MARCH 2012

CITY OF CITRUS HEIGHTS

Neighborhoods 6 & 7 Storm Drainage Master Plan Study

WEST YOST ASSOCIATES

Neighborhoods 6 and 7
Storm Drainage Master Plan Study

Prepared for

City of Citrus Heights

March 2012

WEST YOST
ASSOCIATES
Consulting Engineers

396-00-10-01

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Executive Summary

1.0 INTRODUCTION

The City of Citrus Heights (City) incorporated in 1997 and until 2010, the storm drainage facilities that serve the City were owned by the City and maintained by the County of Sacramento. The City has now taken over full responsibility for the drainage system. The City retained West Yost Associates (West Yost) to perform a drainage study for City Neighborhoods 6 and 7. This study represents a comprehensive effort towards the development of a drainage Capital Improvement Program (CIP) for Neighborhoods 6 & 7.

1.1 Study Objectives

The main objectives of the study are as follows:

- Gain an understanding of the facilities that comprise the existing drainage system in the study area.
- Determine the flood control performance of the key elements of the existing drainage system.
- Identify local drainage and flooding problems and develop solutions to eliminate the problems.
- Develop a CIP that includes a list of the proposed drainage and flooding solutions, the associated costs, and an implementation schedule.

1.2 Study Area

Neighborhoods 6 and 7 are located in the northeastern portion of the City (see Figure ES-1). These neighborhoods are comprised of rolling terrain that drains to one of the two major creeks in the area: Cripple Creek and Mariposa Creek (see Figure ES-2). Most of the known drainage problems are located within Neighborhood 6 and the western portion of Neighborhood 7; therefore, the detailed efforts of this study were focused on those areas.

1.3 Study Approach

The general approach to the study was as follows:

- Define the Existing Storm Drainage System – The first step of the study was to gain an understanding of the existing drainage system. To do so, we collected the available information on the drainage system and performed a field inventory.
- Identify Problems – The existing drainage and flooding problems were identified by the following activities:
  - Hydraulic analyses of trunk storm drains
  - Review of service call records
  - Input from City staff
  - Input from residents

- Develop Solutions for Problem – The identified problems were evaluated and recommended solutions were developed.
- Develop a CIP – A drainage CIP was developed that includes a prioritized list of recommended improvements. The CIP also includes estimated implementation costs and an implementation schedule.

Each of the tasks listed above is described in more detail below.

2.0 EXISTING STORM DRAINAGE SYSTEM

To gain an understanding of the existing drainage system in the study area, West Yost gathered the existing available data that had already been prepared by others. We also performed a field inventory and condition assessment.

2.1 Data Collection

The data collected for this study generally fits into one of the following categories:

- Previous Studies Prepared by Others – This included a study for a road widening project on Auburn Boulevard and the Flood Insurance Study prepared by FEMA.
- As-built Design Drawings – This included a number of construction drawings for the major storm drain pipes in the study area.
- Mapping Data – This included aerial topographic mapping, aerial photographs, and Geographic Information System (GIS) based storm drain system mapping.

2.2 Field Evaluation and Condition Assessment

A field evaluation was performed to verify the locations and existence of the drainage system facilities contained in the City's GIS database and to assess the facility conditions. Observations during the field assessment revealed that the project area contains a wide variety of drainage facilities including: 1) traditional curb and gutter systems that drain to underground pipes within the public right-of-way; 2) roadside ditches with driveway culverts; 3) drainage ditches, culverts, and channels through private property; and 4) areas with no facilities at all. Examples of the types of facilities found in the study area are shown in Photos 1, 2, 3, and 4.

Field staff found that the majority of the existing drainage facilities in the study area are represented with reasonable accuracy in the City's GIS database. Some existing drainage facilities were observed that are not included in the GIS database. West Yost revised the City's GIS database to correct the observed errors and omissions. The existing drainage facilities that were observed in the field appear to be in reasonably good condition, with the exception of some collapsed culverts.

Photo 1. Roadside Ditches and Driveway Culverts – Looking West at Watson Way from Patton Avenue

Photo 2. Drainage Channel in Private Backyard – Property on Jessie Way

Photo 3. No Roadside Ditches or Driveway Culverts – Looking West Down Loleta Way

Photo 4. Curb, Gutter and Inlet – Mariposa Avenue at Cina Way

3.0 IDENTIFICATION OF PROBLEMS

Drainage and flooding problems in the study area were identified by the following activities:

- Hydraulic analyses of trunk storm drains
- Review of service call records
- Input from City staff
- Input from residents

3.1 Hydraulic Analyses of Trunk Storm Drains

Existing trunk storm drain pipes with diameters 18-inches or larger were analyzed to determine whether they have adequate capacity to carry runoff from storms (see Figure ES-2). All pipe systems were found to have adequate capacity for the pipe system design flow. However, there are two pipe systems that that lack adequate overland release path for flows in excess of the pipe capacity. The two pipe systems are labeled as SD3 and SD5 on Figure ES-2 and the associated problems are designated as Problem Locations 20 and 21, respectively.

3.2 Review of Service Call Records

City staff provided a list of service calls that document problems reported by residents during prior storm events. This list included service calls recorded primarily by Sacramento County and to a lesser extent the City. This list was reviewed and used to prepare a preliminary list of problem areas within the study area.

3.3 Input from City Staff

City staff have significant knowledge of the drainage issues in the study area based on prior discussions with residents and visual observations during storm events. West Yost met with City staff at the outset of the project to obtain input on known problem locations.

3.4 Input from Residents

A public meeting was held on January 19, 2011, to solicit input from residents on flooding and drainage problems in the area. Descriptions of potential problems were provided by the residents. A follow-up public meeting was held on July 20, 2011. At that meeting, the public was provided a status report and a description of preliminary solutions that had been developed for the problems. Some new problems were identified at that meeting.

Based on all of the activities described above, a total of 26 problem locations were identified. Figure ES-2 presents the general locations the problems.

4.0 SOLUTIONS TO PROBLEMS

Each flooding and drainage problem location was evaluated and a recommended solution identified. In many cases, the proposed solutions affect more than one problem; therefore, multiple problems were grouped together for evaluation. The problem locations and recommended solutions are shown on Figures ES-3 through ES-14. Table ES-1 provides a summary of the problem locations and the recommended solutions. In some cases, the proposed solution involves elimination of an existing roadside ditch. Figure ES-15 shows the general approach for eliminating the roadside ditches.

5.0 CAPITAL IMPROVEMENT PROGRAM

The CIP provides a prioritized list of the recommended improvements along with estimated implementation costs and an implementation schedule. The recommended improvements have been separated into three categories: high priority; medium priority; and low priority. The criteria used to define the priority of a given set of improvements are as follows:

- High Priority Improvements – The high priority improvements include those that address potential structure flooding, threats to health and safety, serious traffic hazards, and those that have a very high benefit to cost ratio. The benefit-cost ratios were determined qualitatively; formal determinations of damages and benefits were not performed.
- Medium Priority Improvements – Medium priority improvements include those that address potential flooding of lesser structures (e.g., garages, outbuildings), chronic ponding over large areas, and problems that require excessive maintenance.
- Low Priority Improvements – Low priority improvements include those that address minor or occasional ponding and nuisance drainage issues.

Table ES-1 lists the recommended projects along with the associated priority, estimated schedule for implementation, and estimated implementation cost. The estimated costs include the cost of construction as well as costs for planning, design, construction management, environmental permitting, and program management. The cost estimates are master planning level estimates suitable for decision making and budgeting purposes. More detailed cost estimates should be prepared to a greater level of accuracy as the projects advance to the design stage and more detailed information is developed. Also, the cost estimates were prepared based on the assumption that small projects will be bundled with large projects at the time of implementation to achieve better cost efficiency. The schedules for the project are based on input from City staff.

Table ES-1. Summary of Implementation Dates and Costs for Proposed Projects

Project Number	Associated Problem Locations	Solution Description	Figure Showing Proposed Improvements	Estimated Implementation Date	Total Estimated Improvements Cost, dollars
High Priority					
1	1	Linden Avenue and Auburn Boulevard diversion pipe	ES-3	2012	892,000
2	2, 3, and 11	Twin Oaks and Mariposa diversion pipe	ES-4	2014	1,196,000
3	8, 9, and 13	Watson Way 10-year pipe improvements	ES-7	2013	980,000
4	12	Poppy Way side and back yard ditch and pipe improvements	ES-9	2012	25,400
5	22	Add grate to inlet along Patton Way	ES-6	2012	3,500
Total Estimated Cost of High Priority Improvements					**3,096,900**
Medium Priority					
6	4 and 21	Side yard ditch or pipe improvements and culvert upsizing on Cedar Drive	ES-5	2012	72,000
7	5, 6, and 7	Patton Avenue and Glenn Avenue improvements	ES-6	2013	501,000
8	17	Upsize outfall pipe at Glenn Ave. and Mariposa Ave.	ES-6	2012	107,000
9	14	Canyon Oaks Drive overland release improvements	ES-10	2014	274,400
10	16	Curb and gutter on Sycamore Drive	ES-12	2012	414,800
11	18	Stem wall on Cripple Creek culvert at Sycamore Drive	ES-12	2012	26,000
12	20	Pipe improvements along Baird Way	ES-24	2015	429,400
13	24	Pipe improvements along Loleta Avenue	ES-6	2012	63,000
14	25	Drainage system improvements along Sunrise Blvd.	n/a	2012	53,000
15	26	Backyard ponding on Reno Lane	ES-7	2012	23,000
Total Estimated Cost of Medium Priority Improvements					**1,963,600**
Low Priority					
16	10	Hansen Avenue and Glen Tree Drive 10-year diversion	ES-8	TBD	TBD
17	15	Ditch clearing and grading near Fair Way	ES-11	2012	8,300
18	19	Ditch grading in lot on Twin Oaks	ES-13	2012	1,700
19	23	Ditch grading near Colony Way	ES-24	2013	12,100
Total Estimated Cost of Low Priority Improvements					**22,100**
Total Estimated Cost of All Improvements					**5,082,600**

