantly reduced the predicted overflow volumes in the Central and City interceptors. Further decreasing the IJS's level from -9 ft to -13.5 ft did not result in that much of an overflow reduction, while it would be

more costly to maintain a lower IJS's level. Therefore, the -9 ft IJS level was chosen to be the hydraulic boundary condition for the ISS buildout, wet weather simulations.

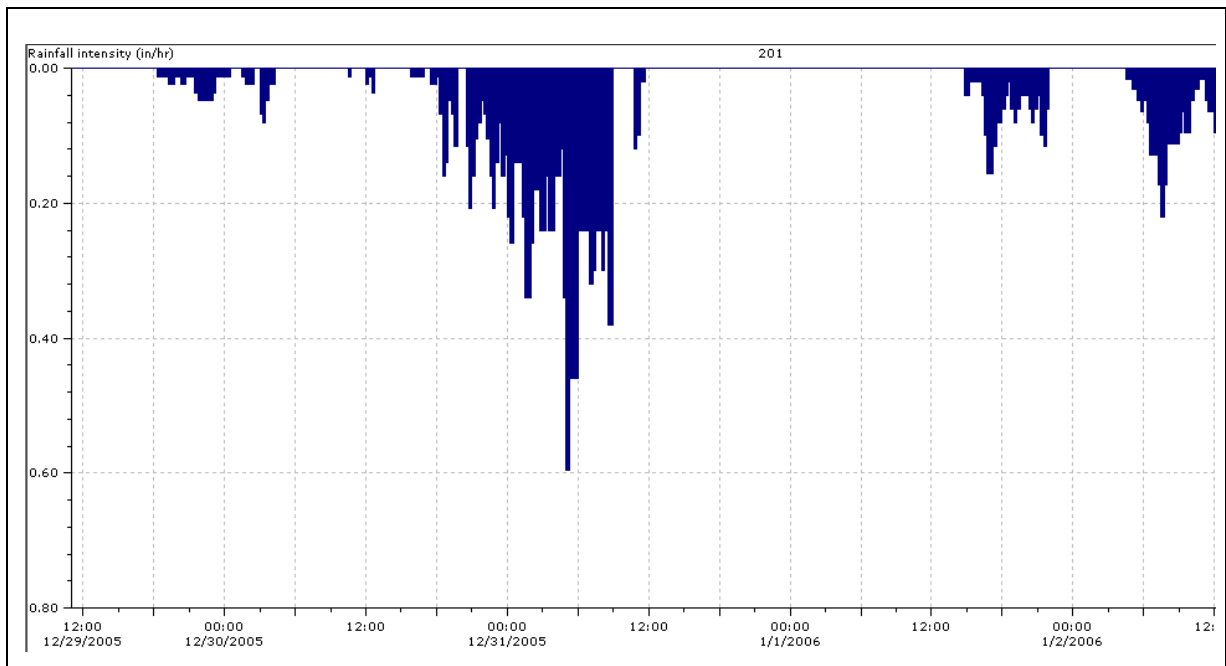
Figure 13.4 Modeling Results for Various Boundary Conditions at the IJS
Scenario: ISS Alternative C3, Conservative Land Use



4.0 HYDRAULIC MODEL EVALUATION

This section describes the hydraulic modeling analysis of the SRCSD sewer system to identify capacity deficiencies in the existing interceptors and capacity requirements for future interceptors. The system's hydraulic performance was evaluated for the near-term and buildout scenarios under wet weather (December 31, 2005 storm event) conditions. The storm event was created using the 15-minute interval radar rainfall data as shown in Figure 13.5. Each wet weather model simulation started at noon of December 29, 2005 and lasted for four days (from 12/29/2005 12:00 through 1/2/2006 12:00).

Figure 13.5 Modeled Rainfall Event



4.1 Near-term (2010) System Evaluation

With the completion of the entire UNWI and Bradshaw Interceptor, the overall interceptor system (except the City Interceptor) is able to convey the near-term (2010) peak wet weather flows (PWWFs). Figure 13.6 depicts the PWWF modeling results for the near-term scenario, showing locations of:

- Predicted overflows
- Sewers surcharged due to downstream deficiencies (back-up surcharged)
- Sewers surcharged due to capacity deficiencies (throttle surcharged)

See Appendix A for each interceptor's PWWF hydraulic grade line (HGL) profiles. The following provides more information on the predicted modeling results:

- **General:**

- Most of the predicted overflows are within the trunk system except for one overflow in the City Interceptor.
 - Flows in the new interceptors such as UNWI, LNWI, Bradshaw, Folsom East, Natomas, and Laguna interceptors are well below their design capacities (approximately from 5% to 50% of their pipe full capacity at existing PWWF conditions).
 - Other interceptors such as the Central and Northeast interceptors are between 50% and 90% of their pipe full capacity.
 - The near-term ISS model results indicate that the -5.5 ft wet weather boundary condition at the IJS causes about 1.5 miles of back up into the upstream systems such as the City, Laguna, Bradshaw, and Central Interceptors as well as the Central and Elk Grove Trunks. The back-up surcharged pipes are shown in blue in Figure 13.7.
- **Dry Creek Interceptor:**
 - The model predicted that the 18-inch Dry Creek Interceptor on Santa Ana Avenue (serving the MBP) would overflow under PWWF conditions. This result is attributed to the model being calibrated with high RDI/I percentages for the old MBP sewer system (before its collector system is rehabbed). Since most of the MBP's sewer system will be replaced by the end of 2010, the RDI/I rates are expected to reduce significantly.
 - The Upper Dry Creek Interceptor is predicted to have minor throttle surcharge under PWWF conditions.
 - **McClellan Interceptor:** System is almost at pipe full capacity, even after the completion of the ARD-2 and 3 trunk relief projects, which divert flow to the UNWI and reduce the amount of flow into the McClellan Interceptor.
 - **Folsom Interceptor:** The model predicts very low flow since the upstream portion is relieved by the Bradshaw interceptor.
 - **City Interceptor:** System is predicted to be critically surcharged with an overflow at manhole N25-MH0033B. However, the model results for this system may be conservative since the City of Sacramento's sewer sheds (downstream of Sump 2) were point-loaded directly into the City Interceptor without modeling the City's trunks and pump stations.

Figure 13.6 Near-term Model - PWWF Results

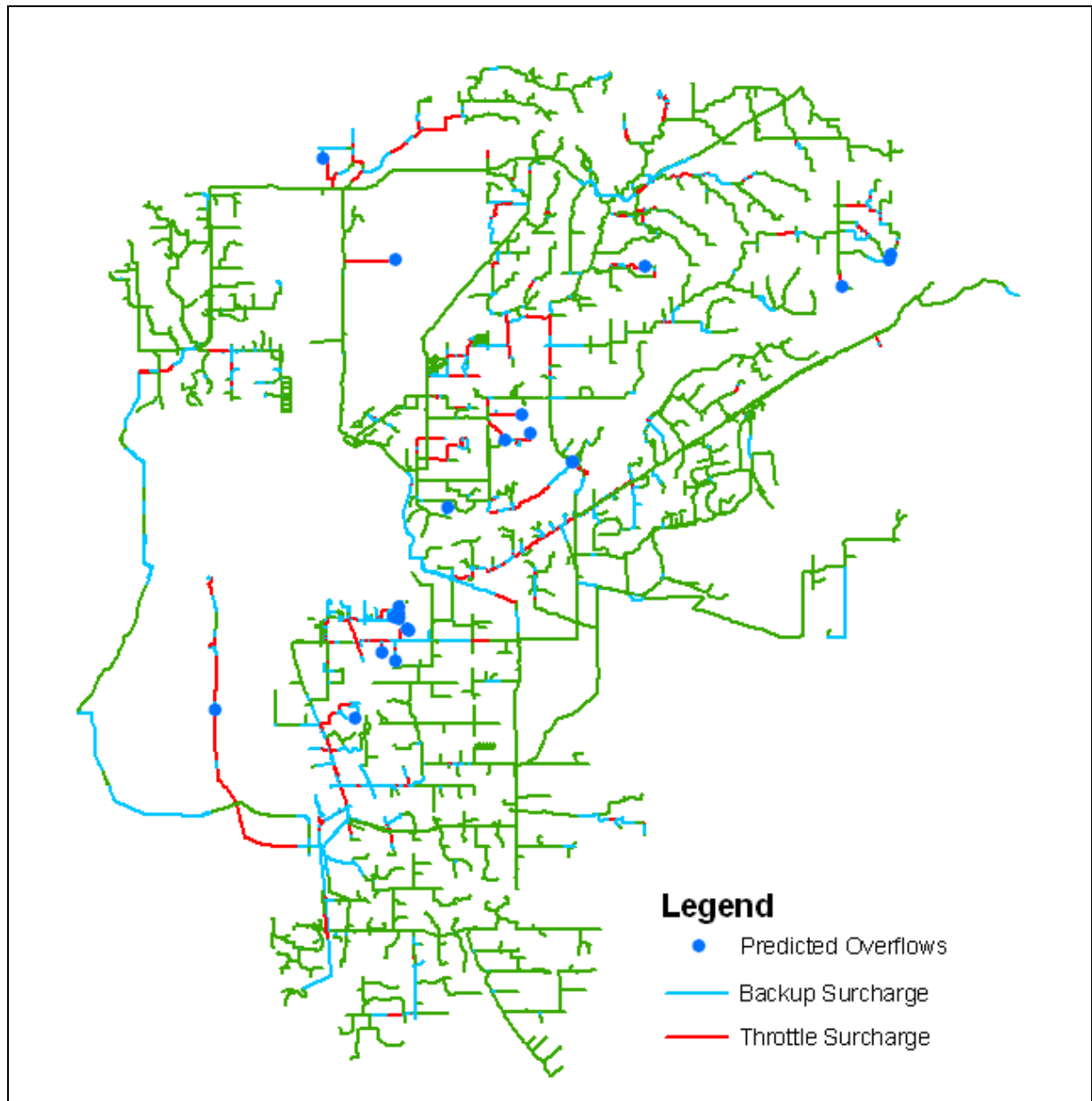
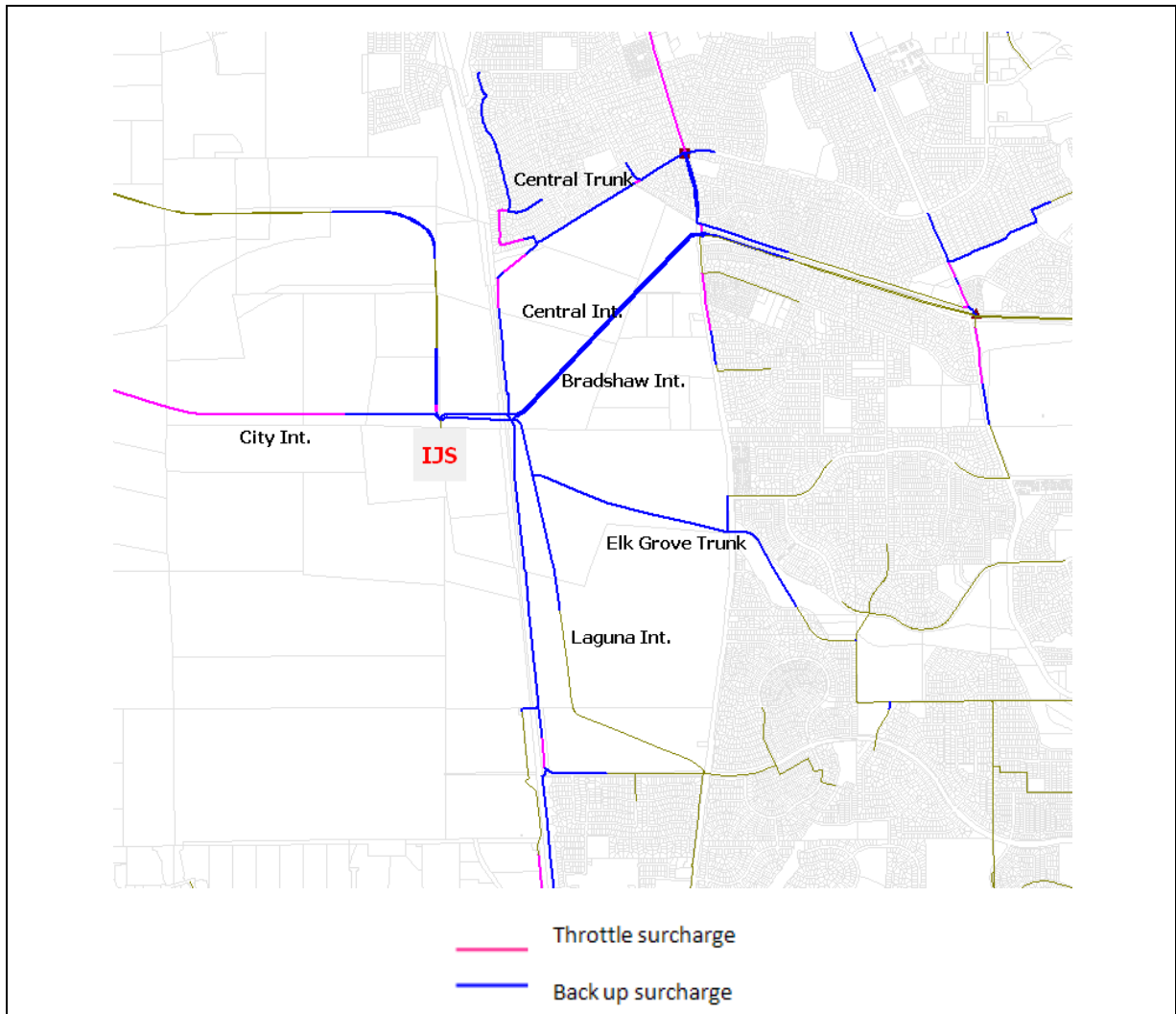


Figure 13.7 Back-up Surge caused By the -5.5 ft IJS Boundary Condition

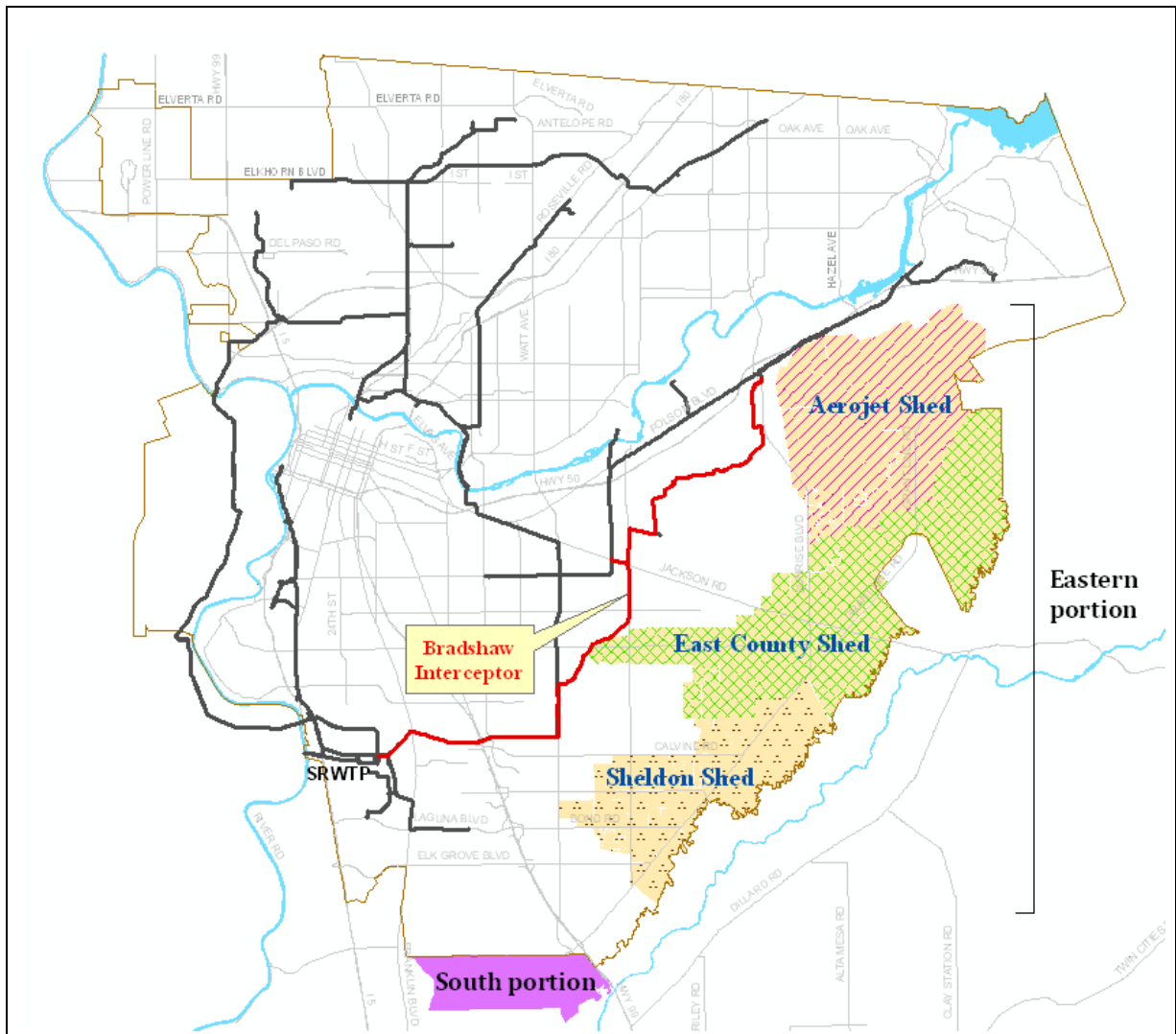


4.2 Buildout System Evaluation

This section describes the hydraulic performance evaluation of the SRCSD interceptor system under realistic and conservative buildout conditions for various interceptor conveyance alternatives. Conservative buildout flows were used to size the future interceptors.

