

Section 1

Introduction



SECTION 1 – INTRODUCTION

The Victor Valley Wastewater Reclamation Authority (VWVRA) contracted with HDR Engineering (HDR), in December 2007, to complete a Sewer Master Plan (SMP) for the VWVRA Interceptor. The SMP has been developed to accomplish the following primary objectives:

1. To satisfy the System Evaluation and Capacity Assurance Program (SECAP) requirements in the Sewer System Management Plan (SSMP) mandated by the California State Water Resources Control Board (SWRCB).
2. To provide data and assessments that will supplement the Operation and Maintenance Plan and Monitoring, Measurement and Modification Plan requirements in the SSMP mandated by the SWRCB.
3. To analyze and estimate Interceptor capacity in relationship to the VWVRA Strategic Plan.
4. To provide the estimates of probable capital cost and construction schedules for Interceptor improvements recommended in this SMP for integration into the current VWVRA Capital Improvements Plan.

These primary objectives were accomplished through the following major tasks:

1. Conduct flow monitoring during dry and wet weather conditions. This formed the basis for Interceptor Model load allocations and Manning's "N" estimates required to calibrate the Model. Flow monitoring data was also utilized to estimate inflow and infiltration impacts on the Interceptor.
2. Review, compile and integrate previous flow monitoring conducted by VWVRA in the Service Area. This task included analysis of the VWVRA Regional Wastewater Reclamation Facility (RWWRf) Influent Flow Meter data. This supplemental data was combined with data from Task 1 to enhance calibration and accuracy.



3. Review, compile and integrate member agency current sewer master plans. This task facilitated allocation of Interceptor Model input load under the service area growth estimates.
4. Compile and integrate the April 2009 VVWRA Service Area Flow Projection Update. This task was conducted to supplement the projections researched under Task 3 using the Service Area Flow Estimate most recently developed for VVWRA.
5. Conduct field survey of all accessible manholes. This task provided the GPS coordinates for the Operation and Maintenance Plan and sewer invert elevation input to the Interceptor Model.
6. Conduct visual condition assessment of all accessible manholes. This task verified manhole configurations and sewer lateral routings for input to the Interceptor Model. Condition Assessment Data Sheets were developed for each accessible manhole for input to the Operation and Maintenance Plan.
7. Construct and calibrate the VVWRA Interceptor Model. This was accomplished using existing flows. The calibrated model facilitated the SECAP.
8. Analyze impacts on Interceptor capacity as growth occurs in the Service Area and capital improvements, such as regional reclamation plants, are brought on line. The calibrated Interceptor Model was used to facilitate the analyses.
9. Provide recommended Interceptor improvements, including capital cost and construction schedule estimates, to be integrated into the VVWRA Capital Improvements Plan.
10. Conduct workshops and meetings with the member agencies to present the results of the work and gather comments.