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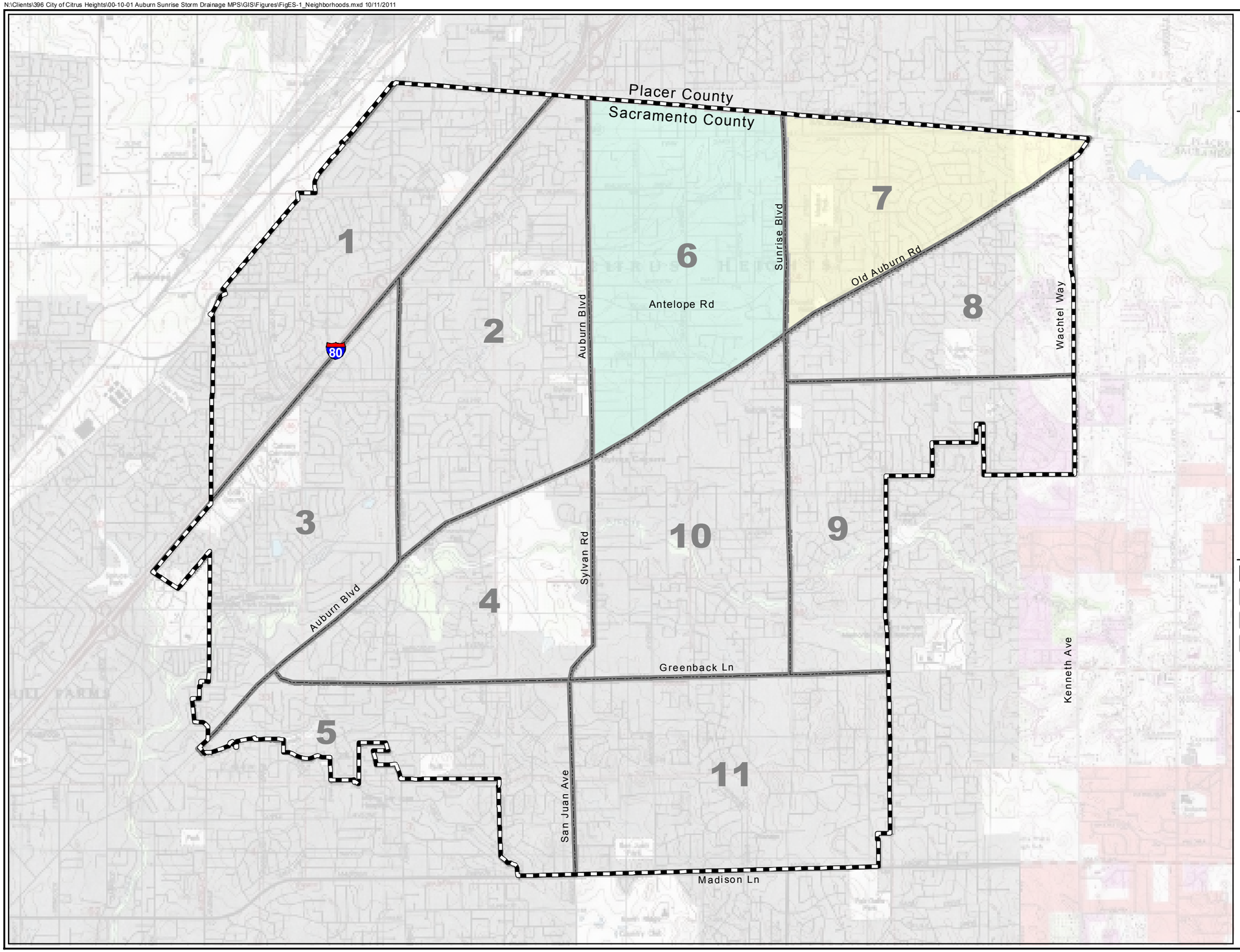
FIGURE ES-1

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

STUDY AREA



N

0 1,250 2,500

Scale in Feet

LEGEND

- City Limit
- Neighborhood 6
- Neighborhood 7
- 4 Other Neighborhoods

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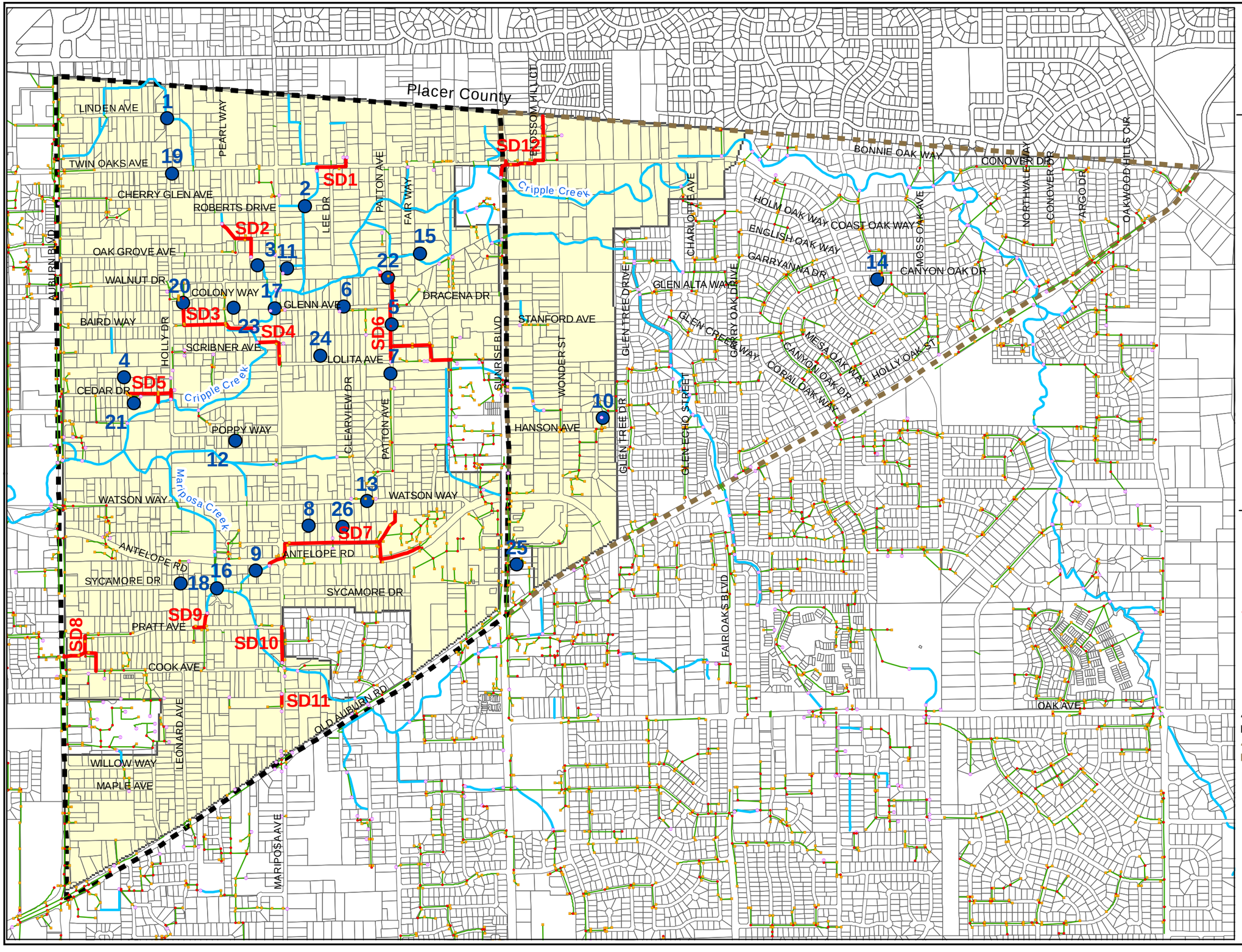
FIGURE ES-2

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

DRAINAGE FACILITIES TRUNK PIPES AND PROBLEM LOCATIONS



LEGEND

- Inlet
- Outfall
- Manhole
- Trunk Pipe with ID
- Problem Location
- Drainage Pipe
- Stream or Channel
- Neighborhood 6
- Neighborhood 7
- Detailed Study Area

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Figure ES-3

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Location 1
Proposed Solution

Placer County

Sacramento County

AUBURN BLVD

LINDEN AVE

TWIN OAKS AVE

HOLLY DR

Problem 1: Recurring Flooding Along Ditch/Pipe System

Diversion Structure: Divert Large Flows to Pipe in Linden Ave

Replace Existing Pipe in Auburn Blvd

42in RCP

24in RCP

42in RCP

18 in

21 in

24 in

12in

10 in

42in

27 in

54in

15 in

12in

24 in

18 in

10 in

12in

N

0 75 150

Scale in Feet

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAVD88)
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole
- Proposed Diversion Structure
- Proposed Pipeline
- Proposed Channel

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TWIN OAKS AVE

ROBERTS DR

WALNUT DR

JESSIE LN

LEE DR

GLENN AVE

MARIPOSA AVE

CRIPPLE CREEK

42in RCP

21in RCP

18in RCP

15in

12in

10 in

36 in

Diversion Structure: Divert Large Flows to New Pipe Along Twin Oaks Ave

Plug Pipe

Plug Pipe

Remove or Plug

Problem 2: Back Yard Ditch is Maintenance & Flooding Problem

Problem 3: Flooding along Ditch

Problem 11: Lack of Pipe and Ditch Capacity Causes Flooding

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAVD88)
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole
- Proposed Diversion Structure
- Proposed Pipeline
- Proposed Curb and Gutter
- Proposed Ditch Replacement

N

0 75 150

Scale in Feet

Figure ES-4

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Locations 2, 3, and 11
Proposed Solution

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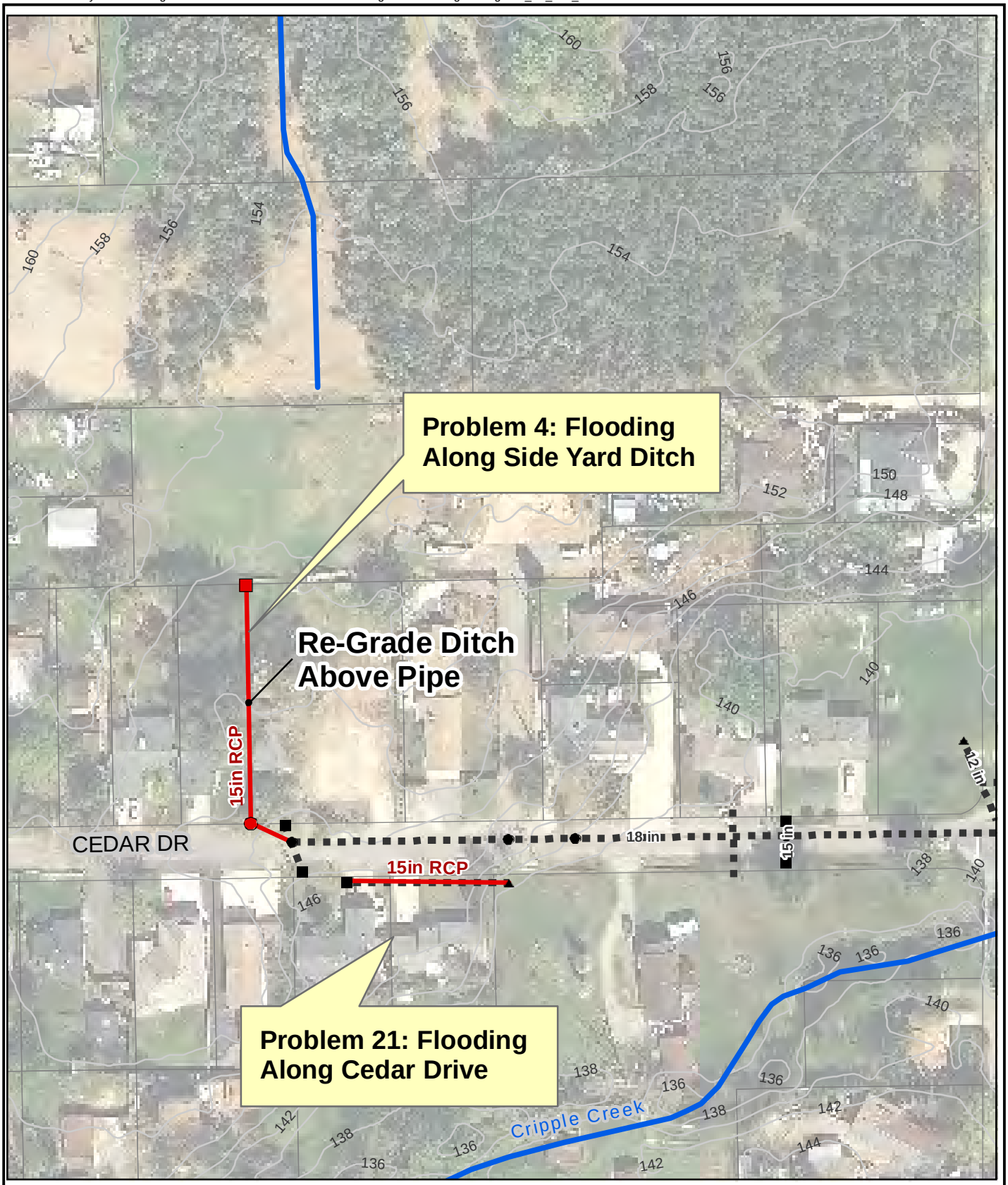

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAVD88)
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole
- Proposed Pipeline

N

0 50 100

Scale in Feet

Figure ES-5

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Locations 4 and 21
Proposed Solution

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Figure ES-6

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Locations 5, 6, 7, 17, 22 and 24 Proposed Solution

Problem 22: Unsafe Inlet

Retrofit Grate onto Inlet

Problem 6: Drainage Problems on Glenn

Problem 17: UnderSized Outfall Pipe

Problem 5: Inadequate Collection System on Patton Ave.