The focus of the ISS's long term planning was to develop ultimate regional solutions to serve the undeveloped south and eastern portions of the SRCSD service area (see Figure 13.8). Another goal was to maximize the use of the existing facilities (i.e., the Bradshaw Interceptor).

Figure 13.8 Eastern and South Portions of the SRCSD Service Area



Eastern Portion

The eastern portion was broken into three main sheds:

- Aerojet shed
- East County shed
- Sheldon shed

The Aerojet shed includes the Westborough, Aerojet Lands, Rio Del Oro and its eastern off-site area, Anatolia, and SunRidge Specific Plan Area. Buildout flow from the Aerojet shed (in all of the ISS conveyance alternatives considered) was routed to the Bradshaw Interceptor Section 8 at White Rock Road. The facilities needed to convey this flow to the Bradshaw Interceptor were not investigated in the ISS but in SASD's and SRCSD's Mid Range Planning efforts.

The East County shed includes the Upper Deer Creek trunk shed (consisting the Cordova Hills development), SunCreek, Waegell, and Florin Road areas. In the models, flows from the Upper Deer Creek shed were pumped to the new Laguna Creek 5 Interceptor along SunCreek, combined with flows from Waegell and Florin Road areas and routed west via the new Florin Interceptor connecting to the Bradshaw Interceptor at manhole N38-MH0057A.

The Sheldon shed is located south of the East County shed in the proximity of Sheldon Road, along Grantline Road. The models assumed this area will be served by the future Sheldon Interceptor, whose proposed alignments varied for different alternatives considered.

South Portion

The South portion is the South Elk Grove area south of Kammerer Road, an expansion area outside of the existing SRCSD SOI. This shed was planned to be serviced by the future South Interceptor.

4.2.1 Conveyance Only Options

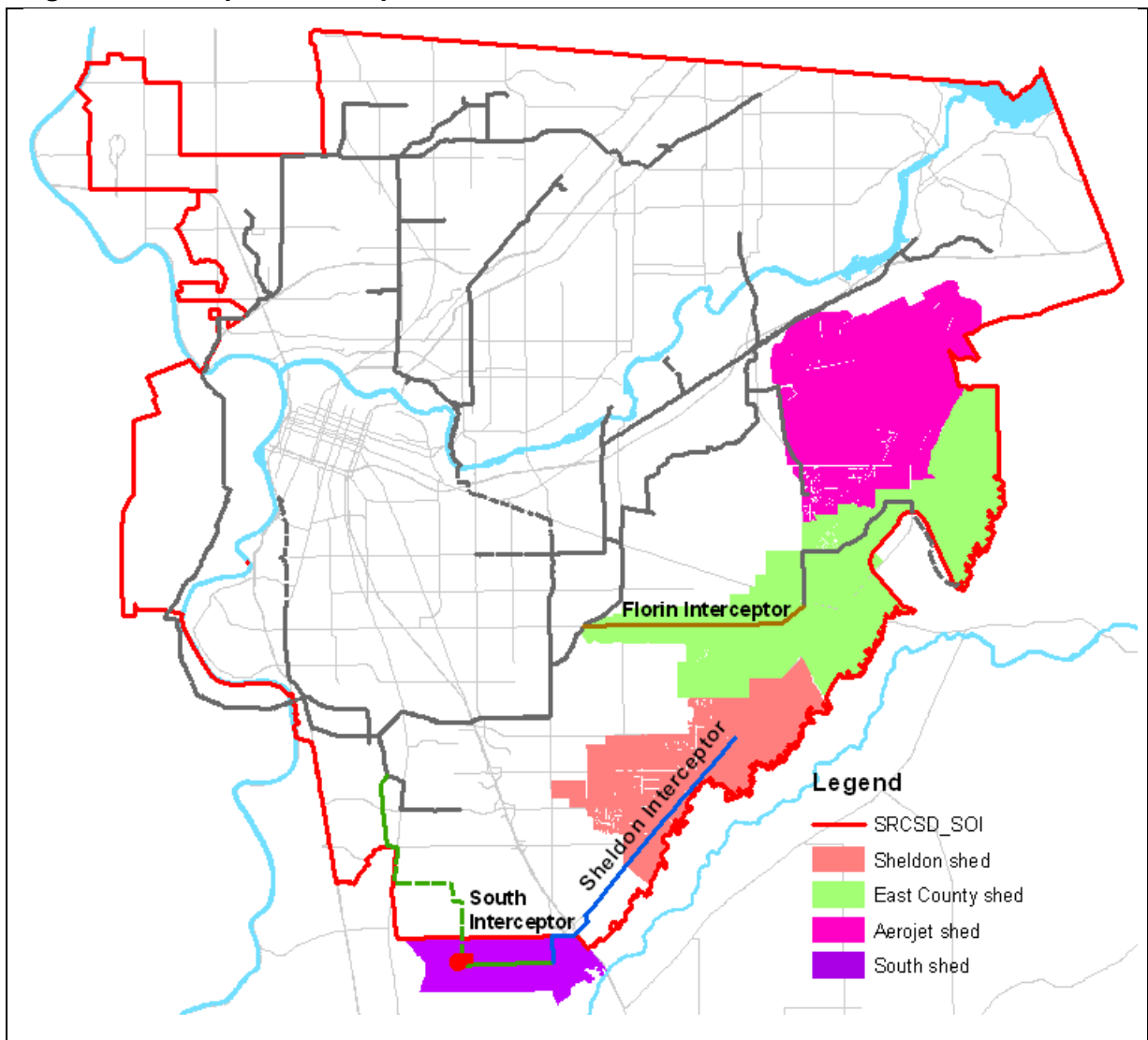
Three ISS conveyance-only alternatives were selected for modeling, and the results are presented in the following sections.

4.2.1.1 Conveyance-Only Option 1 (C1)

See Figure 13.9 for a map of Option C1's components. Option C1 includes:

- Aerojet shed to Bradshaw Interceptor (at White Rock Road)
- East County shed to Bradshaw Interceptor (via Florin Interceptor)
- Sheldon shed to South Interceptor (via Sheldon Interceptor along Grant Line Road)
- South shed to South Interceptor (South Interceptor PS discharges to Laguna Interceptor Extension at manhole N39-MH0006A on Sims Road)

Figure 13.9 Option C1 Map



The modeling results for Option C1 are presented in Figure 13.10 and Table 13.4. The surcharge criteria described in Table 13.4 were established based on the amount of freeboard at the system's low manhole.

- Critical surcharge: Freeboard is less than or equal to 5ft
- Moderate surcharge: Freeboard is greater than 5ft but less than or equal to 10ft
- Minor surcharge: Freeboard is greater than 10ft

The model predicted overflows in the City Interceptor for both realistic and conservative scenarios. The Central Interceptor was predicted to have critical surcharge conditions and 0.35 million gallons (Mgal) of overflows at its upstream end under conservative buildout. This will cause significant back-up into the Northeast Interceptor. The Bradshaw Interceptor was found not to be surcharged under realistic conditions and moderately surcharged under conservative land use assumptions. See Appendix B for the PWWF HGL profiles for each

interceptor system. Information on new interceptors' pipe diameters, lengths, and invert elevations are included at the bottom of the profiles.

Figure 13.10 Option C1 – Buildout PWWF Results

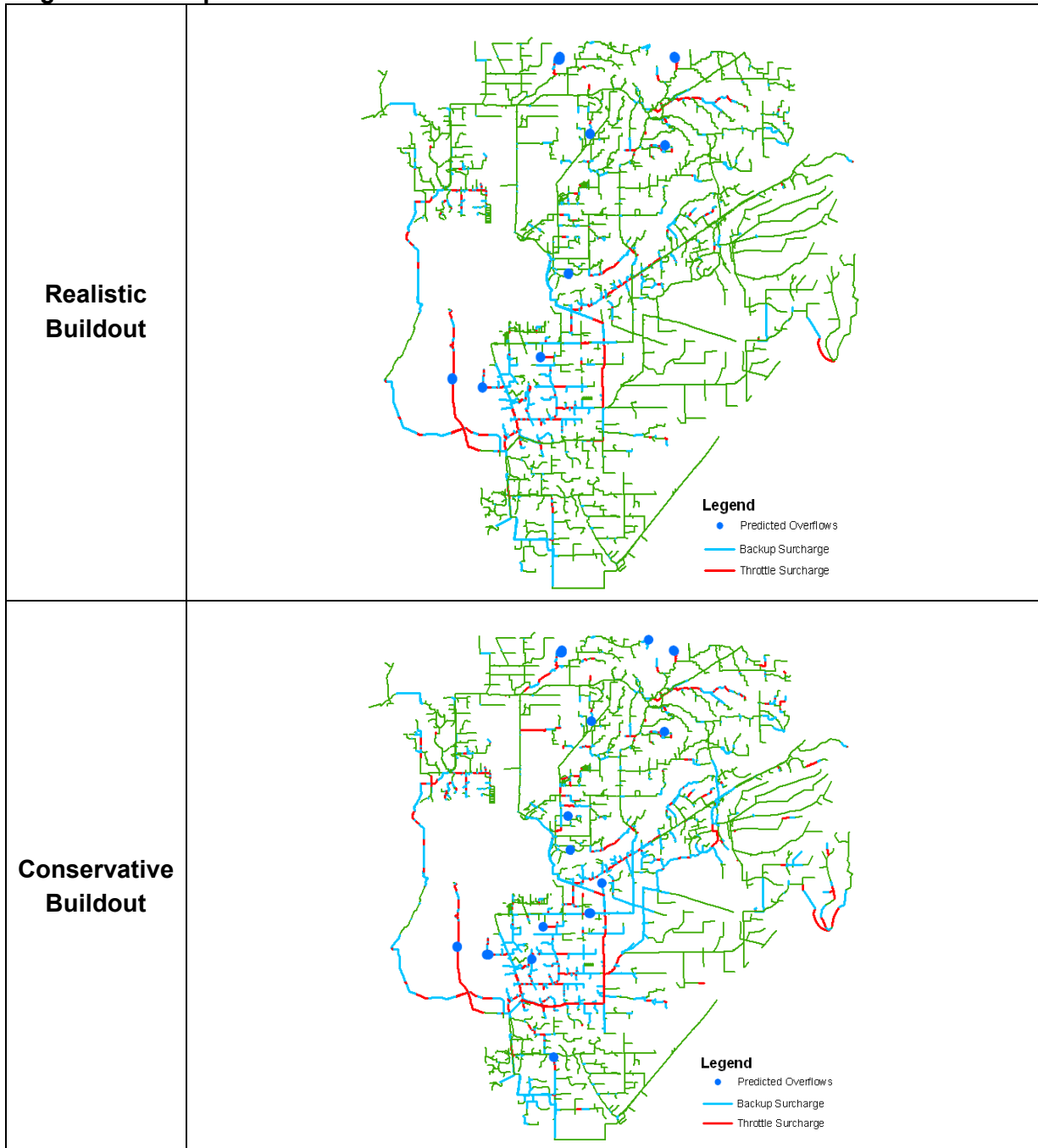


Table 13.4 Summary of Modeling Results for the Options C1 and C2

Interceptor	Realistic Buildout	Conservative Buildout
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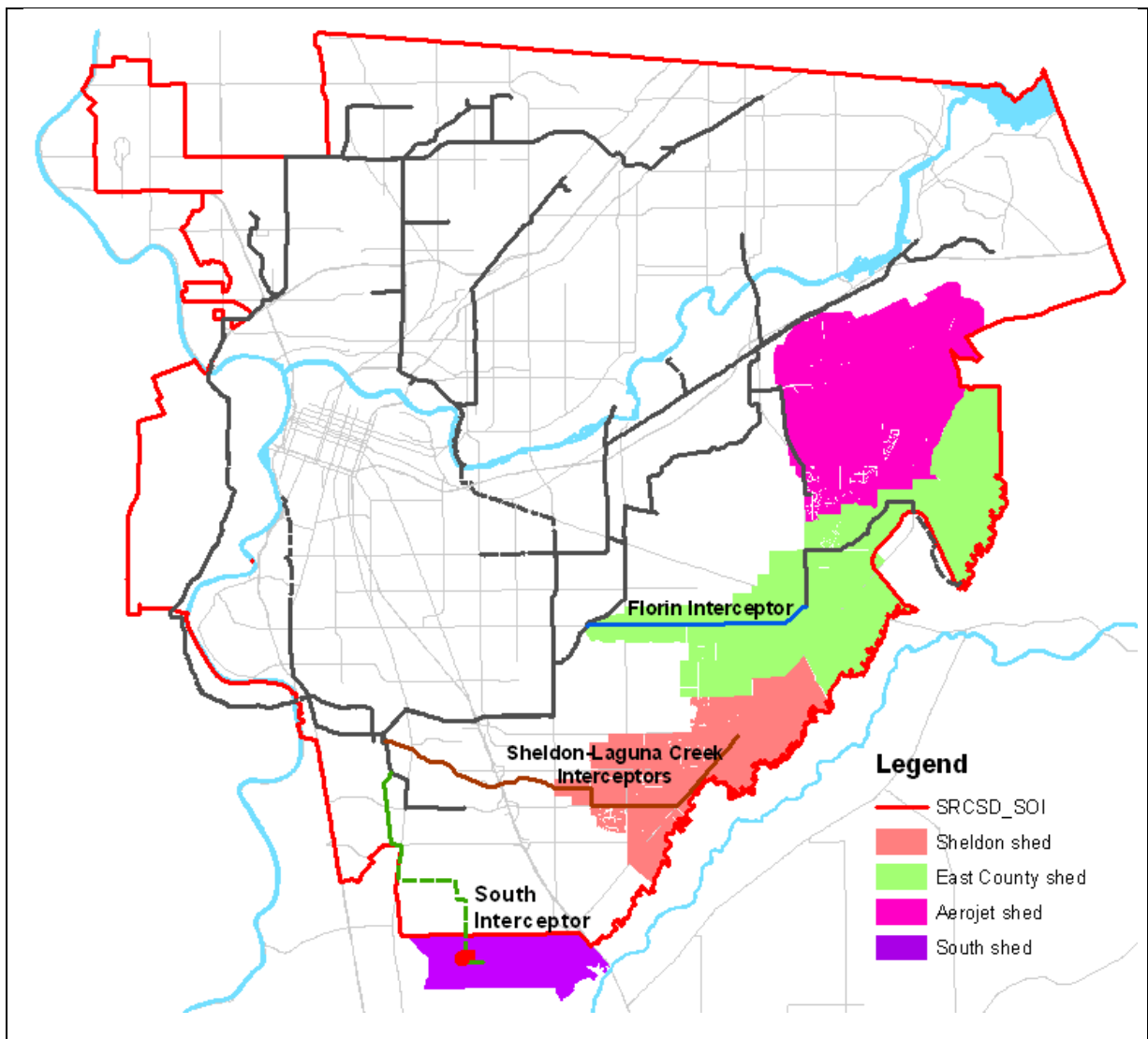
Bradshaw	No surcharge	Moderate surcharge (10 ft freeboard at N38-MH0020A)
Central	Moderate surcharge (7 ft freeboard at N21-MH0074B)	Critical surcharge; Overflows at N21-MH0074B
Northeast	No surcharge	Critical backup surcharge from Central Interceptor (3 ft freeboard at N24-MH0032A)
Sunrise	No surcharge; (6 ft freeboard at low MH SR2040)	Critical backup surcharge from Bradshaw Interceptor (4 ft freeboard at MH SR1130)
City	Critical surcharge; Overflows at N25-MH0033A and N25-MH0033B	Critical surcharge; Overflows at N25-MH0033A and N25-MH0033B
McClellan (after relieved)	No surcharge (4 ft freeboard at an upstream low MH N33-MH0032A)	Minor surcharge downstream; (4 ft freeboard at an upstream low MH N33-MH0032A)
Upper Dry Creek (after relieved)	No surcharge	Minor surcharge (12 ft freeboard at N17-MH0091A)
Lower Dry Creek	No surcharge	No surcharge
Upper Northwest	No surcharge	No surcharge
Lower Northwest	No surcharge	No surcharge
Natomas	No surcharge	No surcharge
Folsom	No surcharge; (6 ft freeboard at low MH N23- MH0014A)	No surcharge; (5 ft freeboard at low MH N23- MH0014A)
Folsom East	No surcharge; (5 ft freeboard at an upstream low MH N37-MH0047A)	Minor backup surcharge from Bradshaw Interceptor; (5 ft freeboard at an upstream low MH N37-MH0047A)
Laguna	No surcharge	No surcharge

4.2.1.2 Conveyance-Only Option 2 (C2)

See Figure 13.11 for a map of Option C2's components. Option C2 includes:

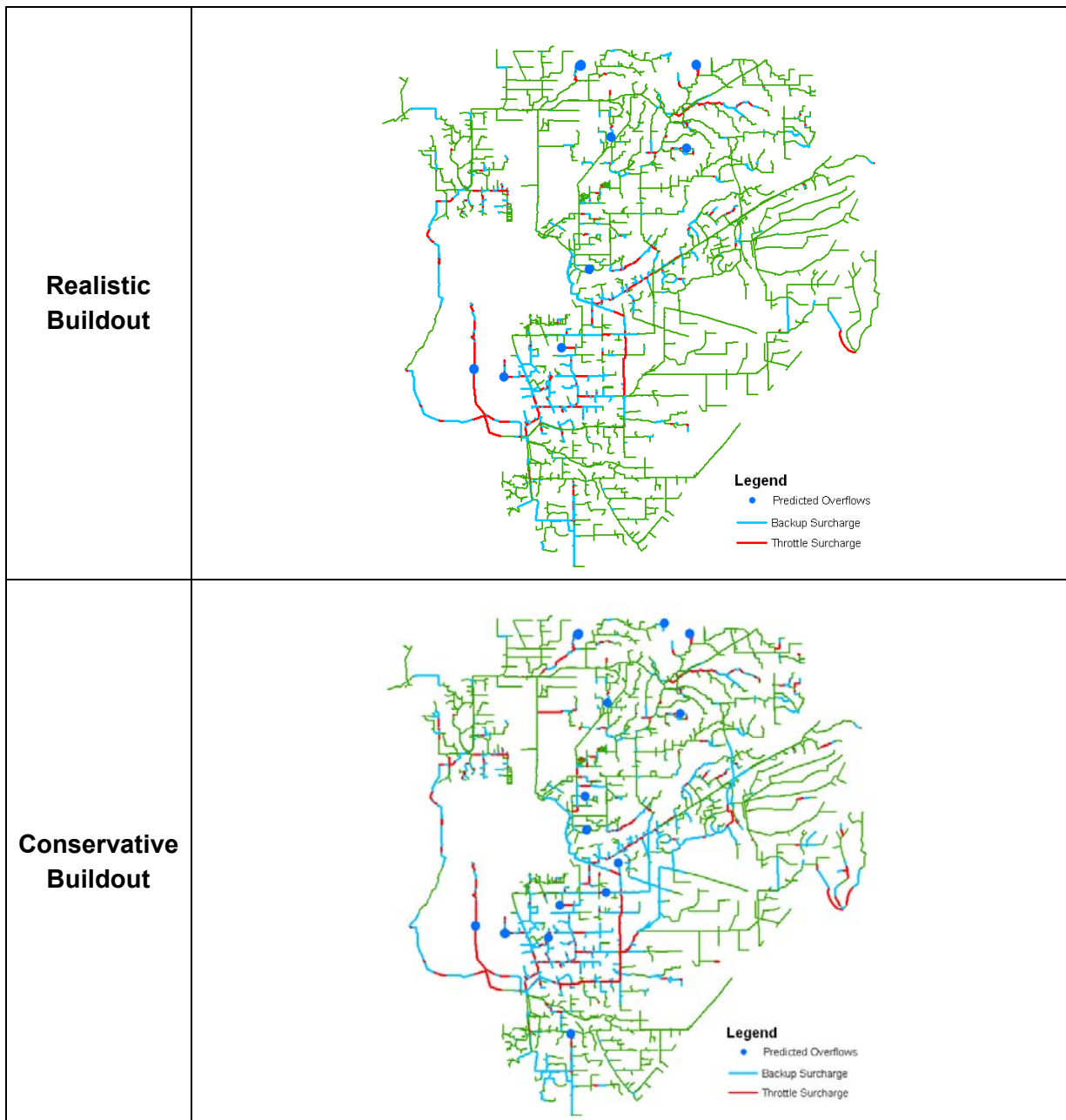
- Aerojet shed to Bradshaw Interceptor (at White Rock Road)
- East County shed to Bradshaw Interceptor (via Florin Interceptor)
- Sheldon shed to Sheldon and Laguna Creek Interceptors
- South shed to South Interceptor (South Interceptor PS discharges to Laguna Interceptor Extension at manhole N39-MH0006A on Sims Road)

Figure 13.11 Option C2 Map



The modeling results for Option C2 are presented in Figure 13.12. Options C1 and C2 are similar except that the future Sheldon Interceptor discharges into the future South Interceptor in C1 and into the future Laguna Creek Interceptor in C2. In both options, the Sheldon shed did not contribute flows to the Bradshaw Interceptor, so the impacts on the existing interceptor system in the two options are similar. See Table 13.4 for the hydraulic performances of the existing interceptors. Since the HGL profiles of most of the interceptors were the same for both options, Appendix C only presents the PWWF HGL profiles for the new Sheldon, Laguna Creek, and South Interceptors for option C2.

Figure 13.12 Option C2 – Buildout PWWF Results

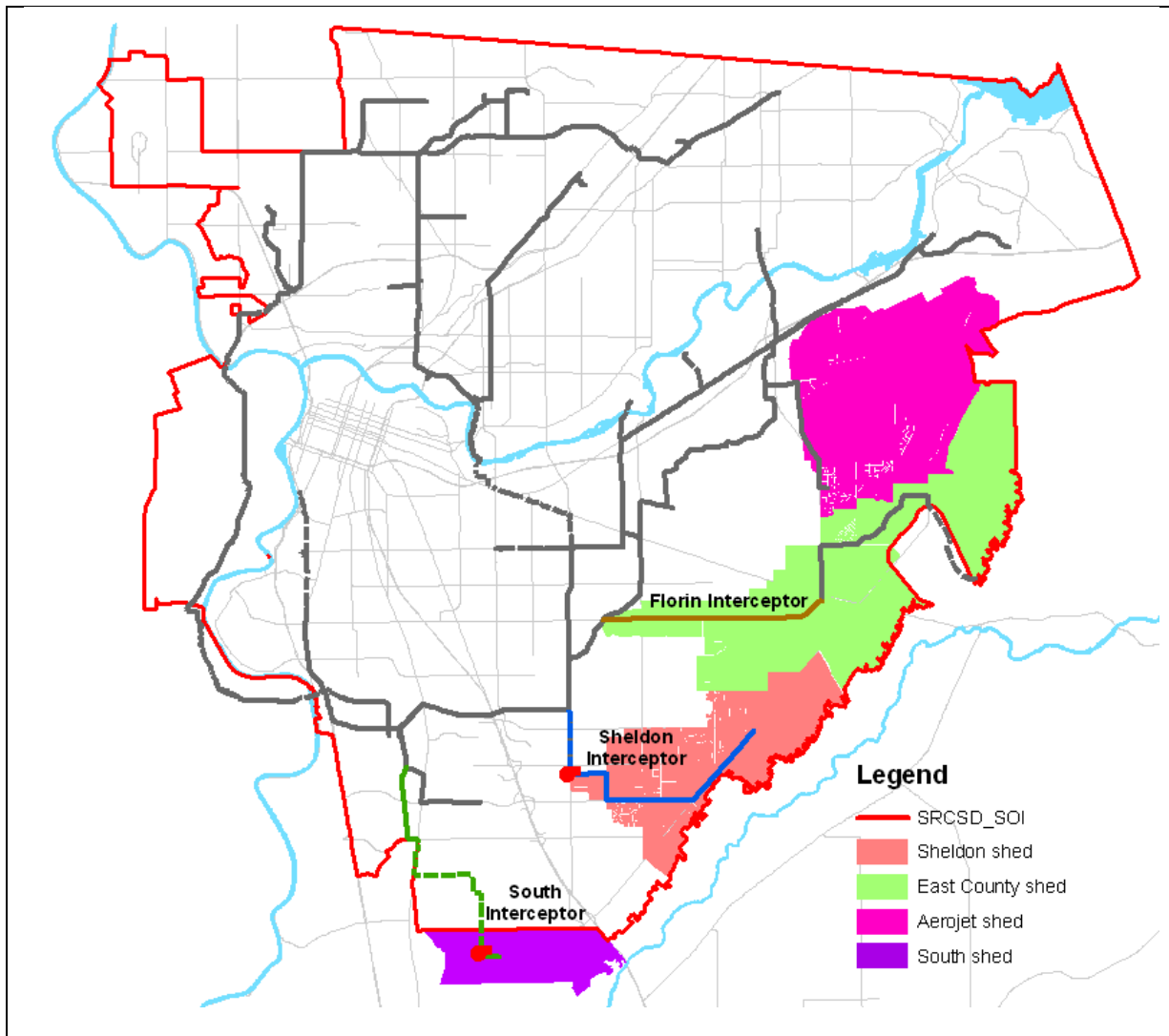


4.2.1.3 Conveyance-Only Option 3 (C3)

See Figure 13.13 for a map of Option C3's components. Option C3 includes:

- Aerojet shed to Bradshaw Interceptor (at White Rock Road)
- East County shed to Bradshaw Interceptor (via Florin Interceptor)
- Sheldon shed pumped to Bradshaw Interceptor (via Sheldon Interceptor)
- South shed to South Interceptor (South Interceptor PS discharges to Laguna Interceptor Extension at manhole N39-MH0006A on Sims Road)

Figure 13.13 Option C3 Map



The modeling results for Option C3 are presented in Figure 13.14 and Table 13.5. Again the models predicted overflows in the City Interceptor for both realistic and conservative scenarios. The Central Interceptor is predicted to have critical surcharge conditions and 1.13 Mgal of overflows at its upstream end under conservative buildout conditions. This is more than the 0.35 Mgal overflow predicted for Options C1 and C2. These overflows are due to the Sheldon shed discharging to the existing Bradshaw Interceptor. The Bradshaw Interceptor is predicted not to be surcharged under realistic conditions and moderately surcharged under conservative land use assumptions. See Appendix D for the PWWF HGL profiles of each interceptor system.

Figure 13.14 Option C3 – Buildout PWWF Results

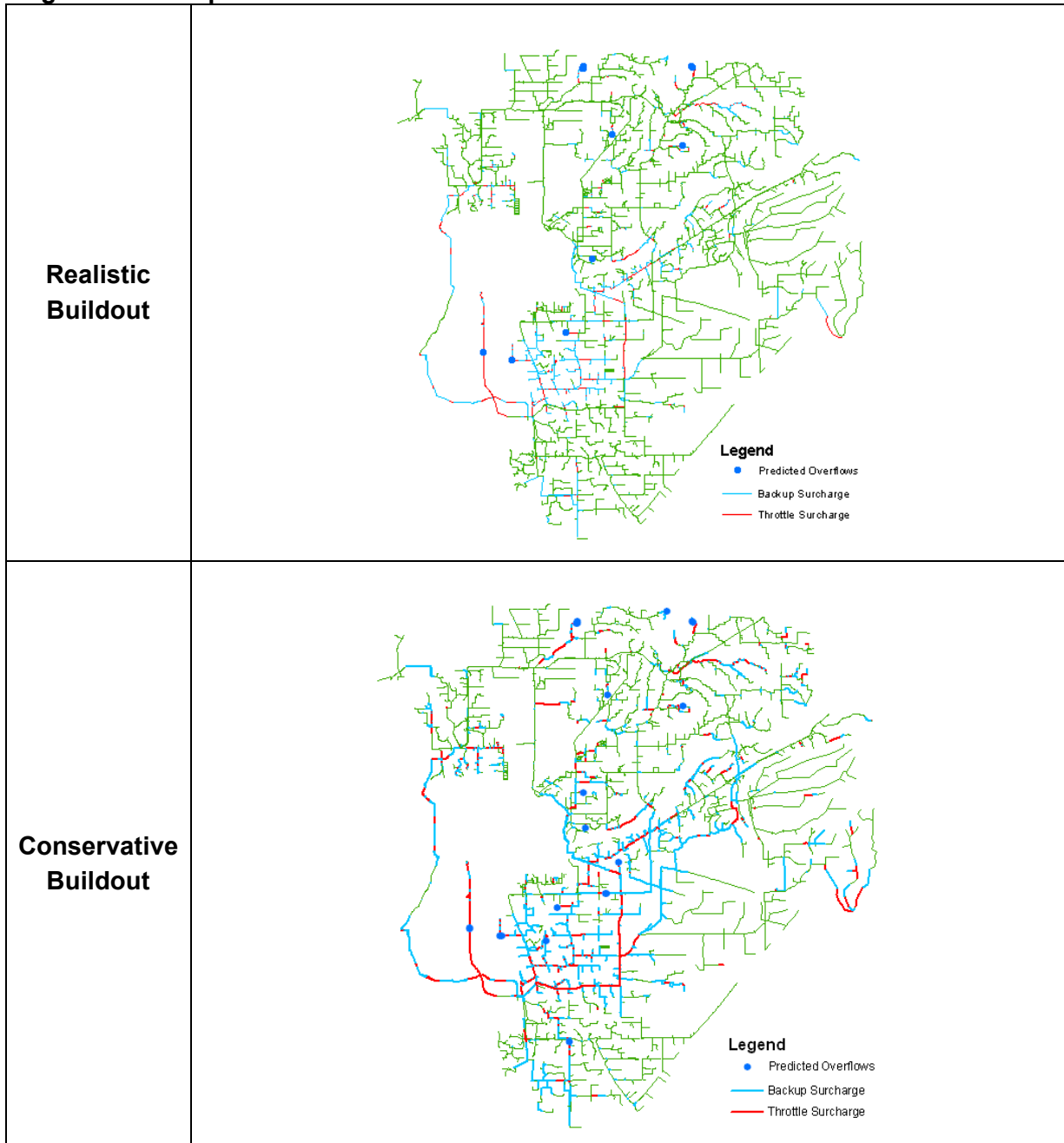


Table 13.5 Summary of Modeling Results for the Option C3

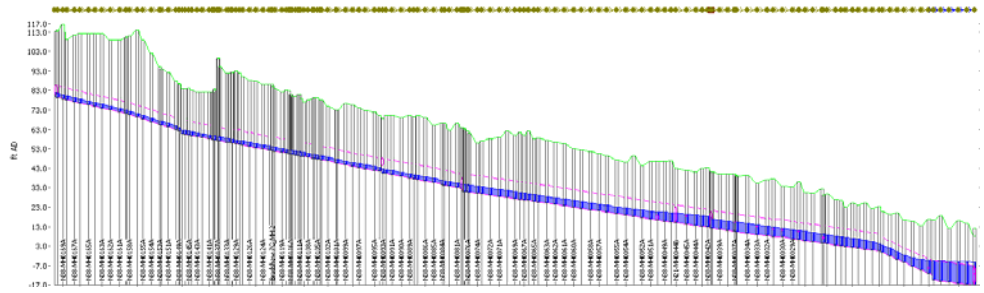
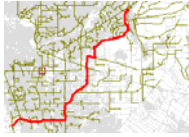
Interceptor	Realistic Buildout	Conservative Buildout
Bradshaw	No surcharge (13 ft freeboard at N38-MH0020A)	Moderate surcharge (8 ft freeboard at N38-MH0020A)
Central	Moderate surcharge (6 ft freeboard at N21-MH0074B)	Critical surcharge; Overflows at N21-MH0074B and N21-MH0073B
Northeast	No surcharge	Critical backup surcharge from Central Interceptor (1 ft freeboard at N24-MH0032A)
Sunrise	No surcharge (6 ft freeboard at low MH SR2040)	Critical backup surcharge from Bradshaw Interceptor (4 ft freeboard at MH SR1130)
City	Critical surcharge; Overflows at N25-MH0033A and N25-MH0033B	Critical surcharge; Overflows at N25-MH0033A and N25-MH0033B
McClellan (after relieved)	No surcharge (4 ft freeboard at an upstream low MH N33-MH0032A)	Minor surcharge downstream (4 ft freeboard at an upstream low MH N33-MH0032A)
Upper Dry Creek (after relieved)	No surcharge	Minor surcharge (12 ft freeboard at N17-MH0091A)
Lower Dry Creek	No surcharge	No surcharge
Upper Northwest	No surcharge	No surcharge
Lower Northwest	No surcharge	No surcharge
Natomas	No surcharge	No surcharge
Folsom	No surcharge (6 ft freeboard at low MH N23- MH0014A)	Minor backup surcharge from Central and Northeast Interceptors (5 ft freeboard at low MH N23- MH0014A)
Folsom East	No surcharge (5 ft freeboard at an upstream low MH N37-MH0047A)	Minor backup surcharge from Bradshaw Interceptor (5 ft freeboard at an upstream low MH N37-MH0047A)
Laguna	No surcharge	No surcharge

Appendix A

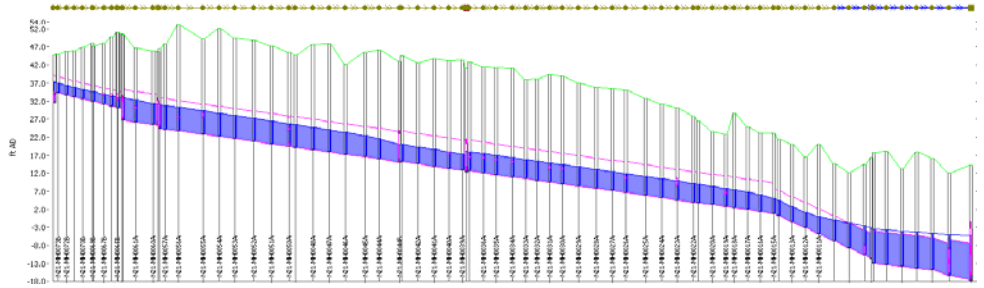
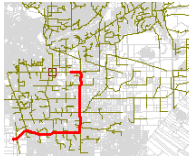
Near-term (2010) Model Results PWWF HGL Profiles

Near-term Model

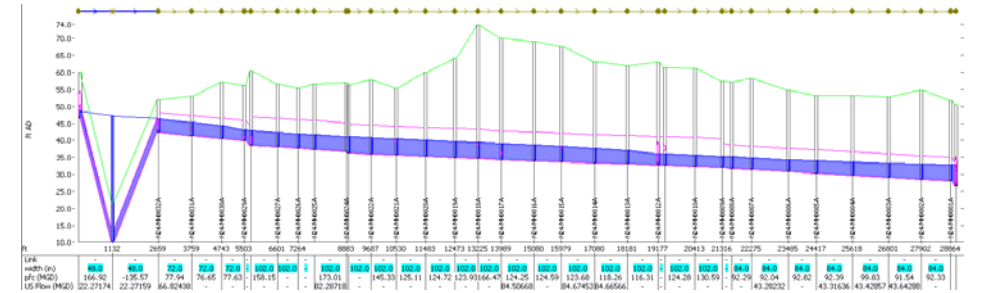
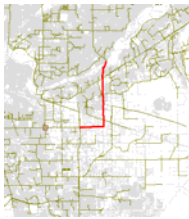
Bradshaw Interceptor