1.1 VICTOR VALLEY WASTEWATER RECLAMATION AUTHORITY

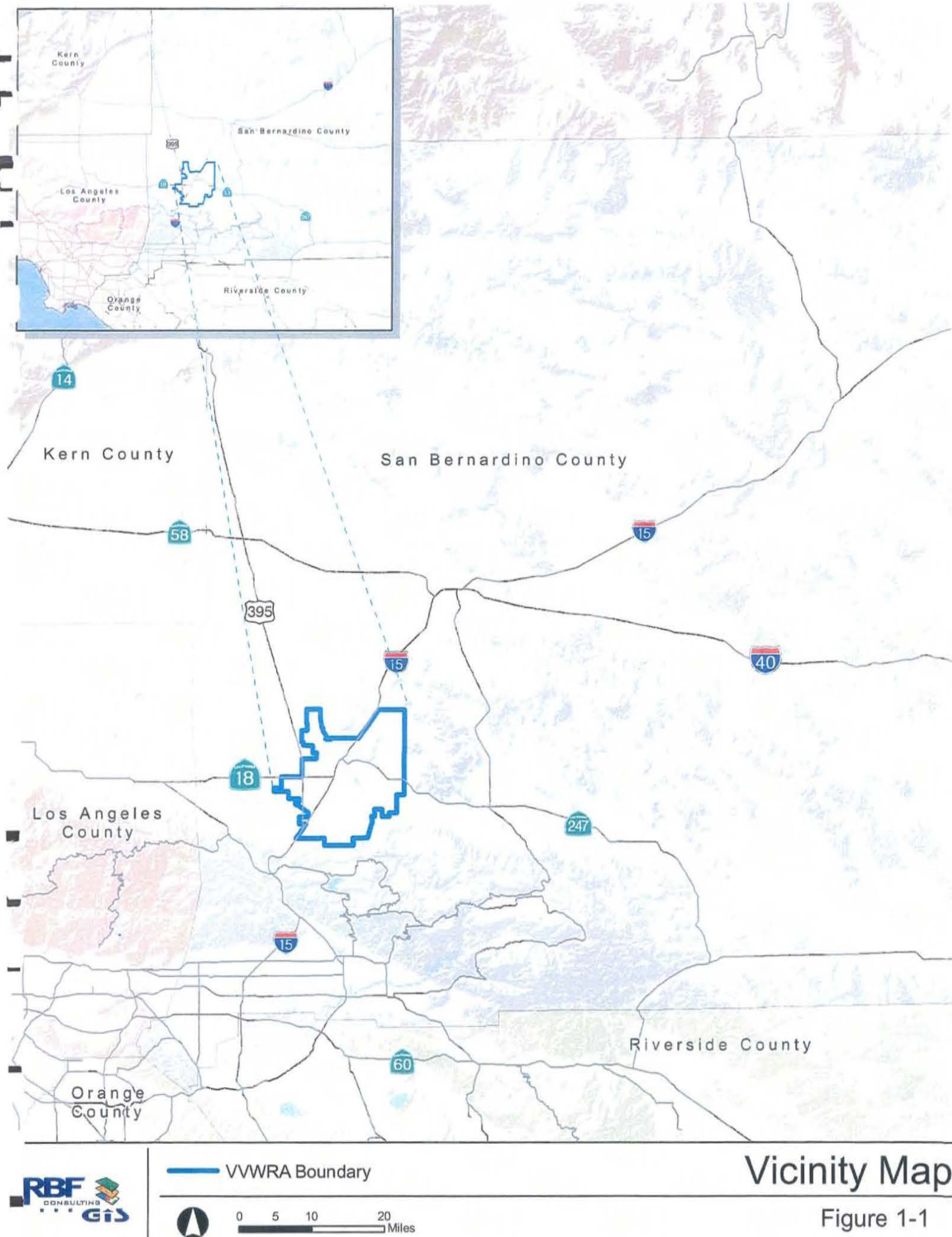
The VVWRA is a California Joint Powers Authority (JPA) that owns, operates and maintains wastewater collection, treatment and disposal facilities. Member agencies of the JPA are the City of Victorville, City of Hesperia, Town of Apple Valley and San Bernardino County (Oro Grande and Spring Valley Lake). The VVWRA Service Area encompasses approximately 141,000 acres in the High Desert area of San Bernardino County, California and is located within the northern portion of the County as shown on Figure 1-1.

The Service Area is situated in a high valley of the Mojave Desert that is bounded to the south by the San Bernardino Mountain Range, to the east by the Granite, Sidewinder, Black and Fairview Mountain Ranges, to the north by the Quartz Mountain Range and by the Los Angeles County Line to the west. The Mojave River flows from south to north in the Service Area.

The average annual maximum temperature in the Service Area (1917-2008) is 77.5°F with a monthly maximum average of 98.2°F in July and 58.7°F in January. Annual minimum temperature averages 43.8°F with a maximum of 60.7°F in July and minimum of 29.2°F in December. Total precipitation has averaged 5.56 inches annually with a monthly maximum of 1.06 inches in February and monthly minimum of 0.13 inches in July. The Service Area has experienced an annual average snowfall of 1.4 inches (1917-2008).