Problem 24: Flooding Along Loleta Ave.

Problem 7: Gap in Pipe System

Replace Pipe

Remove Pipe

Cripple Creek

GLENN AVE

LOLITA AVE

PATTON AVE

MARIPOSA AVE

SHAREEN WAY

42in

15in RCP

18in RCP

12" HDPE

12in RCP

21 in

18 in

15 in

12 in

10 in

10 in

8in

36 in

45in

N

0 75 150

Scale in Feet

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Pipeline
- Alternative Pipe Alignment
- Proposed Ditch Replacement
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole

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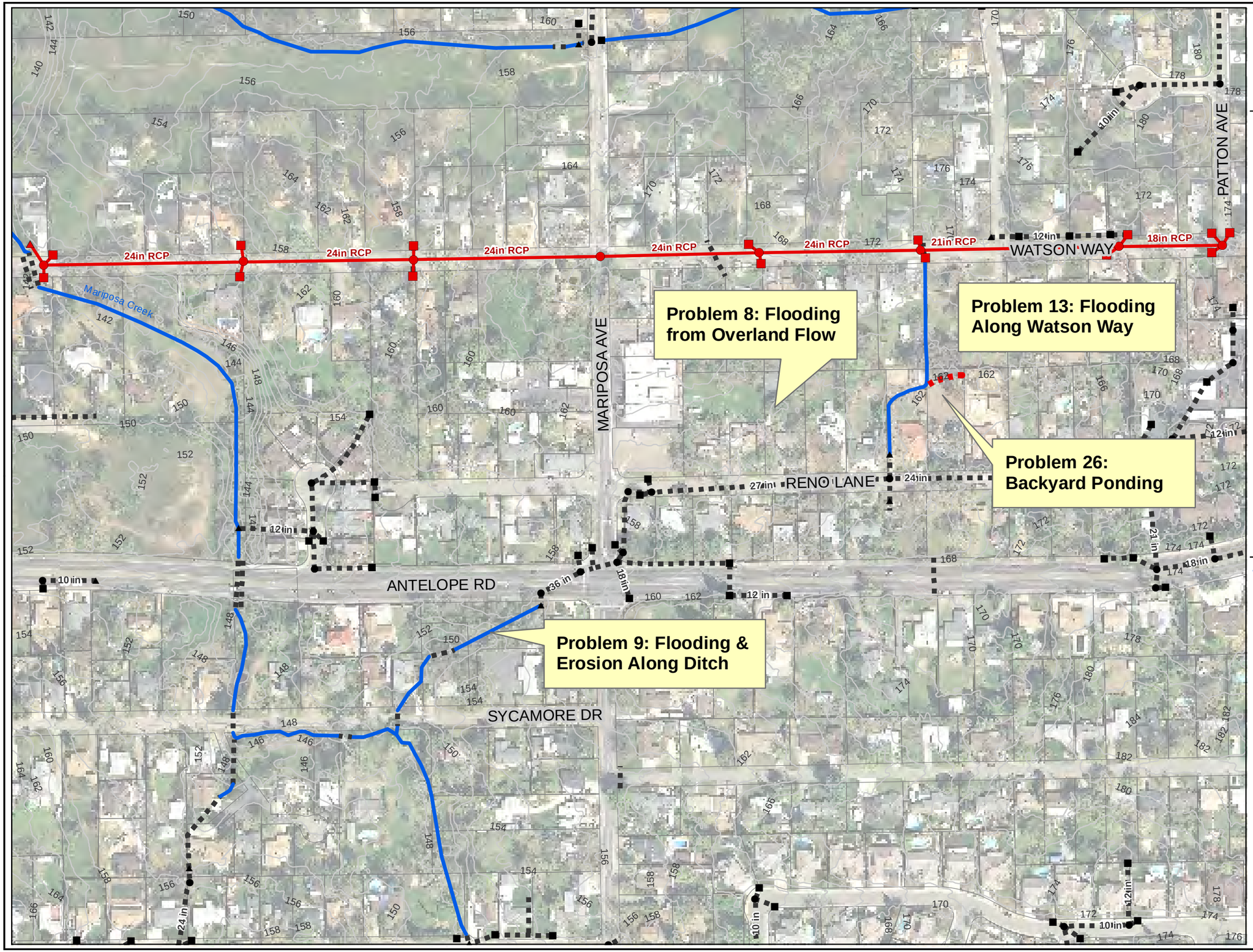
Figure ES-7

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Locations 8, 9, 13, and 26 Proposed Solution



N

0 100 200

Scale in Feet

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole
- Proposed Diversion Structure
- Proposed Pipeline
- Proposed Ditch Grading

CITY OF CITRUS HEIGHTS JANUARY 1, 1997

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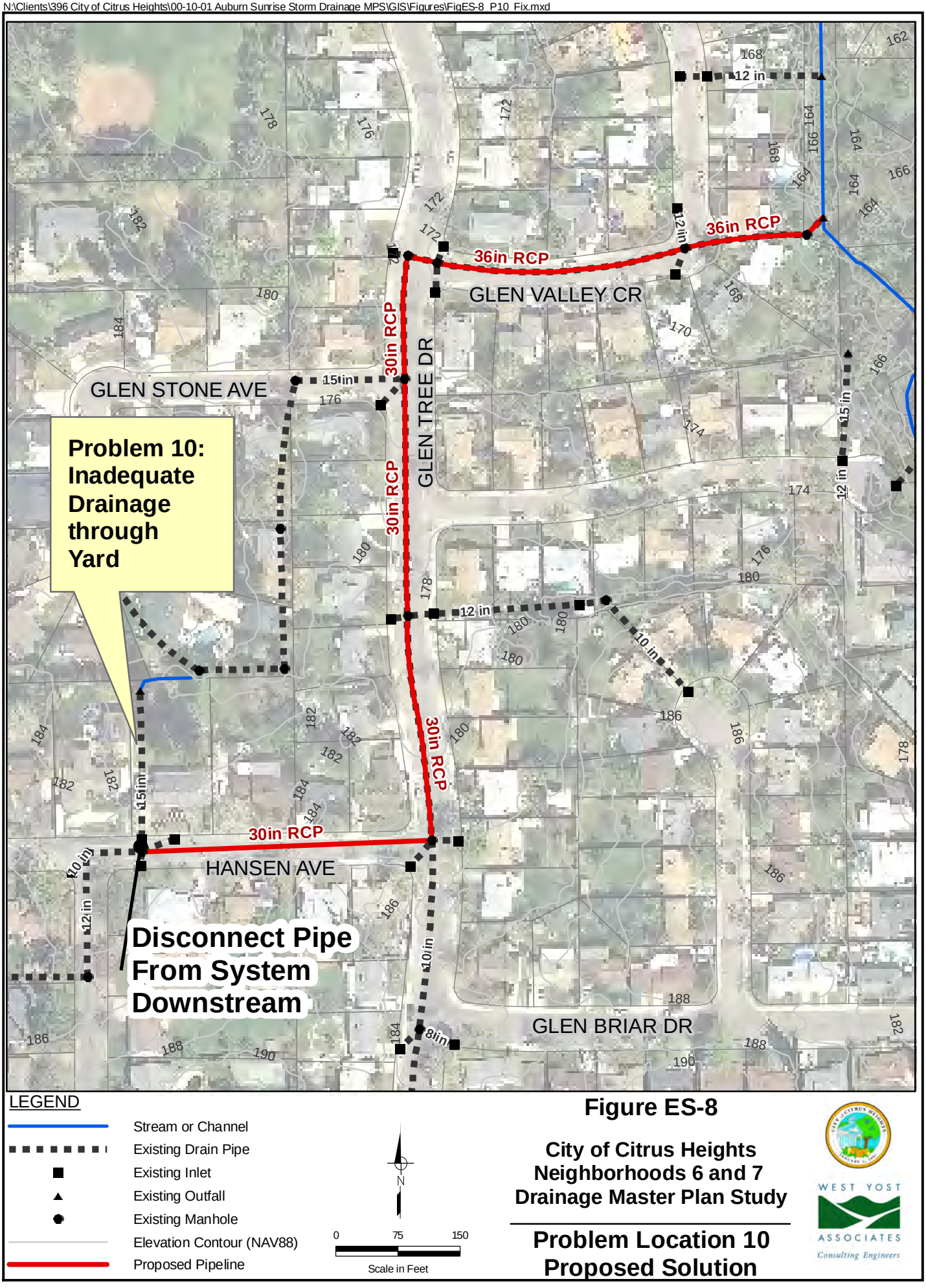

Figure ES-8

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

Problem Location 10 Proposed Solution

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LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Pipeline
- Proposed Ditch

N

0 50 100

Scale in Feet

Figure ES-9

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

Problem Location 12 Proposed Solution

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Figure ES-10

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Location 14
Proposed Solution

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LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Cleared and Re-Graded Channel
- Elevation Contour (NAV88)