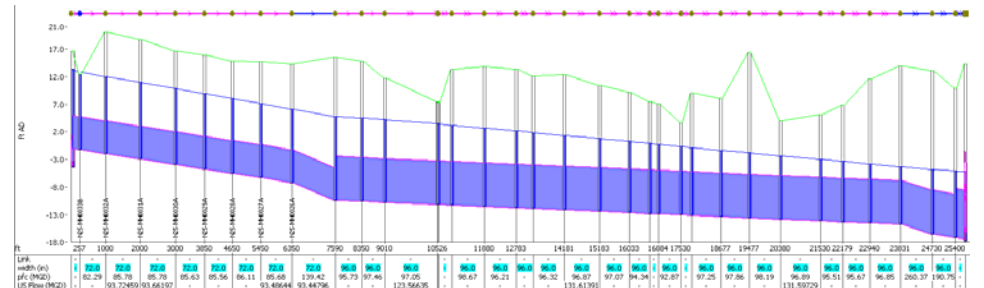
Central Interceptor



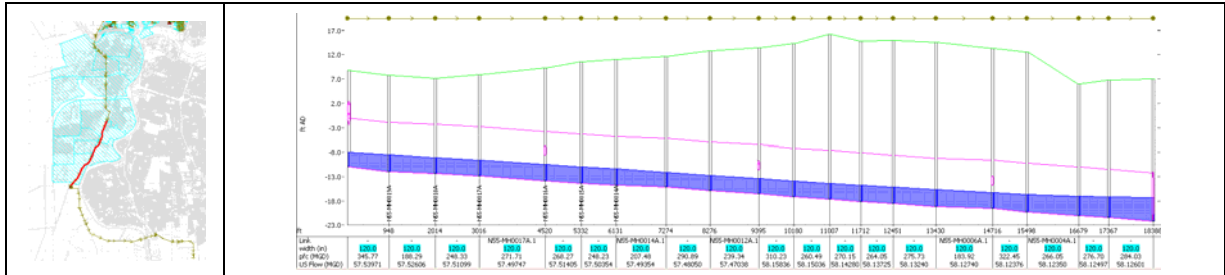
Northeast Interceptor



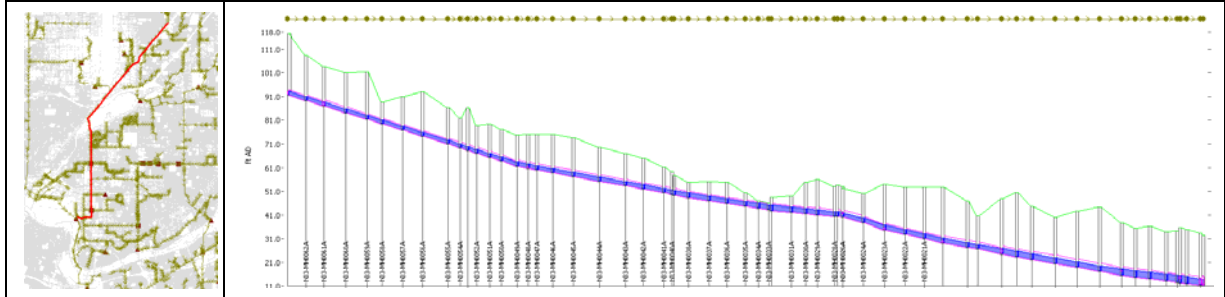
City Interceptor



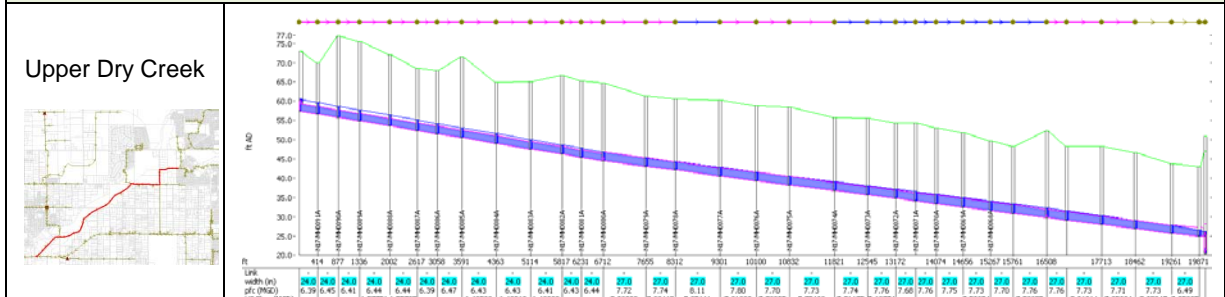
Lower Northwest Interceptor (gravity portion)



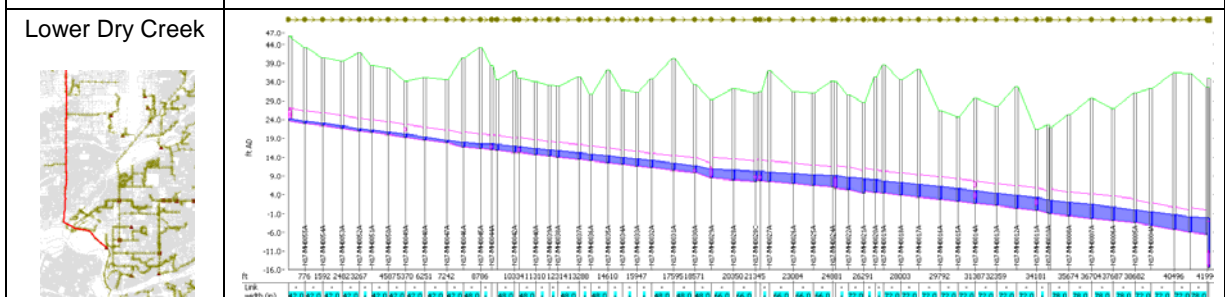
McClellan Interceptor



Dry Creek Interceptor

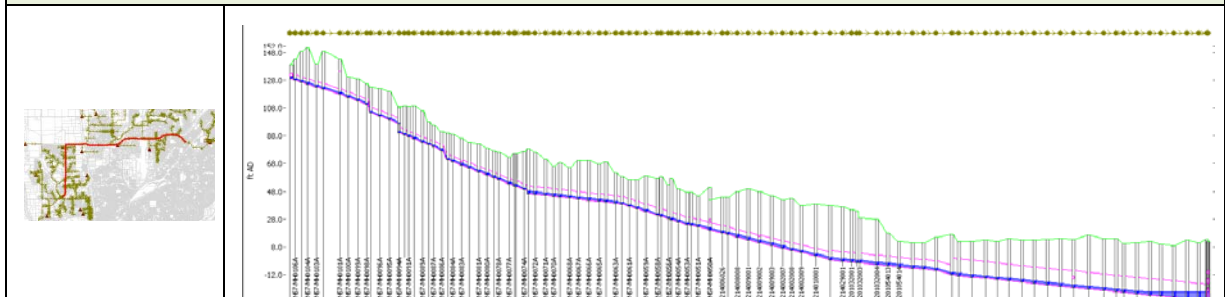


Upper Dry Creek

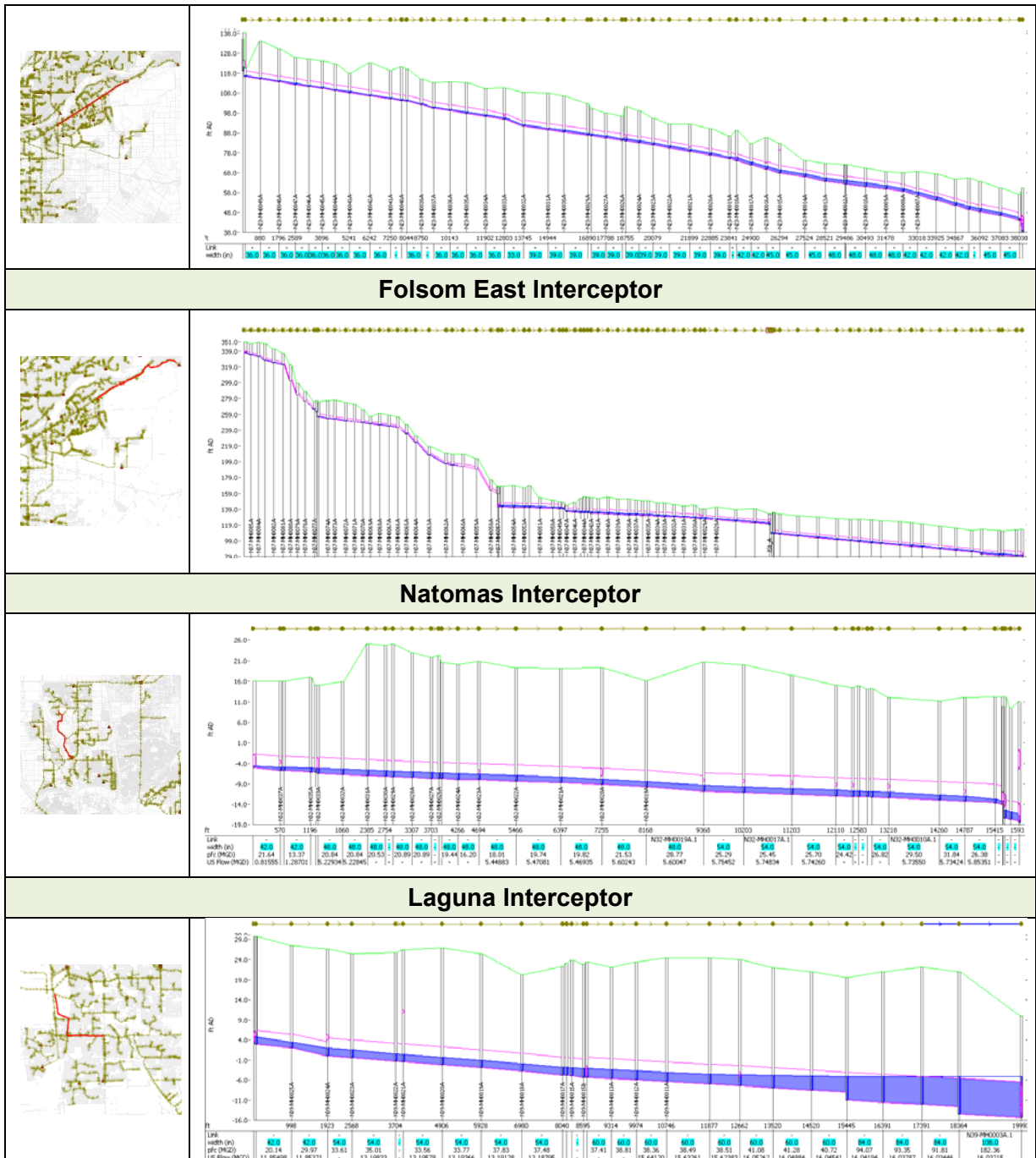


Lower Dry Creek

Upper Northwest Interceptor



Folsom Interceptor



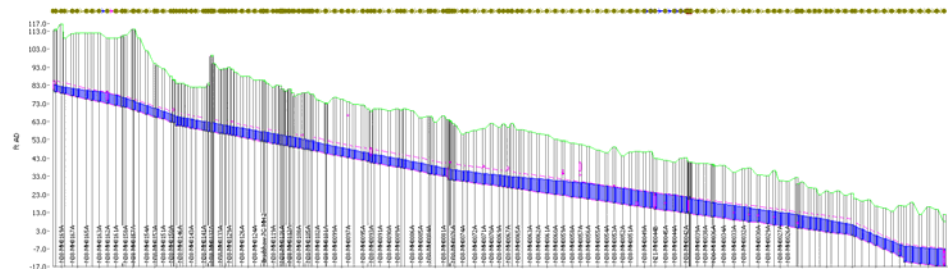
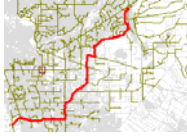
Appendix B

ISS Alternative C1

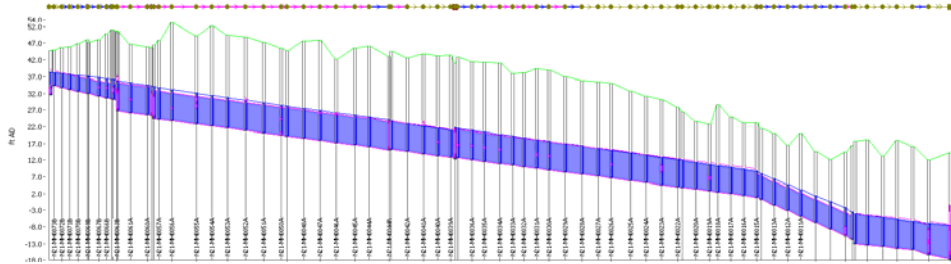
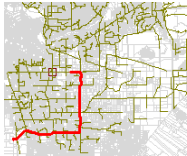
Realistic and Conservative Buildout Model Results PWWF HGL Profiles

Realistic Buildout Model – ISS Alternative C1

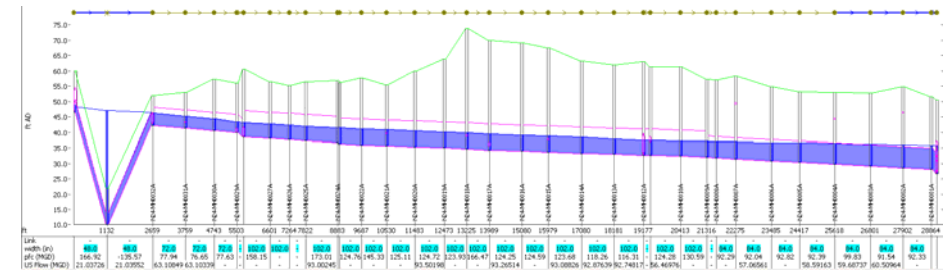
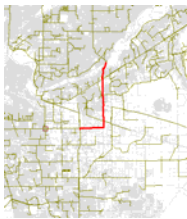
Bradshaw Interceptor



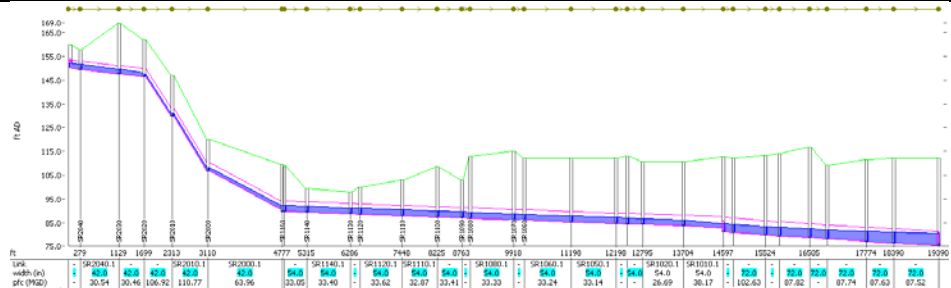
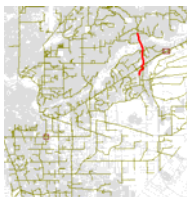
Central Interceptor



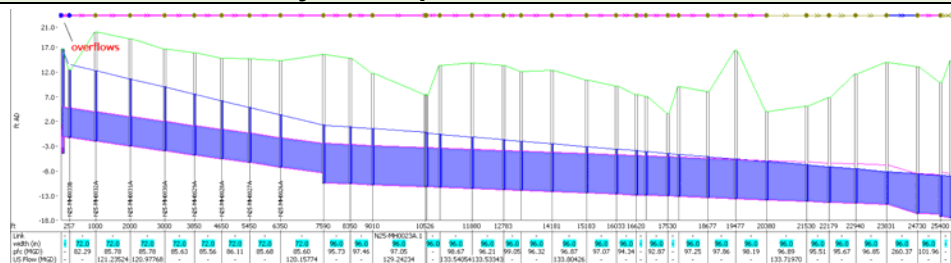
Northeast Interceptor



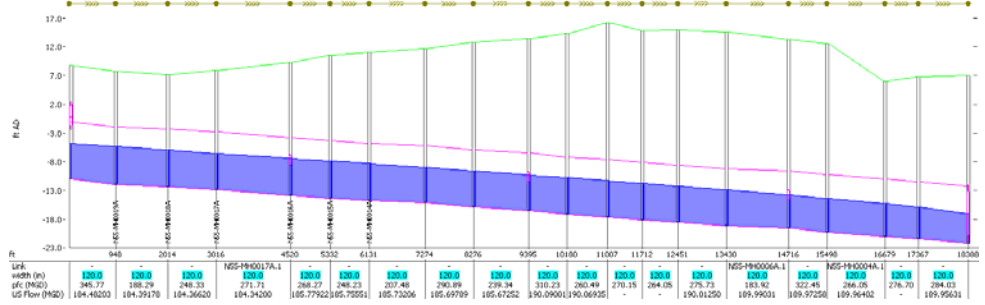
Sunrise, Folsom East, Bradshaw Interceptors



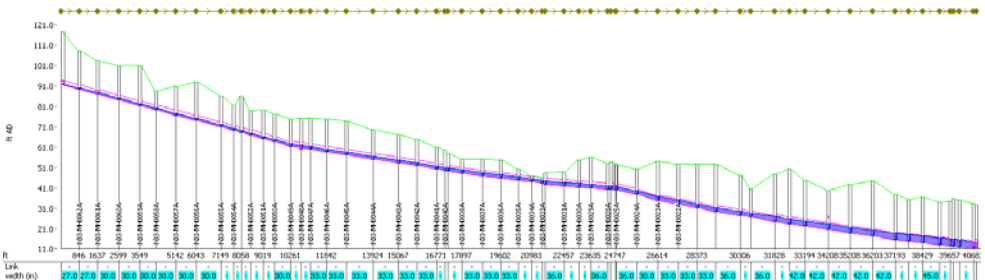
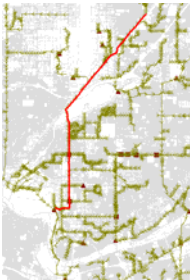
City Interceptor



Lower Northwest Interceptor (gravity portion)