1.2 EXISTING VVWRA FACILITIES

Each member agency operates and maintains a local sewerage collection system that discharges to the VVWRA Interceptor. The local member agency systems include sewers, lift stations and force mains. VVWRA requires that industries on the member agency sewerage collection systems limit the concentration of Biological Oxygen Demand (BOD) and suspended solids discharged to VVWRA. Fats oils and grease concentrations are also restricted.





Existing VVWRA facilities include the following:

1. 40.5 miles of collection sewers.
2. Approximately 460 sewer manholes.
3. 2 sewage lift stations
4. 8 flow metering stations.
5. The Regional Wastewater Reclamation Facility (RWWRF).
6. The portion of the Westwinds reclaimed water (RW) pipeline to the edge of VVWRA property that conveys RW the Westwinds Golf Course.

1.2.1 Sewers

VVWRA owns and maintains the Interceptor. Interceptor sewer sizes range from 10 to 42 inches diameter. Sewage is collected from the southern portion of the Service Area and routed to the RWWRF, located in the northern portion of the Service Area. Manholes within the system are spaced typically 300 to 400 feet apart and at major influent connections and pipeline bends.

The first portions of the Interceptor were constructed in 1973 to 1976 and coincided with the first construction phase of the RWWRF, rated for an average flow of 4.5 mgd. Spring Valley Lake and Victorville were served. Flow from Spring Valley Lake was routed around the Upper Narrows via a lift station located west of the Mojave River. Construction projects in 1980 and 1981 added trunk collectors from Hesperia and South Apple Valley. The North Apple Valley Interceptor was constructed in 2002 and 2003, and a parallel sewer was added from the VSD-3 input lateral to the RWWRF in 1992.

VVWRA has organized the Interceptor into 7 major sections, starting from the Treatment Plant and going upstream these Interceptors are defined as:

1. Schedule 1 & 2 Relief Interceptor system extends from the RWWRF upstream to a parshall flume type metering structure (VSD 3) located adjacent to Turner Rd street just west of National Trails Hwy. This section is located in the City of Victorville.



2. Schedule 1 & 2 Interceptor extends from the RWWRF paralleling Schedule 1 & 2 relief interceptor and ends at Manhole 2-27 adjacent to VSD 3. This section includes the SCLA Interceptor (westward of schedule 1) and Oro Grande Interceptor (eastward of schedule 1) located in the City of Victorville.
3. Schedule 3, 4, and 5 extends from south Apple Valley Interceptor northward to VSD-3, at the start of the double barrel section. This section is located in the City of Victorville.
4. The North Apple Valley Interceptor that extends from its connection to Schedule 4 northeasterly to the County's Juvenile Detention Facility on Dale Evans Parkway. This section is located in the Town of Apple Valley.
5. The South Apple Valley Interceptor extends eastward from its connection to Schedule 5, along Highway 18 to west of Aztec Road. This section is located in the Town of Apple Valley.
6. The SVL/CSA-64 Interceptor that extends from Yates Road to the southern end of Schedule 5 near the Upper Narrows. The majority of this section parallels the Mojave River and is located in Spring Valley Lake and the City of Victorville.
7. The Hesperia "I" Avenue Interceptor that extends from Hercules Street to Bear Valley Road in the City of Hesperia. The line continues north to its connection point south with the SVL/CSA-64 Interceptor within Mojave Narrows Park in the City of Victorville.

1.2.2 Lift Stations

VVWRA owns and operates two lift stations in the collection system; the Nanticoke (Apple Valley Pump Station) and the Oro Grande pump station. The Nanticoke pump station delivers raw sewage from the eastern area of the Town of Apple Valley to the upstream end of the South Apple Valley Interceptor. The Oro Grande Pump Station lifts flow from County Service Area 42 (Oro Grande) to the 36 and 42-inch parallel sewers that discharge to the RWWRF.