N

0 50 100

Scale in Feet

Figure ES-11

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

Problem Location 15 Proposed Solution

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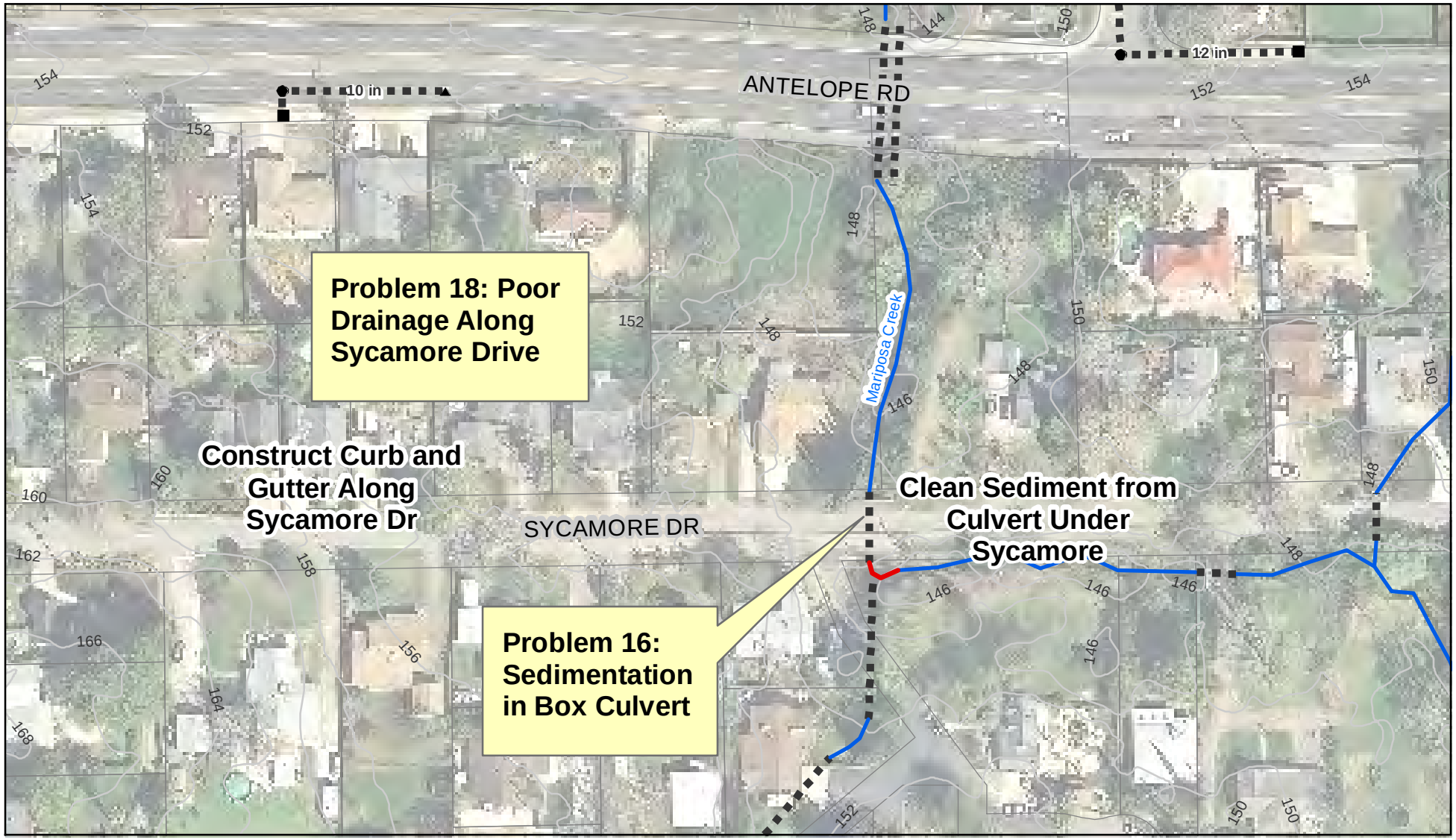

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Stem Wall

N

0 50 100

Scale in Feet

Figure ES-12

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

Problem Locations 16 and 18
Proposed Solutions

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LEGEND

- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Proposed Ditch
- Elevation Contour (NAV88)

N

0 25 50

Scale in Feet

Figure ES-13

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

Problem Location 19 and Proposed Solution

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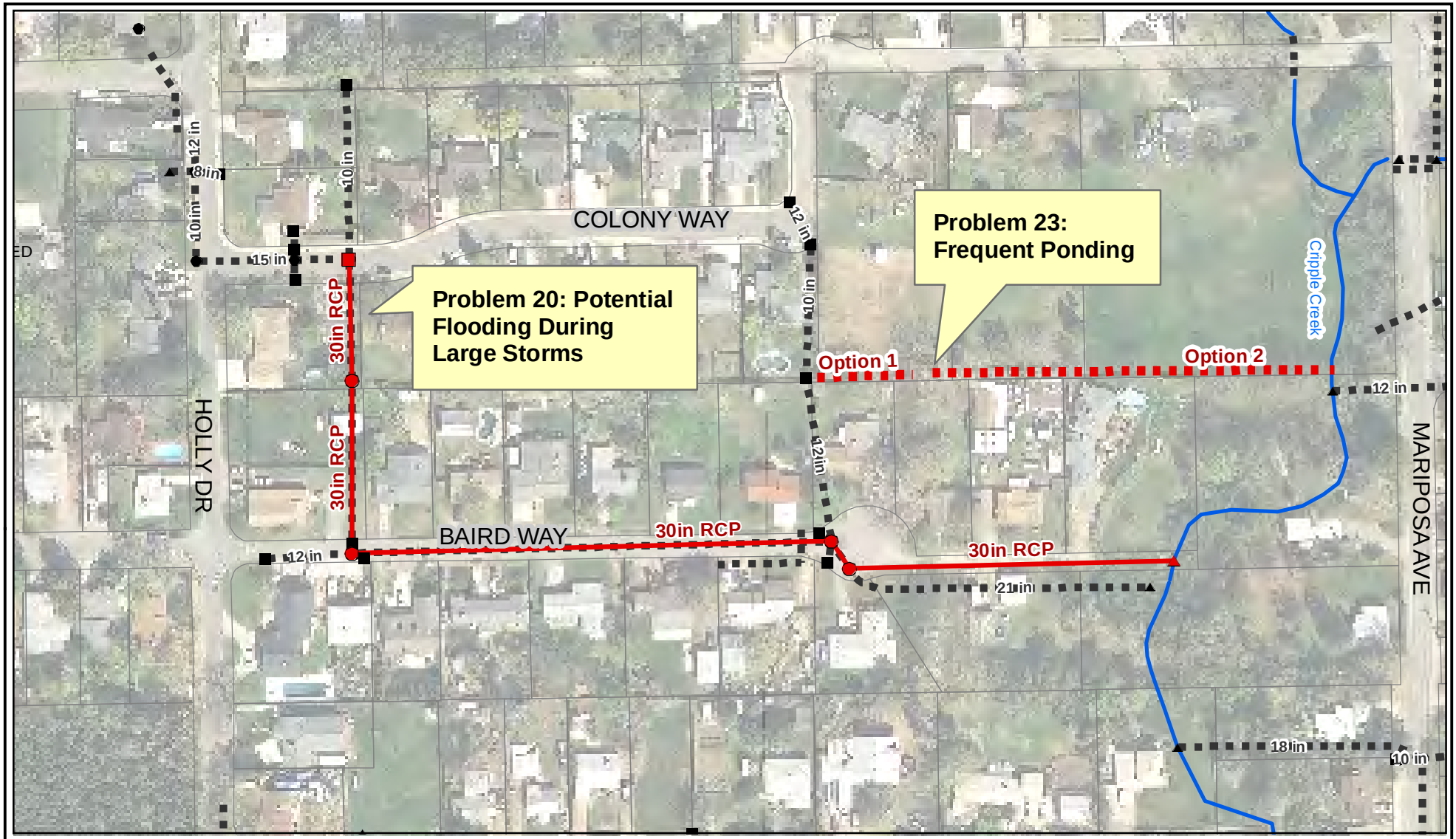

LEGEND

- Stream or Channel
- Existing Drain Pipe
- Existing Inlet
- Existing Outfall
- Existing Manhole
- Elevation Contour (NAV88)
- Proposed Pipeline
- Proposed Ditch
- Proposed Inlet
- Proposed Outfall
- Proposed Manhole

N

0 75 150

Scale in Feet

Figure ES-24

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

Problem Locations 20 and 23 Proposed Solutions

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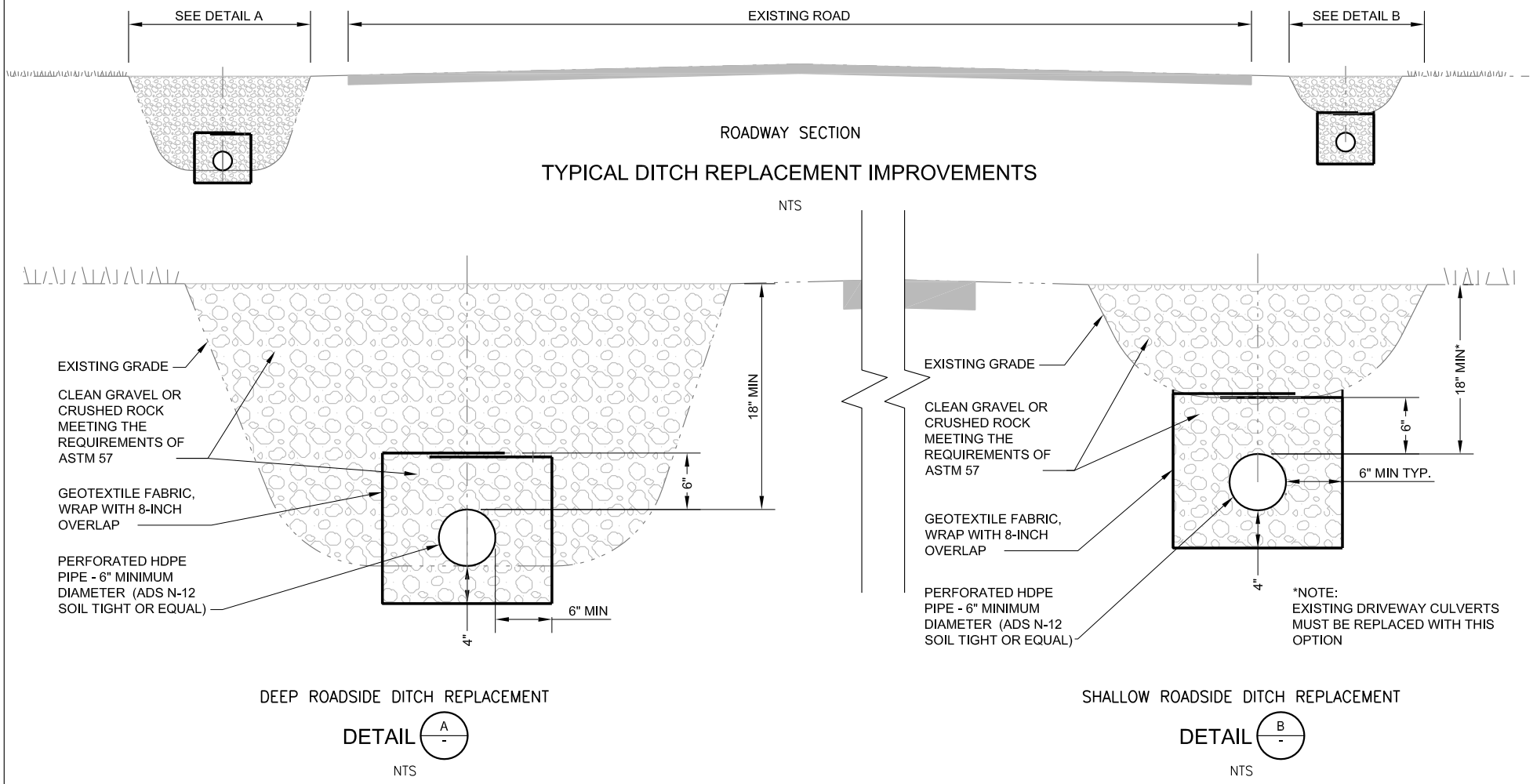

Figure ES-15

City of Citrus Heights
Neighborhoods 6 and 7 Drainage Master Plan Study
Ditch Replacement Detail

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CHAPTER 1
Introduction

The City of Citrus Heights (City) is located in northern Sacramento County just south of the Placer County line. The City incorporated in 1997 and until 2010, the storm drainage facilities that serve the City were owned by the City and maintained by the County of Sacramento. The City has now taken over responsibility for the drainage system. The City has retained West Yost Associates (West Yost) to perform a drainage study for City Neighborhoods 6 and 7. This study represents a comprehensive effort towards the development of a drainage Capital Improvement Program (CIP) for Neighborhoods 6 and 7.