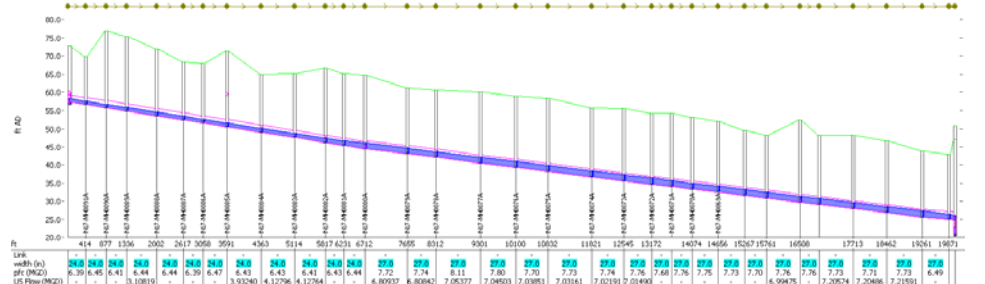


McClellan Interceptor (after relieved)

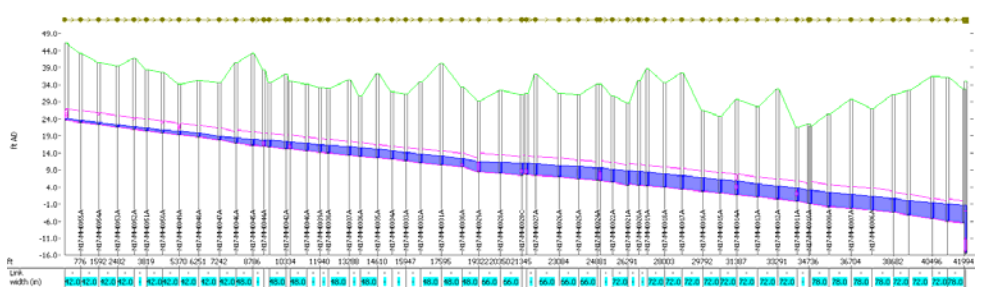
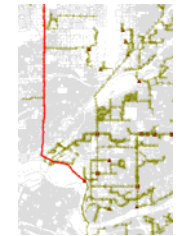


Dry Creek Interceptor (after relieved)

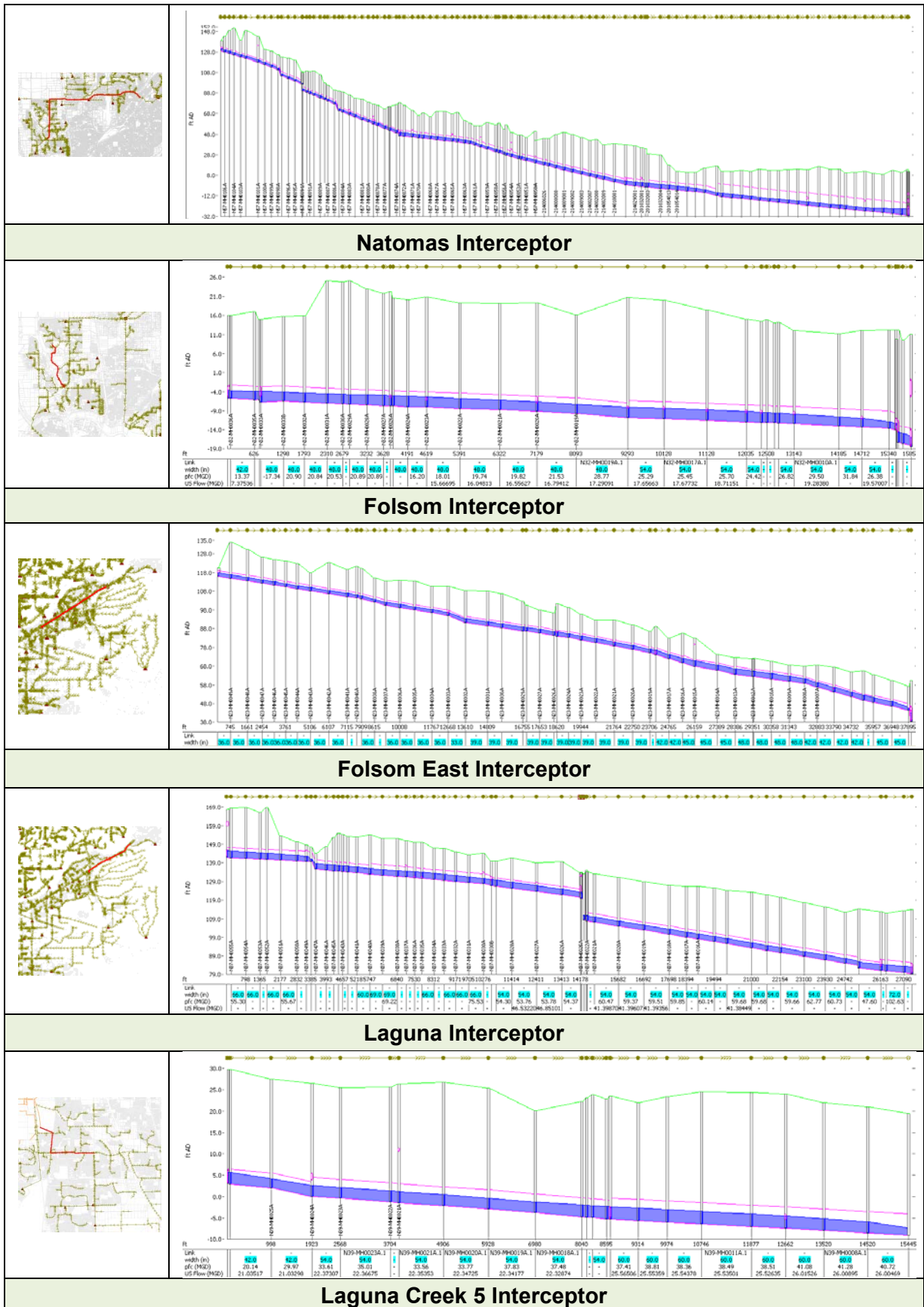
Upper Dry Creek
after relieved

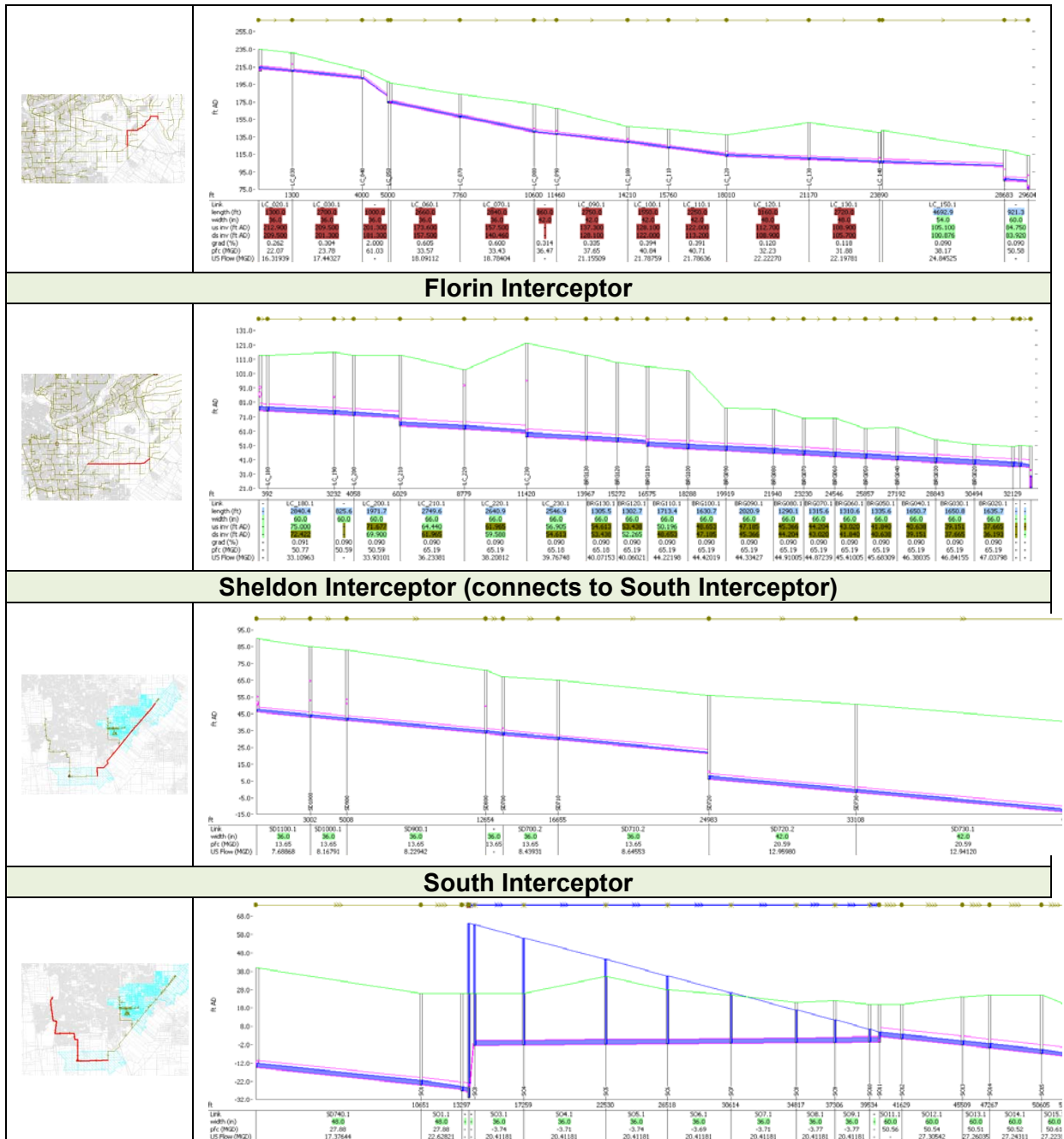


Lower Dry Creek



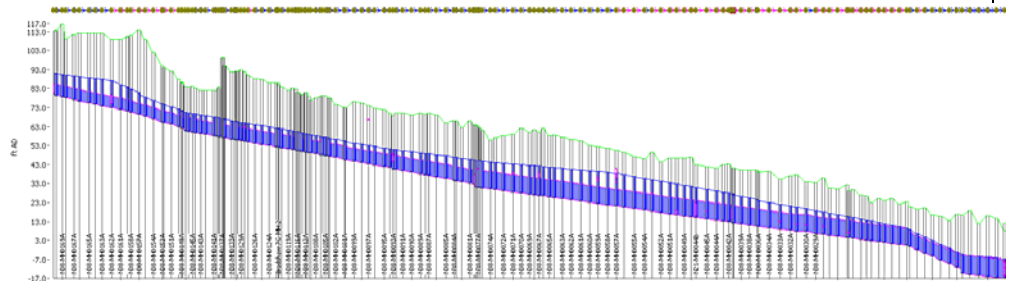
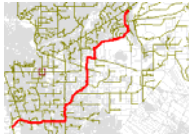
Upper Northwest Interceptor



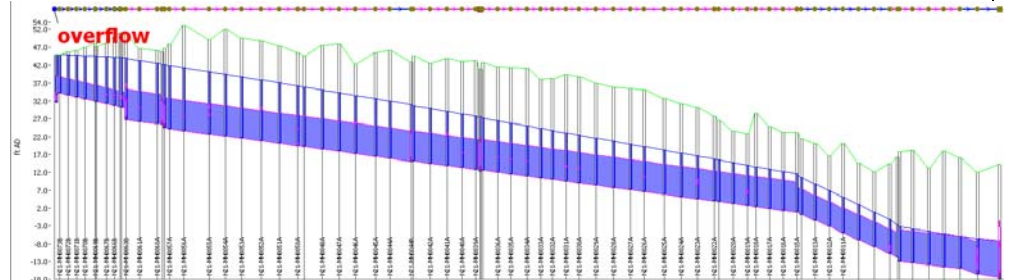
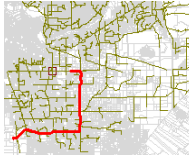


Conservative Buildout Model – ISS Alternative C1

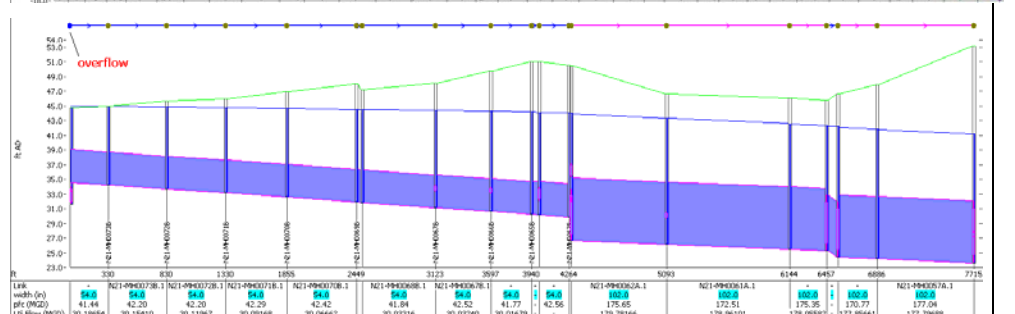
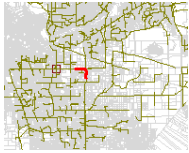
Bradshaw Interceptor



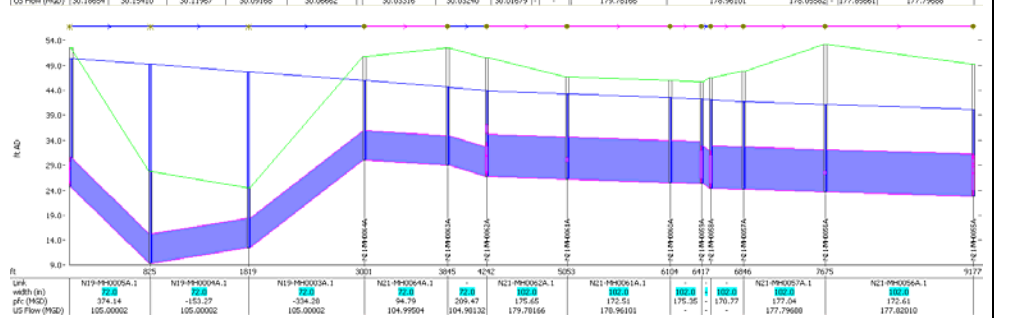
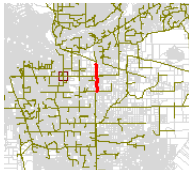
Central Interceptor



Zoomed in
Central
Interceptor
downstream of
Power Inn PS



Zoomed in
Central
Interceptor
downstream of
the Fall Structure

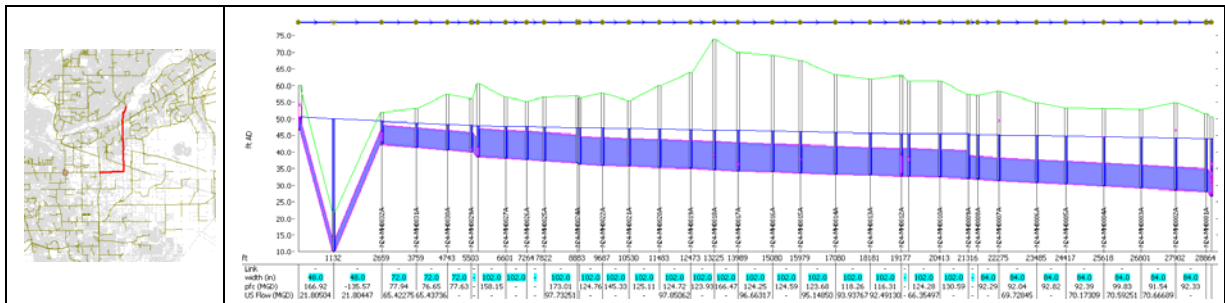


Northeast Interceptor

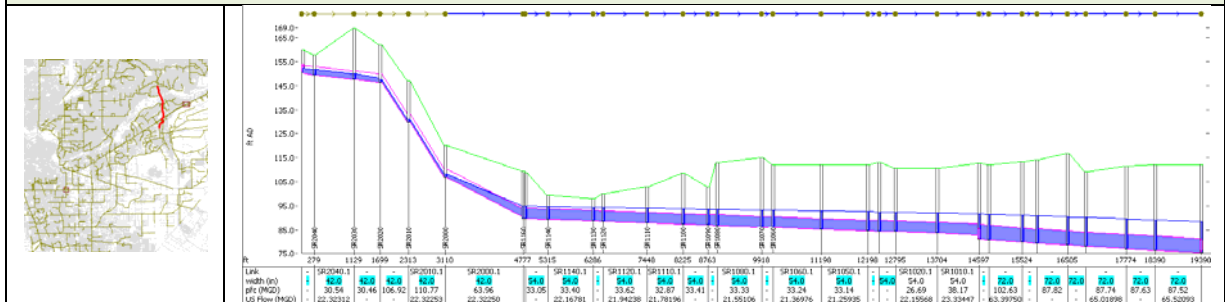
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[http://extranet.msa.sacounty.net/sasd/polplan/iss/SharedDocuments/Technical Memorandums/TM 13 Hydraulic Model Evaluation/TM 13 Hydraulic Model Evaluation_final_20100610.docx](http://extranet.msa.sacounty.net/sasd/polplan/iss/SharedDocuments/Technical%20Memorandums/TM%2013%20Hydraulic%20Model%20Evaluation/TM%2013%20Hydraulic%20Model%20Evaluation_final_20100610.docx)