1.2.3 Flow Metering Stations

Eight (8) metering stations were positioned along the Interceptor at the following locations:

1. The discharge of the Spring Valley Lake community into the SVL/CSA-64 Interceptor
2. Along the Hesperia Interceptor south of Bear Valley Road,
3. Along the South Apple Valley Interceptor behind the Lewis Learning Center
4. Along the Victorville Schedule 1 and Relief Sewer near the connection of VSD-3.
5. At the VSD-4 connection to the Victorville Schedule 1 Interceptor
6. At VSD-1 in old town Victorville
7. At VSD-2 located near Mojave Narrows State Park
8. At VSD-5 near the Cemex Plant

These metering stations are currently not in use.

1.2.4 Regional Wastewater Reclamation Facility (RWWRF)

Construction of the first phase of the RWWRF was completed in 1981 with an average dry weather flow capacity of 4.5 mgd. The first phase utilized the activated sludge process to provide secondary treatment for discharge to percolation ponds and gravity filters with chlorination and dechlorination to provide tertiary treatment for the portion of the flow discharged to the Mojave River.

Seven upgrades have been completed since the initial construction, in response to population growth in the Service Area and stricter regulatory requirements. Denitrification was added to reduce total nitrogen concentrations, and sludge processing facilities were expanded in anticipation of treating waste sludge from future regional reclamation facilities.



The RWWRF's latest expansion, completed in 2009, was designed to increase capacity to 18.0 mgd Average Dry Weather Flow (ADWF). VVWRA is currently designing a Phase III Upgrades Project that will derate the permitted average capacity of the RWWRF to 14.0 mgd. The following primary elements are part of the Phase III Upgrade Project:

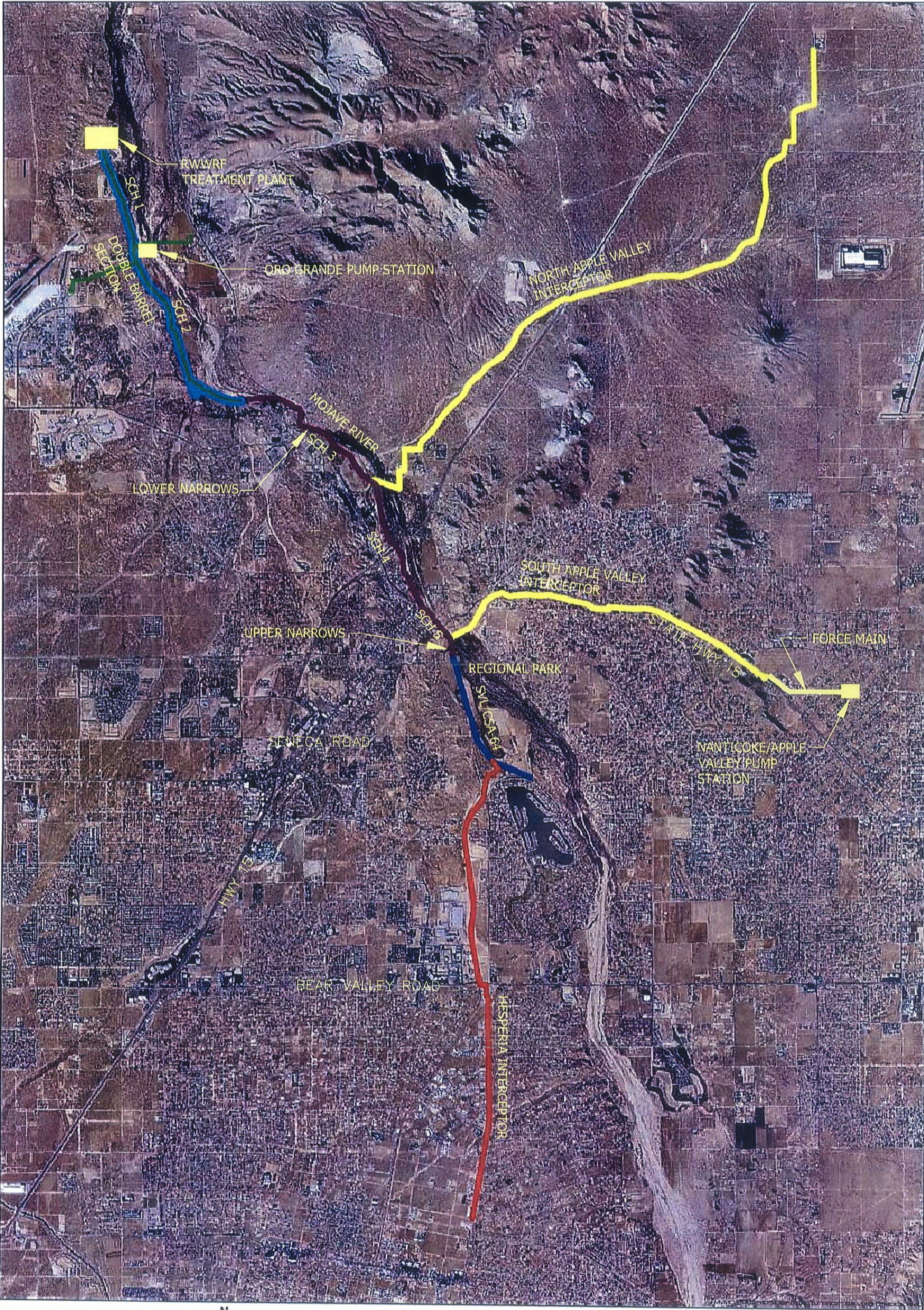
1. Install a biological treatment system that will meet the total inorganic nitrogen limits set by the RWQCB.
2. Install a UV disinfection system to eliminate disinfection byproduct (DBP) formation and TDS increase.
3. Increase tertiary filtration capacity for the entire plant flow.
4. Upgrades to sludge handling at the existing drying beds.
5. Miscellaneous structural upgrades to aging processes.
6. Install a biogas treatment system to utilize digester gas to fuel the recently installed blower engines.