1.1 STUDY OBJECTIVES

The main objectives of the study are as follows:

- Provide an inventory and condition assessment of the existing drainage system in the study area
- Assess the flood control performance of the key elements of the existing drainage system
- Recommend improvements to eliminate or reduce recurring local flooding
- Eliminate roadside ditches in some areas of the study area
- Develop a CIP to help guide the City in implementing future drainage projects

1.2 STUDY AREA

This study is focused on two of the City's 11 neighborhoods – Neighborhoods 6 and 7. As shown on Figure 1-1, Neighborhoods 6 and 7 are located in the northeastern portion of the City.

The study area is comprised of rolling terrain that drains to one of the two major creeks traversing the area: Cripple Creek and Mariposa Creek (see Figure 1-2). Cripple Creek, the larger of the two creeks, enters the study area near the east end of Neighborhood 7 and generally conveys runoff to the west before exiting the study area at Auburn Boulevard between Watson Way and Cedar Drive. Mariposa Creek enters the study area in the southern end of Neighborhood 6 and generally flows to the northwest until joining Cripple Creek approximately 800 feet upstream of Auburn Boulevard. Both creeks have the potential to overflow their banks during large storm events. The Federal Emergency Management Agency (FEMA) has prepared flood maps that show the floodplain along the two creeks. The floodplain defined by FEMA is presented on Figure 1-2. Although the two creeks present a flood threat to portions of the study area, this study was focused on local flooding issues separate from the creek flooding. The creek flooding is considered a regional flooding issue that needs to be resolved in coordination with Sacramento County. Sacramento County is currently preparing an updated flood study along the Arcade and Cripple Creek that could provide the basis for identifying and evaluating flood solutions along the creeks.

The emphasis of this study was the local drainage systems that serve the two neighborhoods. This system includes approximately 24 miles of pipes and culverts, 9 miles of streams and ditches, 400 manholes, and 700 inlets. Within most of Neighborhood 6 and the western portion of Neighborhood 7, the existing drainage pipes are not part of a well-developed underground pipe network, but are part of a non-uniform system of pipes, roadside ditches, culverts, and backyard channels. Much of this area has no curb and gutter, which contributes to the rural feeling of the area. Most of the known drainage problems are located in this portion of the study area and therefore, it was the focus of the detailed efforts of this study. Figure 1-2 presents the limits of this detailed study area. The eastern part of Neighborhood 6 and some smaller pockets within Neighborhood 7 have curb and gutter and well developed pipe systems. Generally, there are few drainage problems in these areas. However, the known problems in this area were also evaluated during this study.

1.3 STUDY APPROACH

The general approach to the study was as follows:

- A data collection effort was performed to obtain all of the available information related to the drainage systems within the study area. This included gathering previously prepared reports, floodplain studies, as-built drawings, topographic mapping, storm drainage facilities mapping, and any other relevant data. The data collection effort is described in more detail in Chapter 2.
- A drainage system inventory was performed to verify the locations and existence of the drainage system facilities contained in the City's Geographic Information System (GIS) database and to provide an assessment of the facility conditions. For this effort field crews visually inspected the drainage system from the surface and, in some cases, pulled manhole covers to view the subsurface conditions of the system. The drainage system inventory is described in more detail in Chapter 3.
- The City's drainage system GIS database was then updated to include the information developed during this study. This included updated information on the existing drainage system as determined during the field inventory and other new information developed during this study. A detailed description of the GIS database update is provided in Chapter 4.
- Hydrologic and hydraulic studies were performed to assess the capabilities of the existing drainage systems and to define recommended improvements to improve conveyance capacity. This included analyses of the existing trunk pipes in the detailed study area, an evaluation of known problem areas, and evaluation of certain roadside ditch systems. These analyses are described in Chapters 5 through 7.
- A storm drainage CIP was developed that defines the recommended improvements, provides estimated implementation costs, and presents the prioritized list of improvements. The CIP is presented in Chapter 8.

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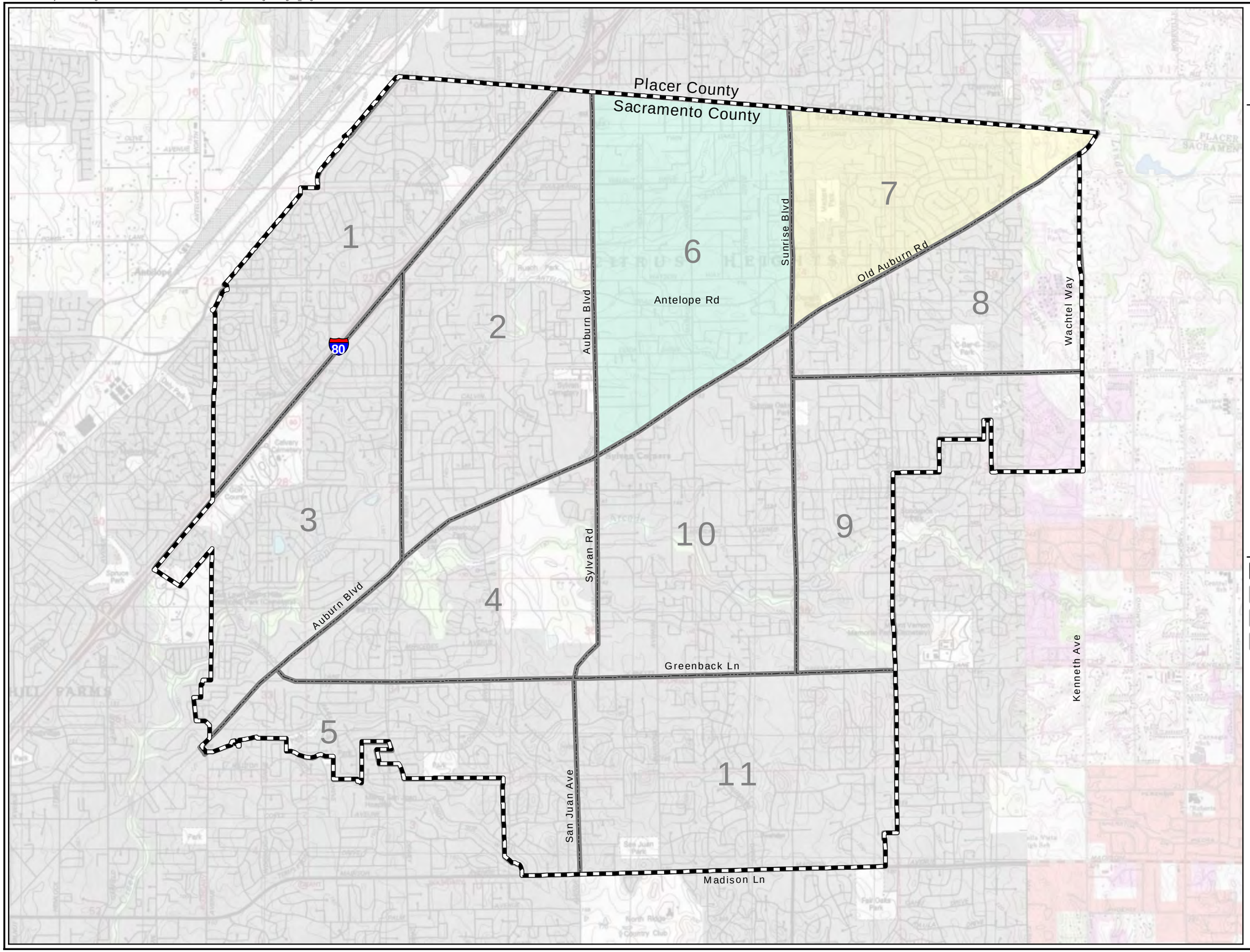
FIGURE 1-1

City of Citrus Heights Neighborhoods 6 and 7 Drainage Master Plan Study

STUDY AREA



N

0 1,250 2,500

Scale in Feet

LEGEND

- City Limit
- Neighborhood 6
- Neighborhood 7
- 4 Other Neighborhoods

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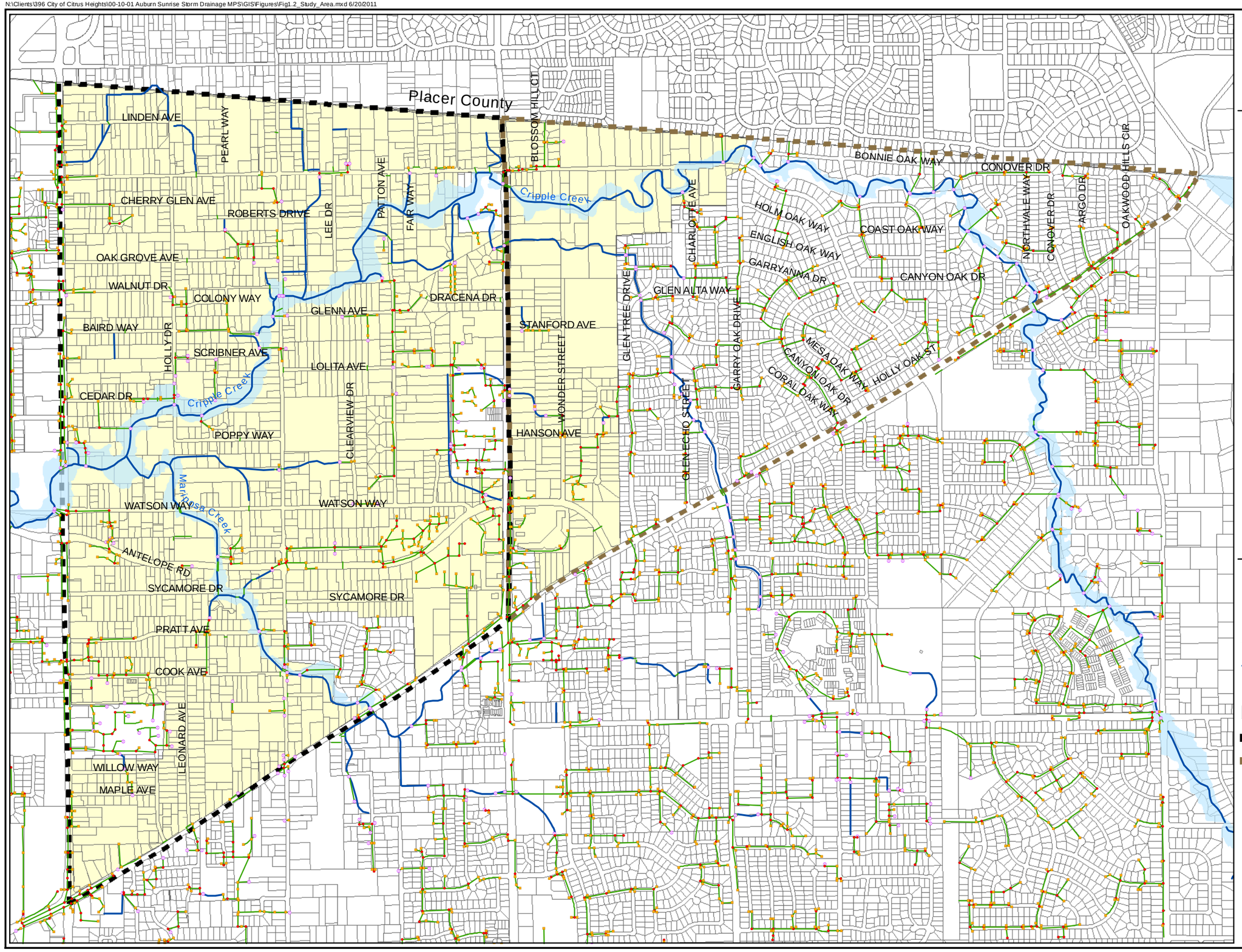
N:\Clients\396 City of Citrus Heights\00-10-01 Auburn Sunrise Storm Drainage MPS\GIS\Figures\Fig1.2_Study_Area.mxd 6/20/2011