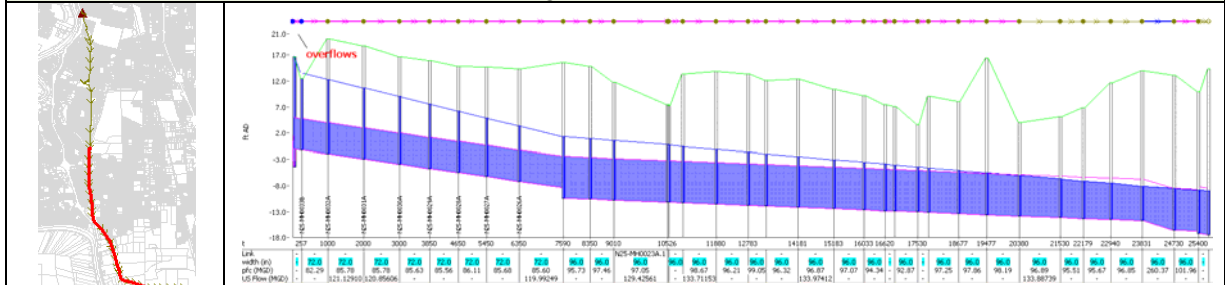
13-38



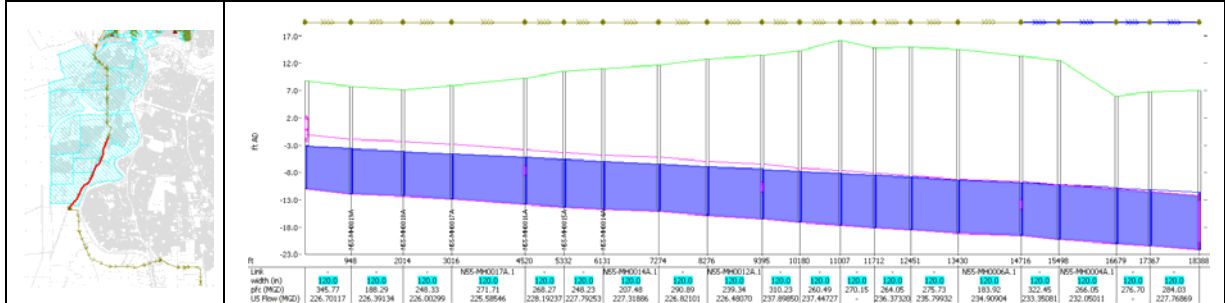
Sunrise, Folsom East, Bradshaw Interceptors



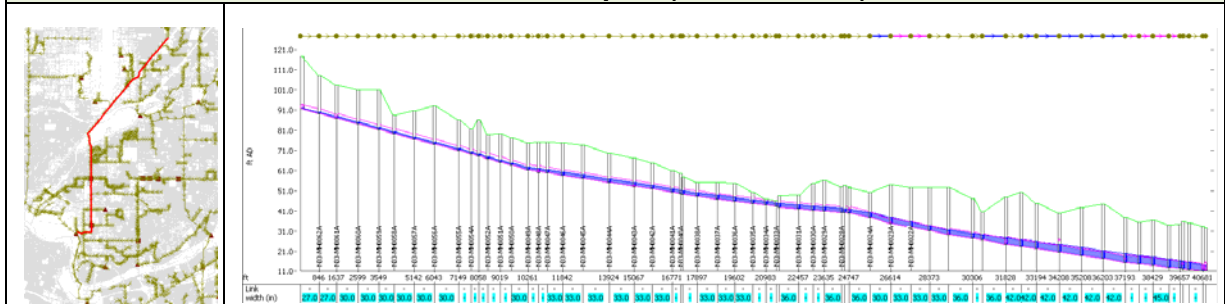
City Interceptor



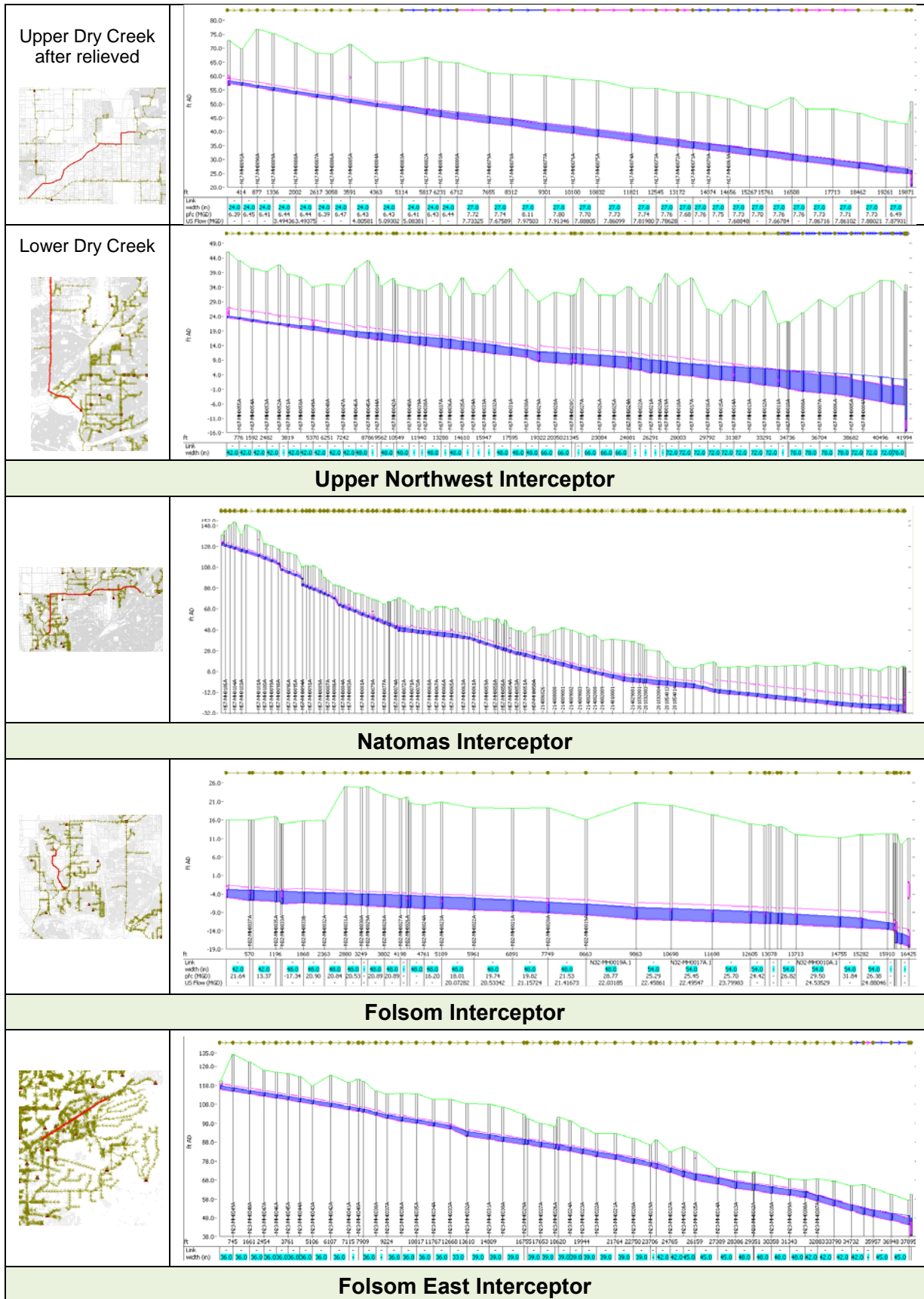
Lower Northwest Interceptor (gravity portion)

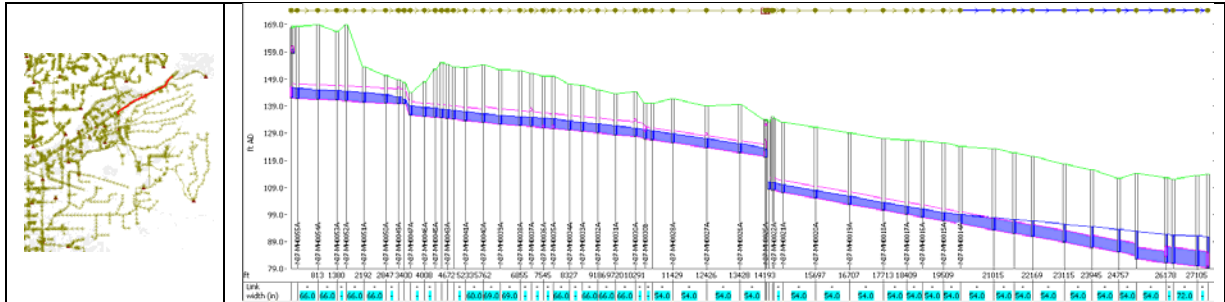


McClellan Interceptor (after relieved)

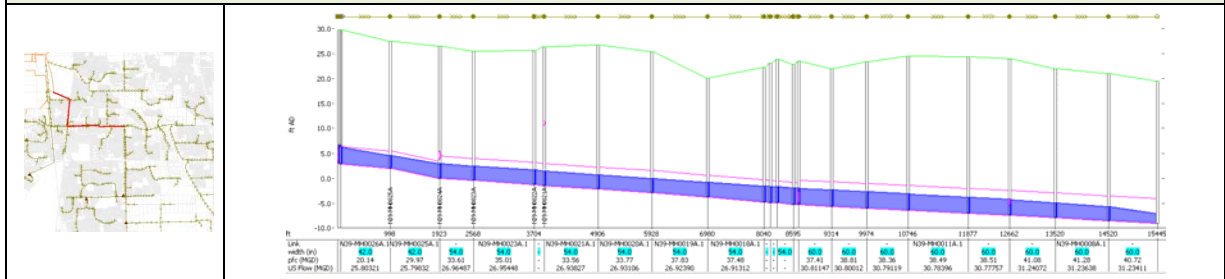


Dry Creek Interceptor (after relieved)

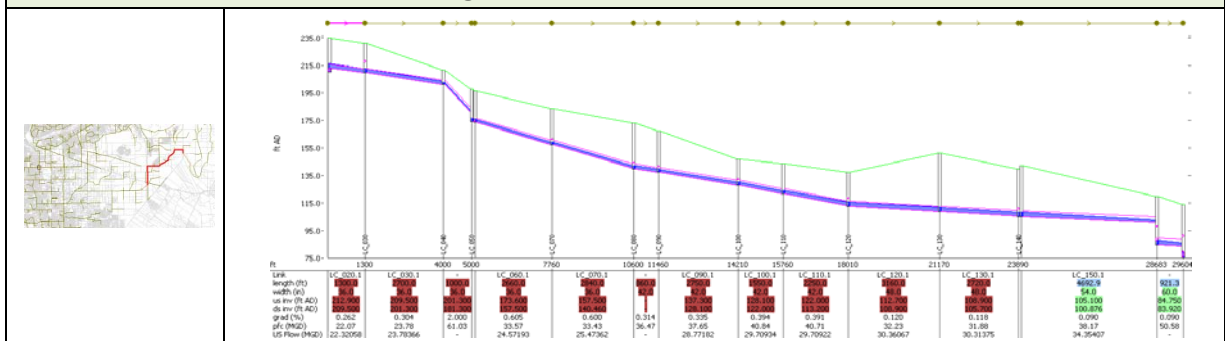




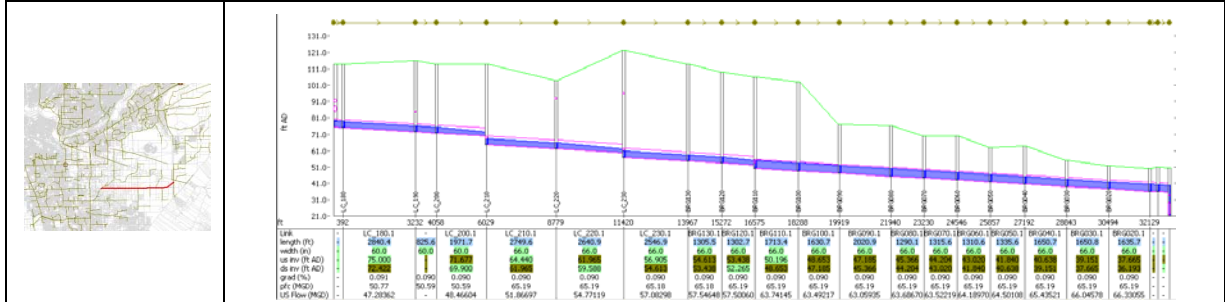
Laguna Interceptor



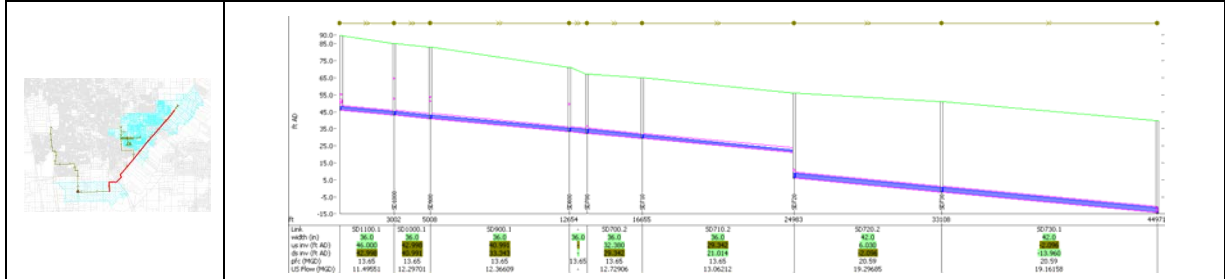
Laguna Creek 5 Interceptor



Florin Interceptor



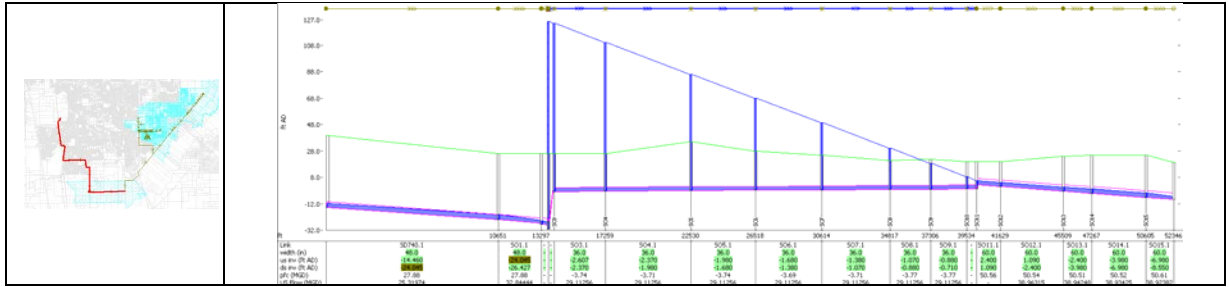
Sheldon Interceptor (connects to South Interceptor)



South Interceptor (40.2 mgd PS, dual 36" and 24" FMs)

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[http://extranet.msa.sacounty.net/sasd/polplan/iss/SharedDocuments/Technical Memorandums/TM 13 Hydraulic Model Evaluation/TM 13 Hydraulic Model Evaluation_final_20100610.docx](http://extranet.msa.sacounty.net/sasd/polplan/iss/SharedDocuments/Technical%20Memorandums/TM%2013%20Hydraulic%20Model%20Evaluation/TM%2013%20Hydraulic%20Model%20Evaluation_final_20100610.docx)

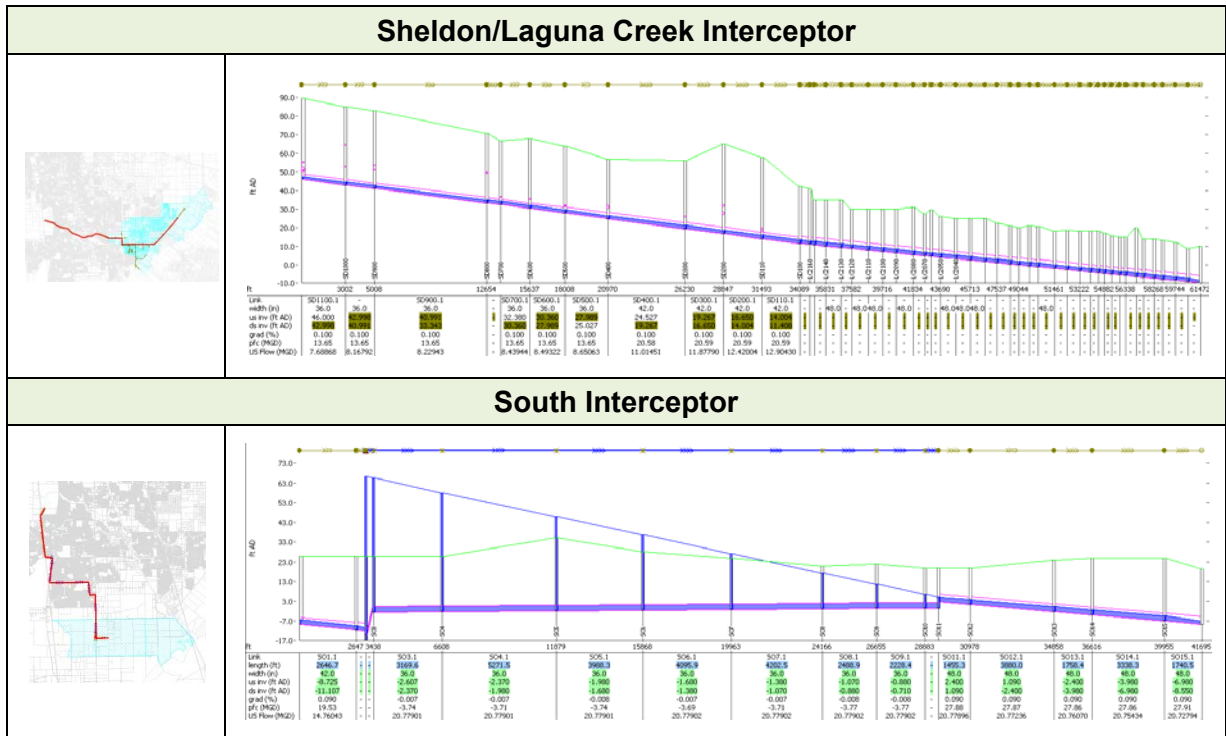


Appendix C

ISS Alternative C2

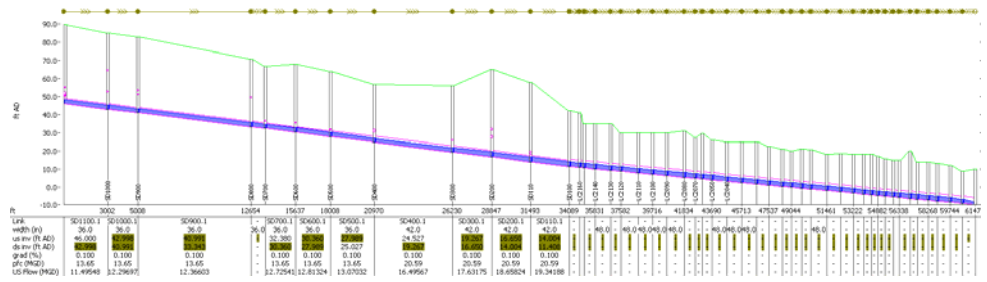
Realistic and Conservative Buildout Model Results PWWF HGL Profiles