1.2.5 Reclaimed Water Piping

A portion of the flow from the RWWRF is treated to Title 22 unrestricted use standards for irrigation of the Westwinds golf course located near the treatment facility. Over 20,000 lineal feet of 12-inch diameter PVC recycled water pipeline was constructed along Shay Road from the RWWRF to the golf course to convey the recycled water for irrigation use. The recycled water pipeline began delivering water to Westwinds in 2005. VVWRA owns and operates the portion of the line from the recycled water pump station to their property boundary.

The composite of the existing facilities described above are depicted on Figure 1-2.

VVWRA Interceptor



Legend

- Hesperia
- Victor Valley Schedule 1 & 2
- Victor Valley Schedule 1 & 2R
- Victor Valley Schedule 3, 4, & 5
- Apple Valley
- Spring Valley Lake
- PUMP STATION

FIGURE 1-2 EXISTING VVWRA FACILITIES



1.3 VVWRA STRATEGIC PLAN

This SMP will supplement the VVWRA Strategic Plan. The VVWRA Strategic Plan was developed to address both wastewater and potable water needs in the Service Area as population increases. Current and anticipated future regulatory requirements factored into the development of the Strategic Plan.

In 2007, HDR was hired by VVWRA to serve as Program Manager for the JPA. A Management Committee was then formed to reassess and update the VVWRA Strategic Plan. The Management Committee included the City Managers from Hesperia, Victorville, Apple Valley, County of San Bernardino Special District Manager, the VVWRA General Manager and HDR.