FIGURE 1-2

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

STUDY AREA AND EXISTING DRAINAGE FACILITIES



0 550 1,100
Scale in Feet

LEGEND

- Inlet
- Outfall
- Manhole
- Drainage Pipe
- Stream or Channel
- FEMA Flood Zone
- Detailed Study Area
- Neighborhood 6
- Neighborhood 7

CITY OF CITRUS HEIGHTS
JANUARY 1, 1997

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CHAPTER 2
Data Collection

This chapter presents a summary of the data collected for use in the Master Drainage Study for Neighborhoods 6 and 7. The data generally fits into one of five categories as follows:

- Previous Studies Prepared by Others
- As-built Design Drawings
- Mapping Data
- Field Evaluations Performed by West Yost Staff
- Service Calls and Public Input

For each category, the specific data collected is described below.

2.1 PREVIOUS STUDIES PREPARED BY OTHERS

Some previous studies relevant to this Master Drainage Study have been prepared by others. To the extent appropriate, some of the previous information has been used during this study. The sources of this information are summarized below:

- Draft Roadway Drainage Report for Auburn Boulevard Widening Project, October 2008 – This study prepared by Mark Thomas & Company evaluated the storm drainage facilities along Auburn Boulevard between the Sylvan Road intersection and Rusch Park. This report was used to define the hydraulic conditions and the downstream end of storm drain systems in the study area that connect to the existing facilities in Auburn Boulevard.
- Flood Insurance Study, Sacramento County, California, December 2008 – This flood study prepared by the FEMA defines the flood risk within Sacramento County, including the two major waterways that pass through the study area: Cripple Creek and Mariposa Creek. The flood study includes floodplain maps that present the limits of the 100-year and 500-year floodplains; and flood profiles for the 10-year, 50-year, 100-year, and 500-year storm events. Although this flood insurance study was published in 2008, the date on the floodplain maps within the study area is 1998. For this study, the FEMA data was used to establish the downstream water surface elevations for the hydraulic analysis of storm drain systems that discharge to the creeks.

  FEMA is currently in the process of updating the flood insurance study for Sacramento County. A draft revised floodplain study was published in January 2011. This revised study is expected to be adopted in early 2012. Within the study area, the floodplain depths and limits on the revised floodplain maps are unchanged from those included with the 2008 Flood Insurance Study. The most significant change on the new floodplain maps is that the reference datum for the flood elevations is changed from National Geodetic Vertical Datum of 1929 to the North American Vertical Datum of 1988 (NAVD88). For this study of Neighborhoods 6 and 7, all elevations are based on NAVD88, therefore, the water surface elevations in the creek are based on the information published in the 2011 draft floodplain study. Table 2-1 provides a listing of the FEMA floodplain map numbers and flood profile numbers that cover the study area.

Table 2-1. FEMA Floodplain Data for Study Area		
Item	Map or Profile Numbers from 2008 Flood Insurance Study	Map or Profile Numbers from Draft 2011 Flood Insurance Study
Floodplain Maps	0602620085E, 0602620105E	06067C0081H, 06067C0082H, 06067C0083H, 06067C0084H, 06067C0082H, 06067C0103H
Flood Profiles	24P, 25P, 55P	47P, 48P, 49P, 95P

2.2 AS-BUILT DESIGN DRAWINGS

As-built plans were gathered from Sacramento County archives and were used to help define the sizes, lengths, slopes and invert elevations of the trunk storm drain pipes within the study area. Table 2-2 provides a list of the drawings that were gathered and the name of the associated storm drain system. The locations of the storm drain systems with as-built data referenced in the table (e.g. SD1, SD2, etc.) are shown on Figure 2-1. For some trunk drains, there was no as-built data available. In other cases, the as-built data provided information on only a part of the trunk drain. For those systems, additional information was gathered in the field as briefly described below and as described in detail in Chapter 3.

Table 2-2. List of Trunk Storm Drains and Associated As-Built Plans	
Storm Drain ID	Associated As-Built Plan Set
SD1	Lee Ranch Estates (7750, 7760, 7770 Twin Oaks Ave)
SD2	Malinda Estates, Oak Grove Estates
SD3	Colonial Acres No. 5
SD4	None
SD5	None
SD6	8040 Patton Avenue, Sunrise Commons, Sunrise Commons South
SD7	None
SD8	7518 Pratt Ave.
SD9	None
SD10	Heather Downs
SD11	7419 Mariposa Avenue
SD12	Heather Estates

2.3 MAPPING DATA

Mapping data used for the study include aerial topographic mapping, aerial orthophotos, and GIS based storm drain system mapping. These items are described below.

- Aerial Topographic Mapping – LiDAR topographic mapping prepared for Sacramento County in 2004 was used to define watershed boundaries and general drainage patterns. This topographic data is based on the North American Vertical Datum of 1988. The coordinate system for the topographic mapping is the California State Plane Zone II NAD83.
- Aerial Orthophotos – The aerial photographs used for this study were created in 2008 for the State of California Central Valley Flood Plain Evaluation and Delineation project. The coordinate system for the aerial photos is UTM Zone 10, NAD83.
- Storm Drainage Facility Maps – The City provided storm drainage facility mapping in GIS format. This mapping provides approximate locations of drainage pipes, manholes, inlets, outlets, streams, and other storm drainage facilities as well as pipe size data. The information is based on the County's CAD based storm drainage facilities maps and is considered approximate.

2.4 FIELD EVALUATIONS

West Yost performed field evaluations to verify the existence of an approximate horizontal location of the facilities included in the City's GIS storm drainage facility mapping, to confirm that the information included on as-built plans is reasonably accurate, to fill in data gaps on important facilities, and to gain a general understanding of the drainage patterns in the study area. A detailed description of the field evaluation approach and findings is provided in Chapter 3.

2.5 SERVICE CALLS AND PUBLIC INPUT

City staff provided a list of service calls that document problems reported by residents during prior storm events. This list included service calls recorded primarily by Sacramento County and to a lesser extent the City. This list was reviewed and used to prepare a preliminary list of problem areas within the study area.

To further assist with defining potential problem areas, a public meeting was held on January 19, 2011. This meeting was well attended by residents within the study area and descriptions of potential problem areas were provided by the residents both verbally and in writing. City staff prepared a summary table that provides descriptions of each problem, the location of the problem, the name and address of the resident that reported the problem, and a problem category (i.e. flooding, drainage system, maintenance). This summary table is provided as Table 2-3. For this report, the names, addresses and phone numbers have been removed from the table. Each problem was assigned a Workshop Item No., which is simply the order the problem was recorded in the workshop. They were also given an Assigned Problem No. for the Master Plan, which corresponds to the problem identification number that is used later in this report (see Chapter 7). In some cases, problem identification numbers were not assigned to a reported problem because the problem was simply a maintenance issue to be addressed by City staff. Although these problems were not evaluated with the master plan study, City staff is addressing them separate from the study. In other cases, the problems were related to flooding along one the major creeks. Creek flooding issues are not being addressed by this study, but may be considered at a future time after the County of Sacramento completes an updated hydrologic and hydraulic study for the Arcade Creek watershed.

Table 2-3. City of Citrus Heights - Neighborhoods 6 & 7 Drainage Master Plan Study
Citizen Feedback
Public Workshops - January 19, 2011 and July 20, 2011