Realistic Buildout Model – ISS Alternative C2

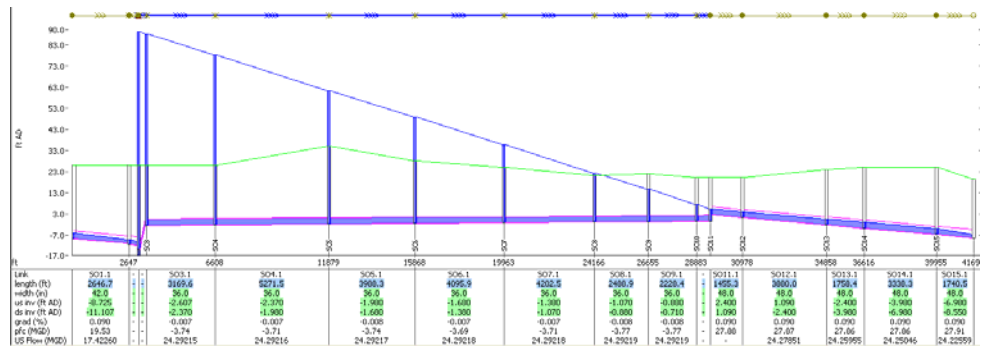
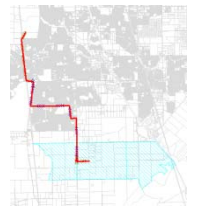


Conservative Buildout Model – ISS Alternative C2

Sheldon/Laguna Creek Interceptor



South Interceptor (24.3 mgd PS, single 36" FM)



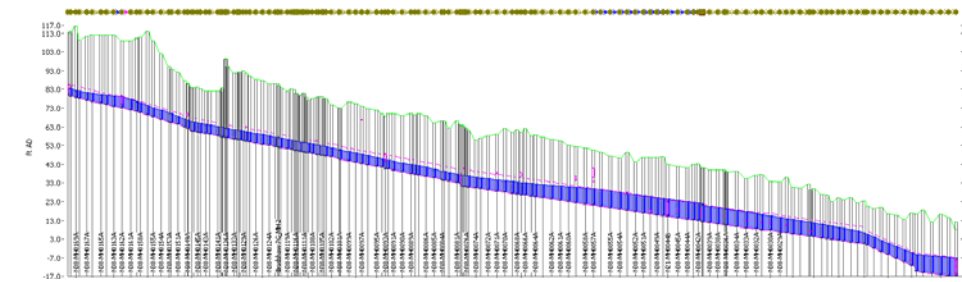
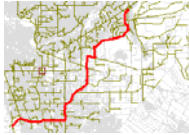
Appendix D

ISS Alternative C3

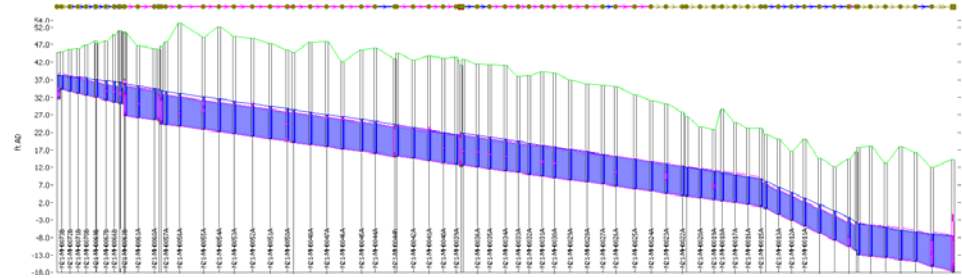
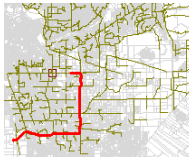
Realistic and Conservative Buildout Model Results PWWF HGL Profiles

Realistic Buildout Model – ISS Alternative C3

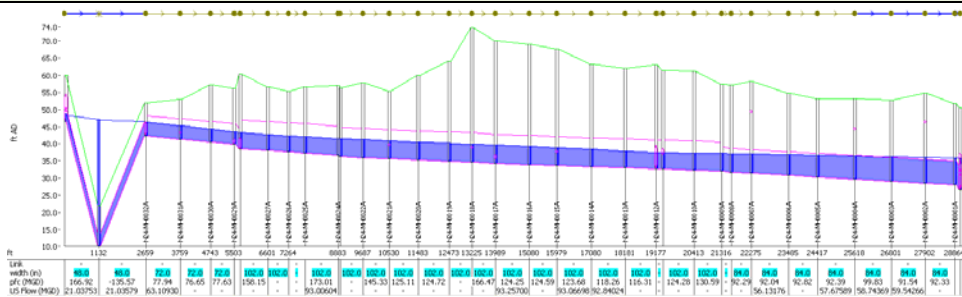
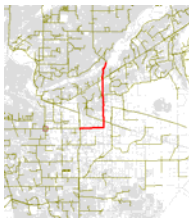
Bradshaw Interceptor



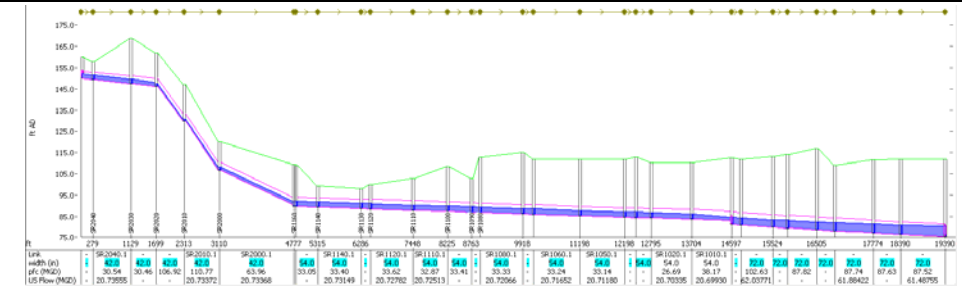
Central Interceptor



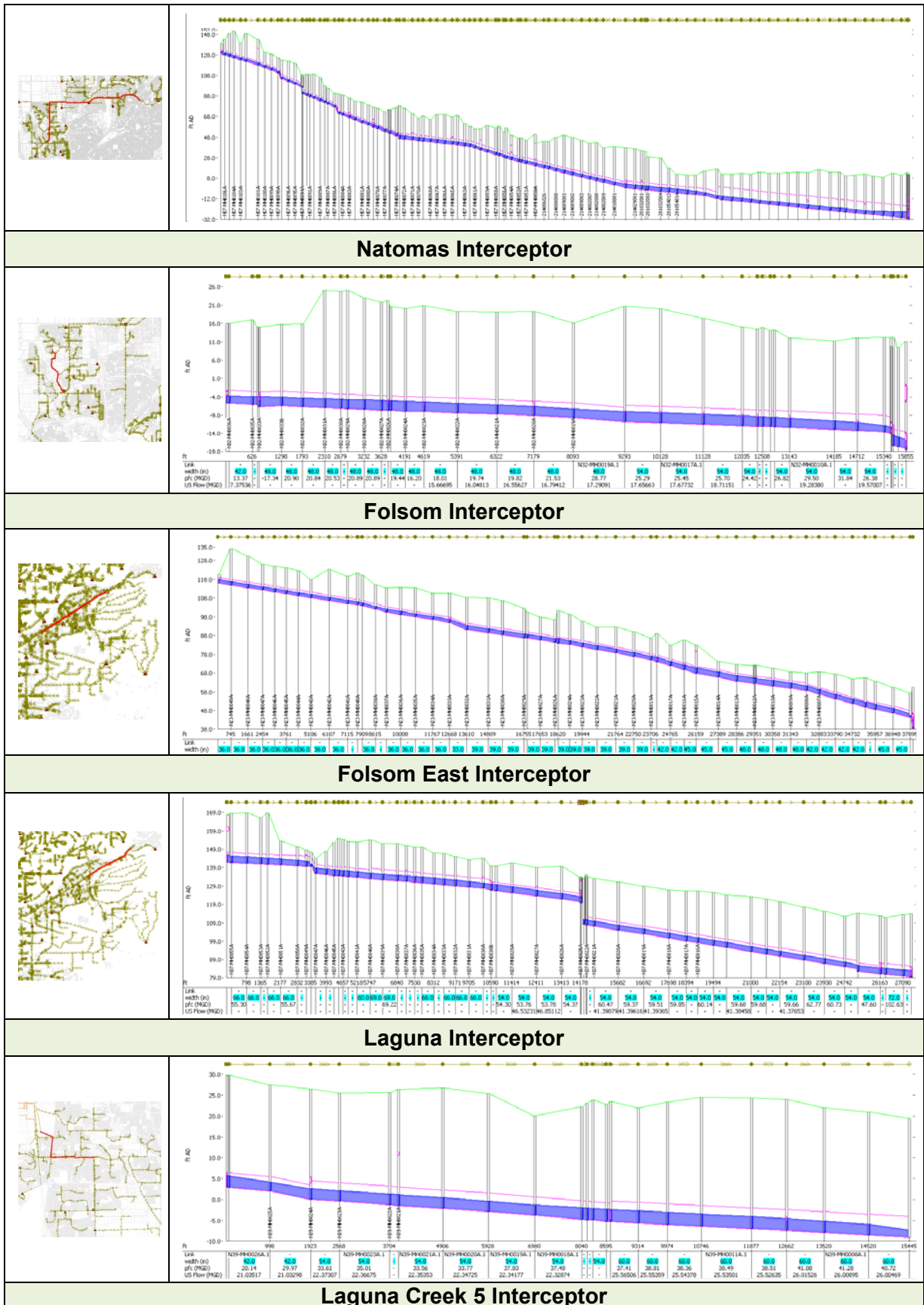
Northeast Interceptor

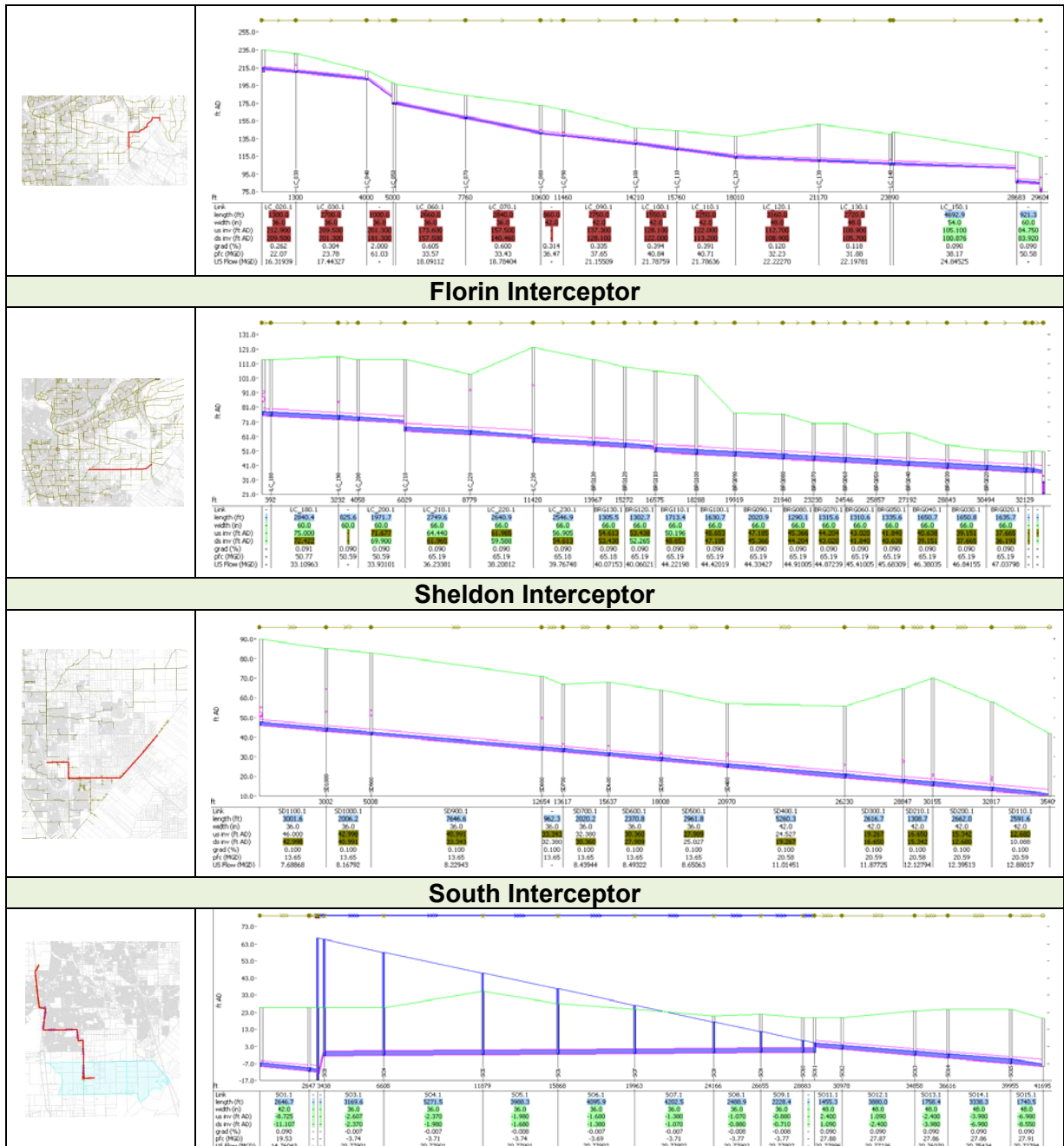


Sunrise, Folsom East, Bradshaw Interceptors



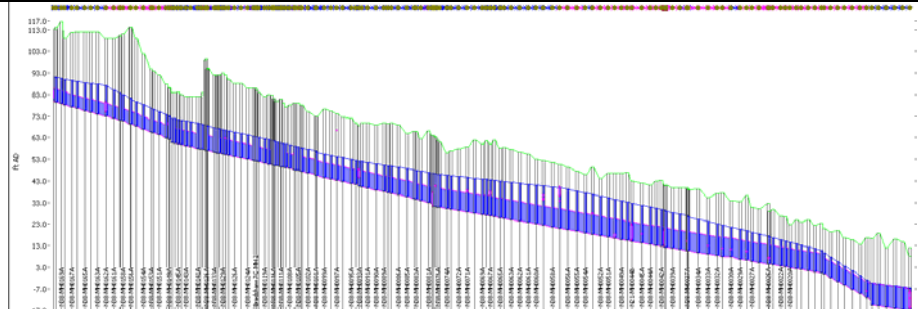
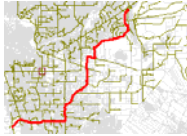
City Interceptor



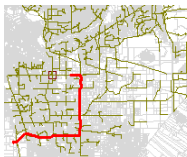


Conservative Buildout Model – ISS Alternative C3

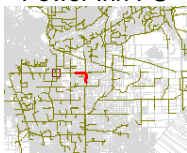
Bradshaw Interceptor



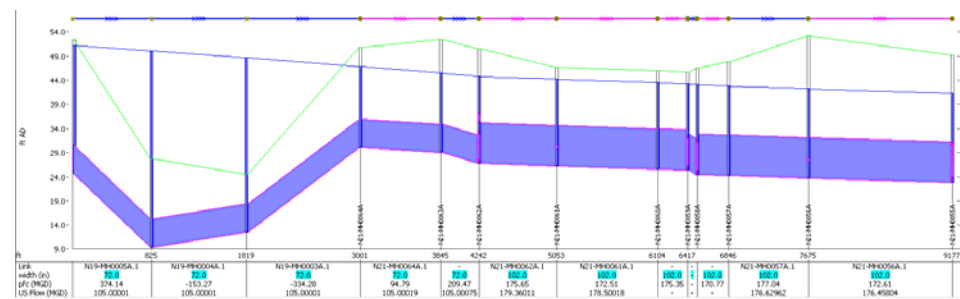
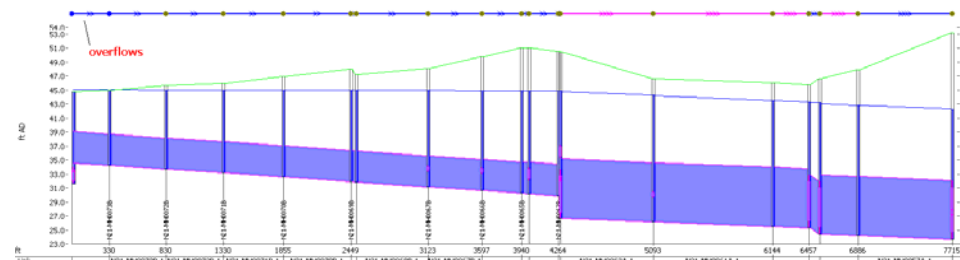
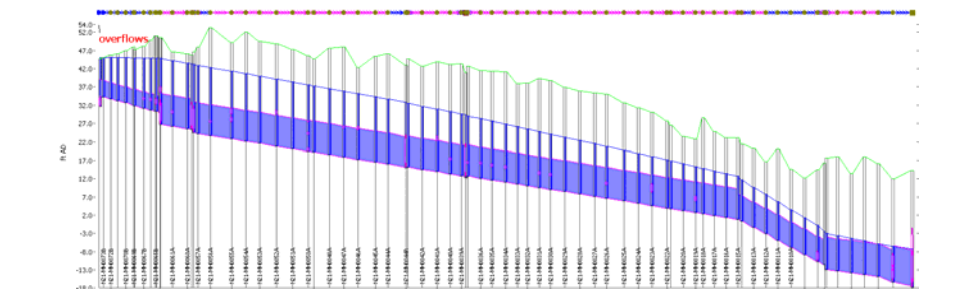
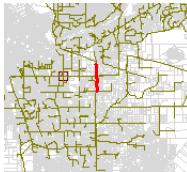
Central Interceptor