The recommendations of the Management Committee are reflected in the VVWRA Capital Improvements Plan (CIP), originally adopted by the VVWRA Board in November 2007 and last updated in April 2009. The latest version of the VVWRA CIP, Version 5C, is shown in Figure 1-3. The CIP establishes the following primary strategic decisions:

1. The RWWRF will be upgraded to produce additional recycled water for use at the Victorville Two Power Plant (3.6 mgd peak flow) and the High Desert Power Plant (1.0 mgd peak flow).
2. The RWWRF will be upgraded with nitrogen removal and disinfection systems that will meet regulations of the Lahontan Regional Water Quality Control Board (RWQCB), as reflected in the VVWRA NPDES permit and Waste Discharge Requirements.
3. The Hesperia Regional Water Reclamation Plant (HWRP) will be constructed with an initial average treatment capacity of 1.0 mgd, and readily expandable to 2.0 mgd. Recycled water will be delivered through a new distribution system to Hesperia customers. Waste solids from this new facility are currently planned for discharge to the VVWRA Interceptor.

VVWRA CAPITAL BUDGET - VERSION 5C

Figure 1-3

Project Code	Project	Months	Start	Finish	Proposed Projects Total Cost Estimate	Potential Projects Total Cost Estimate	Fiscal Year 08/09	Fiscal Year 09/10	Fiscal Year 10/11	Fiscal Year 11/12	Fiscal Year 12/13	Fiscal Year 13/14
WATER RECLAMATION PLANTS												
Westside WRP Phase III (14 MGD IFAS)												
C100	*CRITICAL PATH ITEMS* Phase IIIA		TBD	TBD				16,020,000	3,511,000			
C100	(Renegotiate) Westside WRP Design Phase III		Apr-09	Nov-09	10,692,700		558,976	2,000,000	4,000,000			
	Construction of Phase IIIB (14 mgd IFAS)	18	Dec-09	Dec-11	52,589,186				10,000,000	10,000,000	10,000,000	
Phase III Expense Breakdown												
<u>Regulatory Compliance</u>		Cost for 14 mgd IFAS 2009 Dollars										
C100	Civil Site	1,860,000										
C100	(IFAS) Integrated Fixed-Film Act Sludge Installation	11,800,000										
C100	Filtration	1,900,000										
C100	Ultraviolet (UV) Disinfection	11,100,000										
C100	Electrical Service and Backup Power	1,480,000										
C100	Plant Utility Water System	1,464,000										
C100	Digester Gas Treatment	1,800,000										
C100	Sludge Dewatering	6,970,000										
C100	Emergency Storage Pond Lining	1,100,000										
C100	Secondary Effluent Pump Station Modifications	210,000										
	SUBTOTAL	39,684,000										
	Subtotal Capital Fees	4,251,857										
	Subtotal User Fees	35,432,143										
<u>Repairs & Replacements</u>												
R&R	Laboratory/Administration Building	879,000										
R&R	Primary Clarifiers	3,352,000										
R&R	Aeration Bays	500,000										
C100	Digester Upgrades	2,658,000										
C100	Grease Receiving Station	1,055,000										
C100	Waste Activated Solids (WAS) Thickening	1,405,000										
	SUBTOTAL	9,849,000										
	Subtotal Capital Fees	1,990,321										
	Subtotal User Fees	7,858,679										
<u>Victorville Two Power Plant</u>												
NA	Recycled Water Pumping	0										
	Subtotal Capital fees	0										
	SUBTOTAL	49,533,000										
	Capital Fees	6,242,179										
	User Fees	43,290,821										
TOTAL						63,281,886	1,343,000	558,976	18,020,000	17,511,000	10,000,000	10,000,000
Capital Fees						6,627,321		240,360	7,748,600	7,529,730	4,300,000	4,300,000
User Fees						56,654,565		318,616	10,271,400	9,981,270	5,700,000	5,700,000