Workshop Item No.	Assigned Problem No. for Master Plan Study	First	Last	Address 1	Address 2	Phone Number	Citizen Comments (Edited)	Category (D, F, CC)	City Notes
1-1	n/a, creek maintenance						Concerned about Cripple Creek not being cleaned properly.	CC	Completed by SRCC.
1-2	14						Water is constantly present on driveways and sidewalks. Also, the grounds of my house and neighbors are always saturated. I'm referring to front and backyard, front sidewalk and driveway. During moderate to heavy rain, the gutters in the street flood approximately 5'-8' from the sidewalk. The heavy rains of 1995 caused flooding of my garage, and had standing water for several days. Lastly, digging fence post holes this year and leaving it unoccupied over the night, there was 4" of water in the post hole the next day.	D	Upsizing inlets and laterals may help. Issue with water table needs further research.
1-3	15						Originally this was a County ditch crossing the property and cleaned by the Youth Corp. Occasionally, they come but leave the weeds and branches along the ditch. Debris in the ditch is building up and it needs a thorough cleaning and refuse picked up. This ditch lies within an easement; drainage easement as documented on map.		
1-4	n/a, creek maintenance						Property floods from Cripple Creek. House is elevated nearly 3'. One room has a cement slab and is surrounded by cinder blocks to keep out as much water as possible. The creek has many oak trees, berry bushes. Open field adjacent to property is overgrown with bushes and trees. Wants creeks cleaned more frequently.	F, CC	Property is in the floodplain. Owner is aware about the floodplain issues. Would like creek to be maintained better.
1-5	n/a						Uphill neighbor paved most of property. No drain line or ditch on Ellen – private road. During large rain event water runs off neighbor's property down over our driveway and builds up at base of our house. Since only one house is flooded we are not covered by flood insurance. What is the City's jurisdiction on private roads? Does City have the right to come onto easement private road/property to put in drainage help? There was a lot of discussion about alternatives to drainage lines and ditches. In some areas you should consider swales that hold water in areas where flooding won't be a problem to allow water to infiltrate into soil. This reduces runoff and improves water quality. Neighborhood in Seattle areas are making this change to reduce flooding, and improve water quality. As a licensed pesticide applicator; knowing pesticide safety issues, I would oppose the use of herbicides to clear banks.	D	PRIVATE ROAD. Property owner has placed small asphalt burms to guide flow. Possible solutions may include redirecting flow to field behind house. Boundary dispute with neighbor to the south ongoing.
1-6	n/a, creek maintenance						Localized storm water runoff flooding ideas: Clear Channel (using SRCC), re-channel using concrete lining, re-routing, increasing size. Increasing capacity/volume/rate of systems. Affects at least 4 to 8 homes in this area.	CC	SRCC to clean creek/ditch immediately.
1-7	10						Problem of street flooding at intersection of Hanson and Charlene. Large parking lot at Antelope Road and Christian Fellowship drains rapidly to this intersection. New large pipe was installed about 15 years ago. The drain pipe continues from this intersection through an easement on the west side of our property and empties out north of our property. This drain pipe is old, was not replaced and is likely a smaller diameter. Heavy rain cells about 30-minutes usually cause a backup of water into the intersection. Also our pipes struggle to keep with the heavy rains. The street flooding can overflow onto our property causing flooding of our garage and also floods the west end on the surface above the drain pipe. In the worst scenarios the flooding will also extend over the backyard, from the west side moving eastward. On a few occasions our home itself has come under threat of flooding. Fortunately, to this point, we've been lucky!	D	
1-8	16						Would love to see the roadside ditch shown on the map actually on Sycamore. Can the runoff from neighbor's be diverted so that it does not come onto my property? Creek erosion is occurring at Sycamore. Creek backs up from bridge and Leineke and Sycamore. Not a cul-de-sac. My private parking area.	F	Bridge alignment causes water to backup and reduce flow. Properties are flooding as a result of the lost capacity.
1-9	1						Downhill flooding into houses at 7544 & 7550 Linden. Flooding from the south also from a mound in downstream from 7536 Linden Avenue. Water flows down hill on street over culvert on street and needs to flow into culvert – not over it and into 7544 and 7550 houses. Along south side of street a narrow ditch is needed. In stream hump is causing back up into 7544 and 7550 from the south. The hump is about 2'-3' high at extended about 15' of filled in stream. You can come though my property. We can open up a fence at the south of my property. But manpower would be best as a shovel-machine would have to come from Twin Oaks.	D, CC	The ditch needs to be clean. SRCC to cleaned a.s.a.p. Ditch crosses multiple properties and culverts. Problem is related to 7553 Linden.
1-10	11						The only problem we have is that the pipe of the creek in my backyard is not letting the water flow right. So when it rains a lot, the water level goes up to the point that it almost gets into my house so cleaning that pipe would be great.	D	Pipe is very flat and may be blocked. Pipe could be extended or modified. Problem is at Jessie Ave.

Table 2-3. City of Citrus Heights - Neighborhoods 6 & 7 Drainage Master Plan Study
Citizen Feedback
Public Workshops - January 19, 2011 and July 20, 2011

Workshop Item No.	Assigned Problem No. for Master Plan Study	First	Last	Address 1	Address 2	Phone Number	Citizen Comments (Edited)	Category (D, F, CC)	City Notes
1-11	n/a, maintenance issue						Creek on backside of our yard is full of debris, i.e. dead fallen trees, brush, garbage, etc. We have noticed it is starting to back up drainage. Since we recently moved into this house, who will come and clean out the creek before it backs up as the trees are too big for us to remove ourselves?	CC	Completed by SRCC.
1-12	17						Two drain pipes; 1- 15"x20" and one 12". When we get a heavy rain the smaller pipe cannot handle the flow and the ground is eroding around the pipe. The drain pipes are on Glenn Ave.	D	Pipe is undersized. Pipe is 12" and all upstream pipes are 18". Pipe outlets at the creek near the location of the Mariposa CBR project.
1-13	n/a, maintenance issue						Drain easement on my property drains to Cripple Creek for over 38 years. My property is approximately 50' from creek. The storm drain was recently filled, causing drain "storm water" to back up onto my property, not going into the creek. Drain was maintained by the County – past 10-years. I have cleaned/maintained the drain across my property.	D	8292 Lee Drive owner is blocking the drainage ditch and causing flooding upstream.
1-14	12						Ditch between PL is full of debris. Water overflows into his property. Drains to his backyard. Property behind regraded causing water to create a problem. Drainage easement exists.	D	The drainage pipe outlets at the ditch between the properties. Ditch is very small and can't handle the flow. A portion of the ditch runs in his yard. Easement exists along property lines.
1-15	18						Flooded in front entry. Also floods into her backyard and into her pool		
1-16	1						Drainage trouble is on Linden Avenue to Placer County Line.	D	The ditch needs maintenance but runs into Placer County. Possible solution could be to run pipe on Linden towards Auburn and connect to system.
1-17	n/a, creek flooding issue						Need to dredge Cripple Creek from Fair Way (West) so Cripple Creek will no longer jump its banks and threaten Jurgen Lane Bridge and Fair Way Bridge. Parts of a creek showing on the map do not exist. Please correct the map. Check both directions from the Catalpa cul-de-sac to get exact location of creek shown. Surface trenches were dug to prevent flooding onto Catalpa. Vernal pools have been filled that used to leach and evaporate rain water. Dredge and clean out creeks before anymore runoff is allowed into those creeks. Also the environmental friendly collection pools that run off slowly into the creeks after a major rain as described by Kevin Becker sounds like an excellent plan. However, please purchase the land from the owners first. Don't just flood it. Or have a flood collection for each new development planned.		
1-18'	13						Major problems every year. Was sick and would like a call from Cesar to discuss his concerns. Call cell number.	F	Met with resident onsite. He said that the problem is the culverts, because they get full and lose capacity. The result is flooding that begins at the corner of Patton and Watson.
1-19	13						Homebound. Front door faces Patton. She has to sandbag her front door to prevent flooding.	F	Met with resident, she has been in the area for over 50 years. She mentioned that Patton only has ditch on one side and it used to have ditches on both sides. She believes that the ditch gets blocked and therefore floods easily. Pipes don't seem to be able to handle all the flow.
1-20	13						Open ditch drains Clear View & Watson through a 12" CMP under Watson, open ditch runs along property line to rear of property. Ditch drains into open ponds between Reno and Watson. Some ponds have been filled in affecting drainage. Mosquitoes are another issue due to ponding water.		
1-21	13						Water rushes down Watson Way and comes across our driveway. Occasionally floods our pool. We usually sand bag our side gate to keep it from entering the pool. The water floods our neighbor to the west every year, both his garage and work shop.		
1-22	13						Ditch on north side of property filled in by neighbor. His house and shop flood.	F	
1-23	13						Drain between 7767 and 7771 floods. Ditch in front of house and pipe is damaged and broken. Water backs up and floods. County videoed the pipe and said it needs repair.	F	
1-24	1						Ditch behind our house (on county property) was filled by home owner and is blocking the flow. Contacted the county but was told that it wasn't a priority.	D, CC	Ditch needs to be restored. The buried portion of the ditch is located in Placer County. SRCC to clean ditch on his property.

Table 2-3. City of Citrus Heights - Neighborhoods 6 & 7 Drainage Master Plan Study
Citizen Feedback
Public Workshops - January 19, 2011 and July 20, 2011

Workshop Item No.	Assigned Problem No. for Master Plan Study	First	Last	Address 1	Address 2	Phone Number	Citizen Comments (Edited)	Category (D, F, CC)	City Notes
2-1	22						There is an inlet that picks up runoff from the road side ditch on the west side of Patton Avenue. The inlet opening is very large and may represent a safety hazard.		Inlet needs to be retrofitted with a rebar grate.
2-2	n/a						The Polaris dealership north of McDonalds. The shop floods every year. Water accumulates and floods along the roadside ditch flowing to Cripple Creek.	F	This problem will be addressed by the Sunrise Boulevard improvement project currently under design by the City.
2-3	n/a						Northeast corner of Canyon Oaks Drive and Old Auburn Blvd. There is high ground between the end of the curb and gutter on Canyon Oaks and the road side ditch along Old Auburn Blvd. Water accumulates and floods along this route.	D	SRCC to re-grade ditch between end of curb and gutter and road side ditch.
2-4	23						Ditch may have been filled by neighbor at 7660. Backyard neighbor along Baird Way is affected.	D	
2-5	n/a						Drainage ditch behind the lots along Glen Alta Way was not maintained regularly by Sacramento Co. and became filled with debris. City has done a better job of cleaning the ditch, but they are concerned that this issue will be forgotten as the City proceeds	CC	City to continue with regular maintenance by SRCC.
n/a	24						Runoff on Loleta Avenue flows through residential lot on north side of road resulting in property flooding.	F	
							GENERAL COMMENTS		
1-25	n/a						The County already did the Arcade Creek watershed study. I am not sure if they published its final results yet or if they are doing more in-depth study; but I think it would be in everyone's best interest for you to work with them so all systems are compatible. Can you please put any results from the County Study on your website so we can stay informed? The corner of Sunrise and Twin Oaks (southwest Corner) was specifically whited out to show that a detailed study wasn't going to be done. That area is almost completely within the 100 year flood plain and the surrounding area is affected with flash flooding during heavy rain to the point Sunrise Boulevard goes under water. I can't imagine that isn't the most important area to study and make long term plans for. Is Citrus Heights working with County to make joint decision on creek drain pipe?		
1-26	n/a, maintenance issue						Flooding on Glenn Avenue is minimal. An option that would help with minimal cost would be simple maintenance or cleaning of roadside ditches. I can recall this being done once or twice in the 22 years we've been in our home.	CC	Roadside ditches were clean. Maintenance of the ditches is ongoing. Minor standing water along the ditches. Culverts around 7781 Glenn need to be cleaned because they are completely full/block.
1-27	n/a						In the future, have the speakers use a microphone, and provide a microphone for the audience members asking questions.		