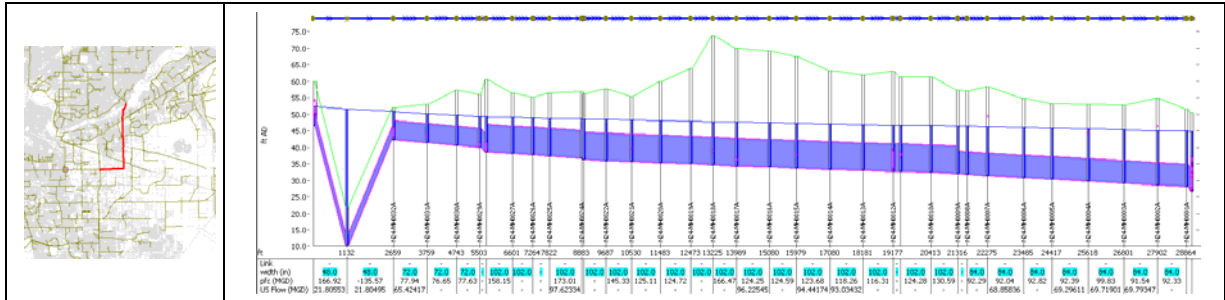
Zoomed in
Central
Interceptor
downstream of
Power Inn PS



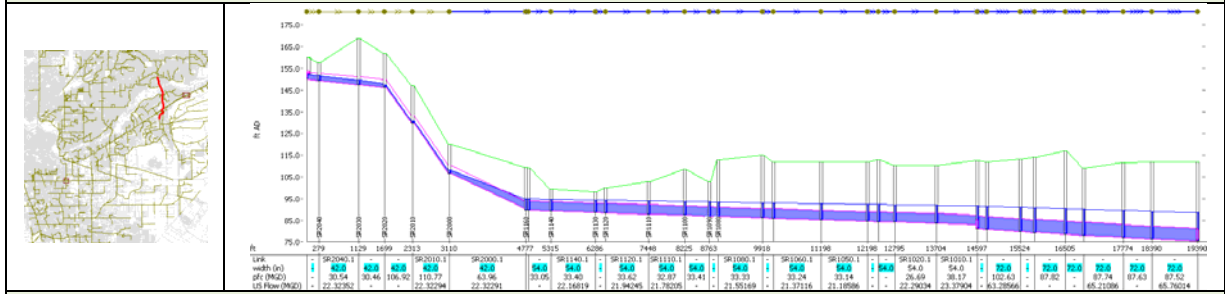
Zoomed in
Central
Interceptor
downstream of
the Fall Structure



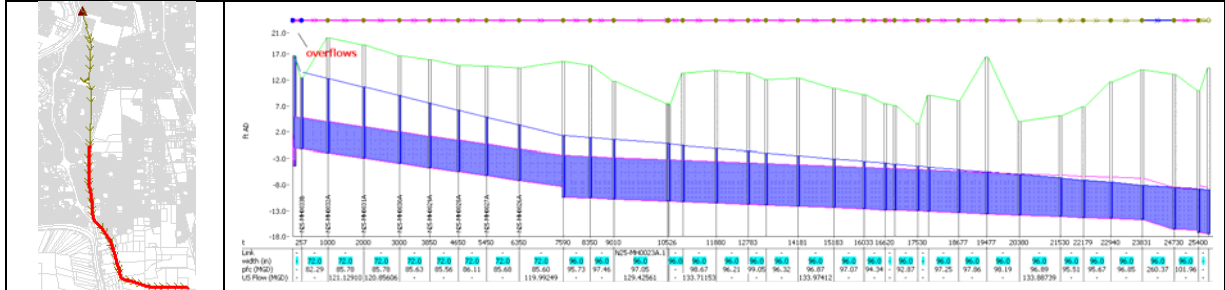
Northeast Interceptor



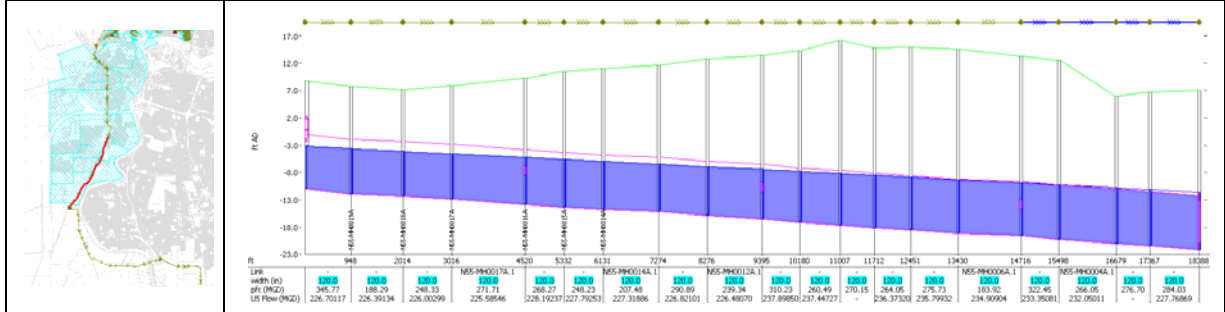
Sunrise, Folsom East, Bradshaw Interceptors



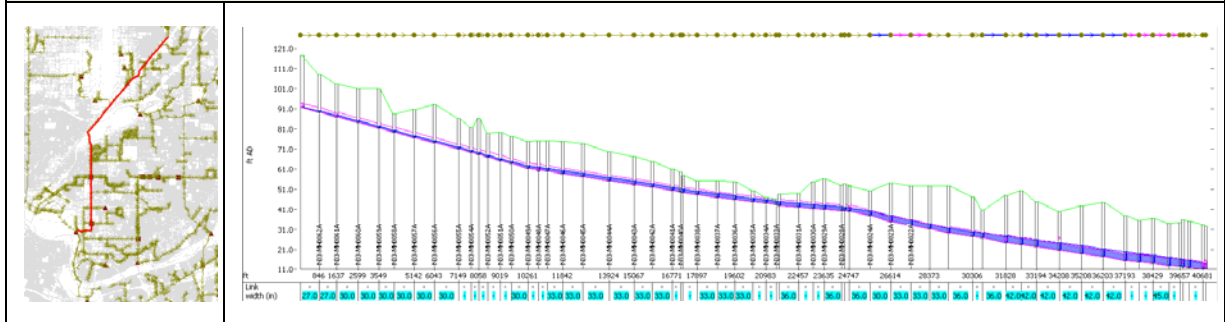
City Interceptor



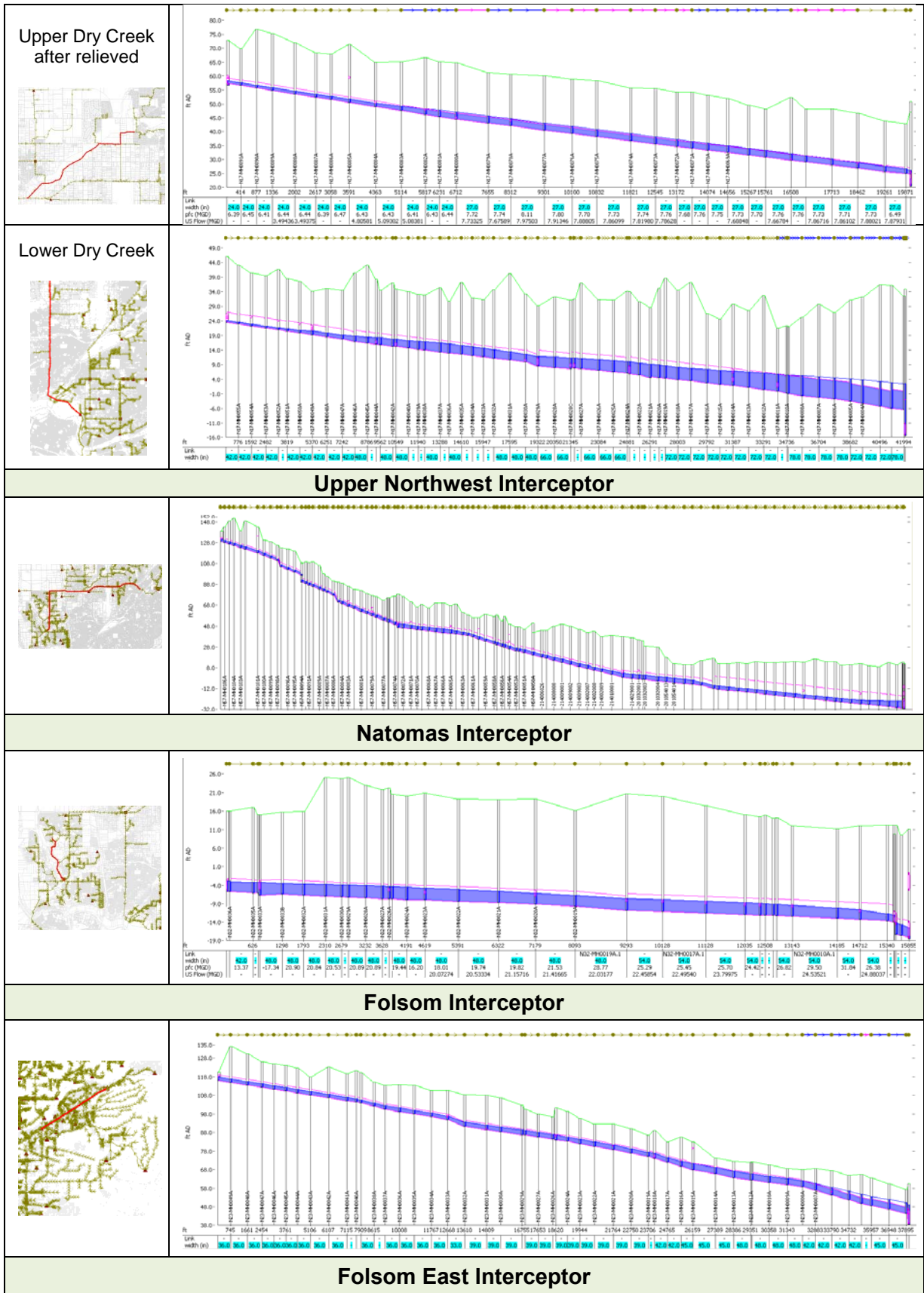
Lower Northwest Interceptor (gravity portion)

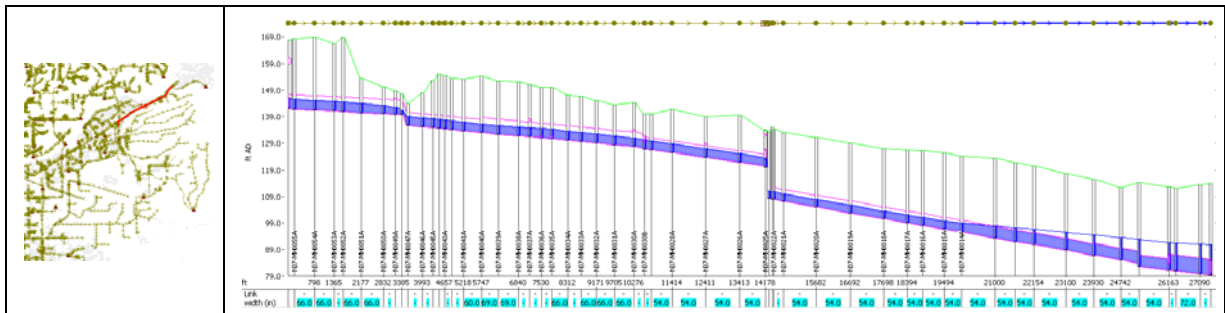


McClellan Interceptor (after relieved)

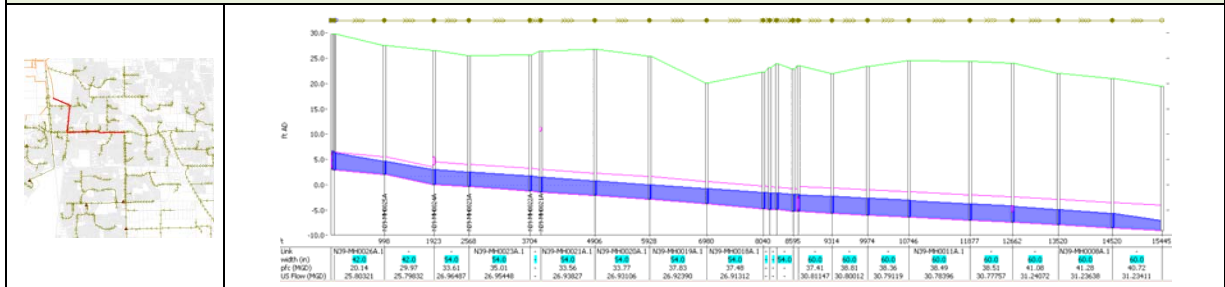


Dry Creek Interceptor (after relieved)

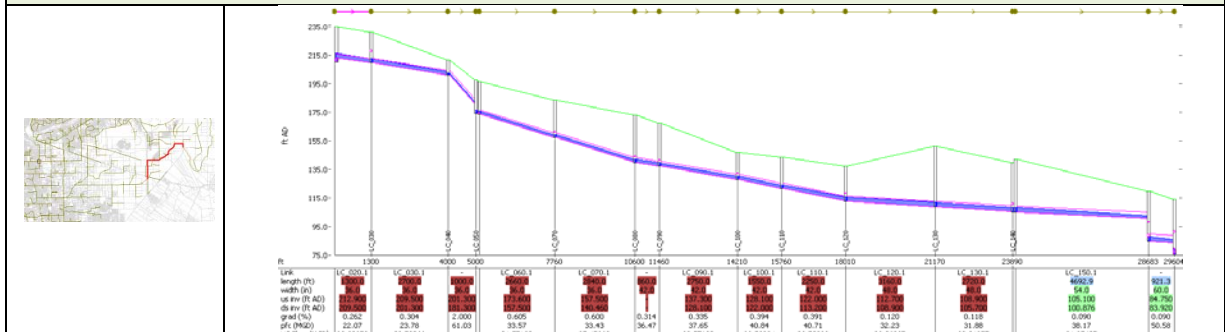




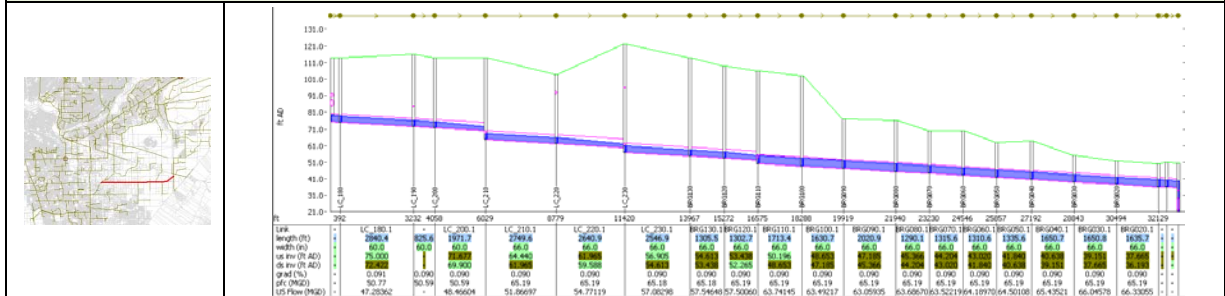
Laguna Interceptor



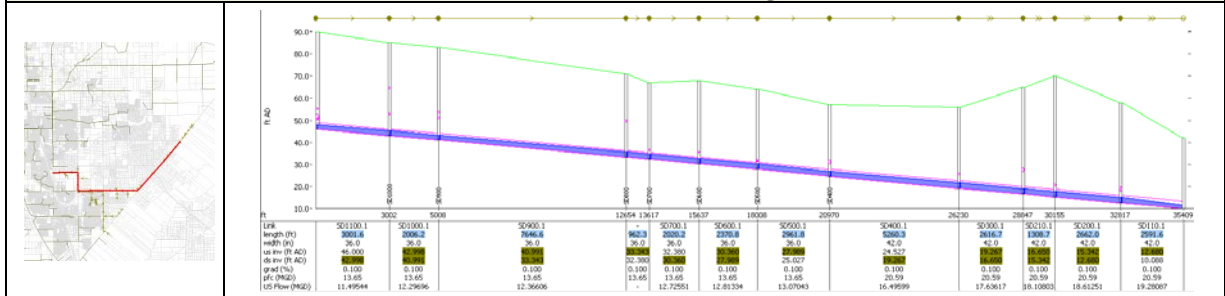
Laguna Creek 5 Interceptor



Florin Interceptor



Sheldon Interceptor (19.3 mgd PS)



South Interceptor (24.3 mgd PS)

DRAFT - July 16, 2010

http://extranet.msa.sacounty.net/sasd/polplan/iss/SharedDocuments/Technical Memorandums/TM 13 Hydraulic Model Evaluation/TM 13 Hydraulic Model Evaluation_final_20100610.docx

13-54