VVWRA CAPITAL BUDGET - VERSION 5C

Figure 1-3

Project Code	Project	Months	Start	Finish	Proposed Projects Total Cost Estimate	Potential Projects Total Cost Estimate	Fiscal Year 08/09	Fiscal Year 09/10	Fiscal Year 10/11	Fiscal Year 11/12	Fiscal Year 12/13	Fiscal Year 13/14
Hesperia WRP-1, Force Main (2 miles) & Pump Station (2 MGD, 1 MGD MBR)												
C101	Engineering/Environ/Regulatory Hesperia WRP-1	12	Jan-10	Dec-10	1,699,405			1,699,405				
C101	Construct Hesperia WRP-1	21	Jan-11	Sep-12	39,461,770				10,798,870	28,662,900		
C102	Construct Hesperia WRP-1 Pump Station/Force Main	21	Jan-11	Sep-12	14,562,200				3,985,004	10,577,197		
SUBTOTAL					55,723,375		0	1,699,405	14,783,874	39,240,096	0	0
Capital Fees					55,723,375		0	1,699,405	14,783,874	39,240,096	0	0
User Fees					0		0	0	0	0	0	0
Apple Valley WRP & Gravity Interceptor (2 MGD, 1 MGD MBR)												
C103	Engineering/Environ/Regulatory Apple Valley WRP	12	Jan-10	Dec-10	1,699,405			1,699,405				
C103	Construct Apple Valley WRP	21	Jan-11	Jun-13	28,803,883				7,882,297	20,921,587		
C104	Environmental Apple Valley Trunk Line	5	Aug-09	Dec-09	30,000			30,000				
C104	Engineering Apple Valley Trunk Line	6	Feb-09	Jul-09	100,000		100,000					
C104	Construct Apple Valley Trunk Line	15	Jan-10	Mar-11	5,394,920			2,080,932	3,313,988			
C104	Demolition Nanticoke Pump Station	3	Jun-11	Aug-11	350,000					350,000		
SUBTOTAL					36,378,209		100,000	3,810,337	11,196,285	21,271,587	0	0
Capital Fees					36,378,209	0	100,000	3,810,337	11,196,285	21,271,587	0	0
User Fees					0	0	0	0	0	0	0	0
Eastside WRP & Interceptor (4 MGD, 2 MGD MBR) This project will be devoloper driven, only land acquisition and environmental will be completed												
C105	Land Acquisition for Eastside WRP	12	TBD	TBD		5,000,000						
C105	Environmental Eastside WRP	18	TBD	TBD		80,000						
C105	Engineering Eastside WRP	24	TBD	TBD		3,520,000						
C105	Construct Eastside WRP	24	TBD	TBD		35,200,000						
C106	Environmental Eastside Interceptor	18	TBD	TBD		54,900						
C106	Engineering Eastside Interceptor	12	TBD	TBD		1,000,000						
C106	Construct Eastside Interceptor	24	TBD	TBD		10,000,000						
SUBTOTAL					0	54,854,900	0	0				
Capital Fees					0	54,854,900	0	0				
User Fees					0	0	0	0				
<u>RECLAIMED WATER PROJECTS</u>												
HESPERIA Reclaimed Water Distribution System												
NA	Engineering	18	TBD	TBD		2,180,000						
NA	RW Pump Station	17	TBD	TBD		11,500,000						
NA	RW Distribution System	17	TBD	TBD		10,300,000						
Apple Valley Reclaimed Water Distribution System												
NA	Engineering	18	TBD	TBD		1,890,000						
NA	RW Pump Station	17	TBD	TBD		11,400,000						
NA	RW Distribution System	17	TBD	TBD		7,500,000						
SUBTOTAL					0	44,770,000	0	0	0			
Capital Fees					0	44,770,000	0	0	0			
User Fees					0	0	0	0	0			

VVWRA CAPITAL BUDGET - VERSION 5C

Figure 1-3

Project Code	Project	Months	Start	Finish	Proposed Projects Total Cost Estimate	Potential Projects Total Cost Estimate	Fiscal Year 08/09	Fiscal Year 09/10	Fiscal Year 10/11	Fiscal Year 11/12	Fiscal Year 12/13	Fiscal Year 13/14
INTERCEPTOR PROJECTS												
	Sewer Master Plan (Redefine Scope)	24	Dec-07	Dec-09	1,417,200		430,000	100,000				
C108				SUBTOTAL	1,417,200		430,000	100,000				
				Capital Fees	1,077,750		260,550	100,000				
				User Fees	339,450		339,450	0				
SAFARI Sewer												
C109	Engineering SAFARI Sewer	10	Mar-08	Dec-08	233,756		233,756					
C109	Construct SAFARI Sewer	12	Mar-09	Mar-10	2,772,000			2,772,000				
				SUBTOTAL	3,005,756		233,756	2,772,000				
				Capital Fees	2,705,180		210,380	2,494,800				
				User Fees	300,576		23,376	277,200				
Hesperia (HI) - Spring Valley Lake Interceptor (SVL)												
C110	Environmental (split between HI and SVLI)	9	Oct-09	Jun-10	140,000			140,000				
C111	Easement Acquisition	9	Oct-09	Jun-10	300,000				300,000			
C110	HI Engineering	8	Feb-09	Sep-09	50,000		50,000					
C110	HI Construction	12	Jul-10	Sep-11	2,472,667				1,826,329	646,338		
C111	SVL Engineering	8	Feb-09	Sep-09	50,000		50,000					
C111	SVL Construction	12	Jul-10	Sep-11	1,960,220				1,447,832	512,388		
				SUBTOTAL	4,972,887		100,000	140,000	3,574,161	1,158,726		
				Capital Fees	4,454,966		89,000	124,600	3,181,003	1,031,266		
				User Fees	517,921		11,000	15,400	393,158	127,460		
Other Capital - Repair and Replacement Projects												
C100	Miscellaneous Projects	12	Jul-08	Jun-09	471,000			471,000				
TBD	Construction Inspectors	72	Apr-09	Apr-15	990,836			158,112	263,520	284,602	284,602	
C113	Apple Valley Manhole/Interceptor Rehabilitation	18	2009	2010	400,000			200,000	200,000	200,000		
				SUBTOTAL	1,861,836			829,112	463,520	484,602	284,602	0
				Capital Fees	1,143,127			318,584	397,640	413,452	213,452	0
				User Fees	718,709			510,528	65,880	71,151	71,151	0
				Proposed Projects Total Cost Estimate	166,641,149	Potential Projects Total Cost Estimate	100,967,900					
				TOTAL			1,422,732	27,370,854	47,528,840	72,155,011	10,284,602	0
				Capital Fees	108,109,928	NA	900,290	16,296,326	37,088,532	66,256,400	4,513,452	0
				User Fees	58,531,221	NA	692,442	11,074,528	10,440,308	5,898,610	5,771,151	0



4. The Apple Valley Regional Water Reclamation Plant (AVWRP) will be constructed with an initial average treatment capacity of 1.0 mgd, and readily expandable to 2.0 mgd. Recycled water will be delivered through a new distribution system to Apple Valley customers. Waste solids from this new facility are currently planned for discharge to the VVWRA Interceptor.
5. The Eastside Regional Water Reclamation Plant (EWRP) will be constructed with average treatment capacity of 4.0 mgd. Recycled water will be delivered through new distribution and storage systems to customers in the City of Victorville and Town of Apple Valley. An Eastside Interceptor must be constructed through the Upper Narrows and north to the reclamation plant site to deliver sewage to the EWRP. Waste solids from this new facility are planned for discharge to the VVWRA Interceptor. A construction schedule has not yet been established for the EWRP.

1.4 INTERCEPTOR SEWER MASTER PLAN ORGANIZATION

The VVWRA Interceptor Sewer Master Plan (SMP) has been divided into the following sections:

- Executive Summary.
- Section 1 provides the Introduction to the work completed in this SMP.
- Section 2 provides an assessment of existing conditions in the Interceptor.
- Section 3 provides a review of the historical flow monitoring data and flow monitoring conducted in support of this SMP
- Section 4 describes the methodology used to allocate existing flow and flow patterns to the Hydraulic Model
- Section 5 generates the calibrated Interceptor Hydraulic Model.
- Section 6 uses the calibrated Interceptor Model to assess Interceptor capacity.
- Section 7 provides the recommended Interceptor improvement projects to be incorporated into the CIP.