Category Codes:
D= Drainage issue (the system is not working right or there is no system)
F= Flooding (issue is causing flooding repeatedly)
CC= Conservation Corp (issue can be solve by the crews, maintenance)

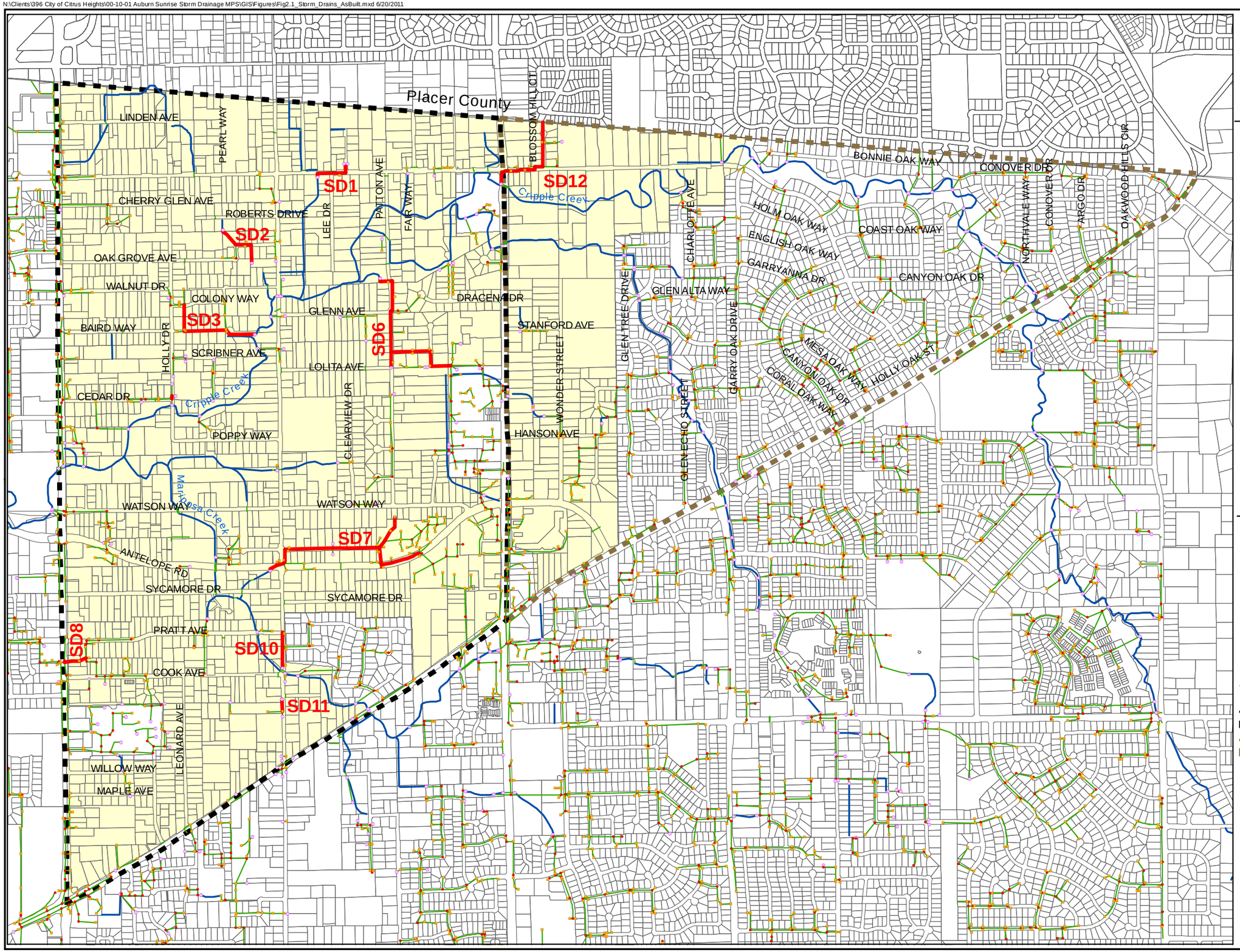
A follow-up public meeting was held on July 20, 2011 to provide residents with a progress report and to present preliminary solutions to problems. Additional problems were reported at that meeting and these are also presented on Table 2-3.

N:\Clients\396 City of Citrus Heights\00-10-01 Auburn Sunrise Storm Drainage MPS\GIS\Figures\Fig2.1_Storm_Drains_AsBuilt.mxd 6/20/2011

FIGURE 2-1

City of Citrus Heights
Neighborhoods 6 and 7
Drainage Master Plan Study

TRUNK STORM DRAINS WITH AS-BUILT DATA



0 550 1,100
Scale in Feet

LEGEND

- Inlet
- Outfall
- Manhole
- Drainage Pipe
- Stream or Channel
- Trunk Storm Drain with As-Built Data
- Neighborhood 6
- Neighborhood 7

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CHAPTER 3
Drainage System Inventory

3.1 INTRODUCTION

The purpose of the drainage system inventory was to verify the locations and existence of the drainage system facilities contained in the City's GIS database, and to provide an assessment of the facility conditions. The drainage system within the study area contains more than 24 miles of pipeline, over 400 manholes, and hundreds more inlets, and catch basins. Detailed verification and assessment of every facility in the study area would have been time consuming and costly and was not necessary to achieve the objectives of the study. Therefore, the system inventory was performed only within the detailed study area as shown on Figure 1-2. This area includes a non-uniform collection of pipes, inlets, roadside ditches, culverts, backyard channels, and some areas with curb and gutter. In the remainder of the study area, the existing drainage systems are more uniform and traditional (i.e., curb and gutter and an underground pipe system) and the GIS database is thought to be more accurate in these areas. A detailed description of the approach used to perform the drainage system inventory is provided below along with the key findings.

3.2 APPROACH AND CRITERIA

The specific approach and criteria for conducting the drainage system inventory are presented below.

3.2.1 Facility Types

The drainage inventory was focused on the following facility types:

- Manholes
- Drop Inlets/Catch Basins
- Pipe Inlets and Outfalls
- Culverts
- Drainage Ditches

3.2.2 Assessment Type

Two types of assessments were performed during the drainage system inventory:

1. Surface Assessment – A surface assessment was performed for all the storm drain facilities included in the City's GIS drainage database within the detailed study area. This step included a visual observation of all drainage facilities visible from the surface. The assessment was performed from the public right-of-way; private property was not entered. The size, material, and condition of the facilities were observed and recorded where possible.
2. Subsurface Assessment – Targeted subsurface assessments were performed at key locations along major storm drain systems with pipe diameters 18-inches or greater. At key locations, manhole lids were opened to obtain the following information:
    a. Pipe shape
    b. Pipe size

c. Pipe material

d. Depth of pipe invert from surface

e. Conditions of pipe invert as visible from surface

The data collected for the subsurface assessment were used to prepare hydraulic modeling as described in Chapter 5. In some cases, the data were used to verify the information included on the available as-built plans. In other cases, no as-built data was available and the field data collected during this task represented the key data source for preparing hydraulic models.

3.2.3 Facility Conditions

When the conditions of the existing facilities were assessed, the conditions were categorized with the codes used by the City's maintenance staff, as follows:

- Physical Condition

  A. Facility appears in excellent condition (new looking, no rust or deformation).

  B. Facility appears in good condition with typical wear and tear (minimal rusting).

  C. Facility appears in fair condition (typical rusting, slight joint separation, minor root intrusion).

  D. Facility is unserviceable and needs replacement (severe rusting, collapse pipe, major joint separation, severe root intrusion).

- Cleanliness

  1. Facility is clean. Flow is not restricted.

  2. Facility has minor sediment and debris. Flow is not significantly restricted (blocked depth is less than 5 percent of the pipe diameter).

  3. Facility has moderate sediment and debris. Flow is moderately restricted (blocked depth is between 5 percent and 10 percent of the pipe diameter).

  4. Facility has excessive sediment and debris. Flow is significantly restricted (blocked depth is greater than 10 percent of the pipe diameter).

3.3 RESULTS

Data collected in the field were recorded on Drainage System Inventory Workmaps, which are included as Attachment 3A. Field staff recorded data on field assessment forms, and this data is provided in Table 3-1. Table 3-1 is organized by Drainage System Inventory Workmap sheet name and contains field data which corresponds to the notations on the Workmaps. Descriptions of the key fields are provided below:

1. Item Type – Facility type (i.e. manhole, pipe, ditch, etc.)

2. ID No. – Temporary ID number created in field and corresponds to labels on Drainage System Inventory Workmaps.
3. GPS Point No. – An assigned point name for facilities that were not located correctly in the GIS database and were located with a GPS unit.
4. Size – The size of a pipe measured during a subsurface investigation.
5. Shape – Shape of pipe.
6. Depth to Invert – Depth from the ground/street surface to the invert of the pipe. Multiple pipe depths were listed with directional indicator (N, W, SE, etc.) to identify specific pipe depths.
7. Material – The facility material type code based on City's standard codes.
8. Photo No. – The file name of the digital photograph taken of the referenced facility. The digital photographs that are listed on Table 3-1 are provided as Attachment 3B which is included on the CD-ROM with this report.
9. Condition Code – Code identifications as described in Facility Condition, above.

3.3.1 General Observations

The project area contains a wide variety of facilities including drainage ditches, culverts, and channels through private property. There are also some areas with more traditional curb and gutter systems that drain to an underground pipe system. All facilities ultimately drain to one of the two major creeks: Cripple Creek or Mariposa Creek. Examples of the types of facilities found in the study area are shown in Photos 3-1, 3-2, 3-3, and 3-4.

In general, field staff found that the majority of the existing drainage facilities in the study area are represented with reasonable accuracy in the City's GIS database. Some cross culverts could not be found, possibly due to being buried when driveways were constructed or when cross culverts collapsed and no longer function. Field staff also found additional drainage facilities that were not included in the GIS database. In a few cases, entire piped drainage systems were missing from the GIS database.

Table 3-1. Field Data and Photo Index

Drainage System Inventory Workmap No.	Date	Item Type	ID No.	GPS Point No.	Size, in	Shape	Depth to Invert, feet	Material	Photo No.	Condition Code		Notes	Horizontal Location (CASP Zone II, NAD83)	
										Physical	Clean-liness		Easting	Northing
A2	1/17/2011	Culvert	A2-1F		12	CIR		CMP	DSCN0187.jpg	F	4	Crossing at Twin Oaks.		
A2	1/17/2011	Culvert	A2-2F		12	CIR		CMP	DSCN0188.jpg	F	4	Crossing at Twin Oaks.		
A2	1/17/2011	Culvert	A2-3F		12	CIR		OTH	DSCN0189.jpg	B	3	Steel pipe crossing Linden Ave Looking North.		
A2	1/17/2011	Culvert	A2-4F		12	CIR		CMP	DSCN0190.jpg	B	1	Crossing Linden Ave Looking South.		
A2	1/17/2011	Culvert	A2-5F		24x12	ARCH		CMP	DSCN0196.jpg	B	2	24"x12" Arch CMP crossing Roberts.		
A2	3/9/2011	Outfall	A2-1J		18	CIR		PVC	IMG_3026.jpg	B	1	18" Plastic pipe to oufall from Whyte.		
A2	3/9/2011	Outfall	A2-1J		18	CIR		PVC	IMG_3027.jpg	B	1	18" Plastic pipe to oufall from Whyte.		
A2	3/9/2011	Outfall	A2-1J		18	CIR		PVC	IMG_3028.jpg	B	1	18" Plastic pipe to oufall from Whyte.		
A2	3/9/2011	Pipe End	A3-2J		(2) 12	CIR		CMP	IMG_3031.jpg	B	1	Twin 12-in CMP culverts at Whyte.		
A2	3/9/2011	Channel	A2-3J						IMG_3023.jpg	B	2	Looking east at drainage channel from Auburn Blvd north of Twin Oaks Dr.		
A2	3/9/2011	Inlet	A2-4J						IMG_3024.jpg	A	1	Small pipe us of drainage channel.		
A2	3/9/2011	MH	A2-5J						IMG_3025.jpg			Paved over MH at Auburn Blvd north of Twin Oaks Dr.		
A3	3/9/2011	MH	A3-1J		36	CIR	6.3	CMP	IMG_2990.jpg	B	1	Donald & Twin Oaks Ave Labeled S - ~1' water inside.		
A3	3/9/2011	MH	A3-2J		36	CIR	5.35	CMP	IMG_2991.jpg	B	1	Twin Oaks between Robie & Donald Labeled S ~1.5' standing water, creek to south appears higher than SDMH Invert.		
A3	3/9/2011	MH	A3-3J	a33j	15 N 36 EW 10 S	CIR	3.0 N 3.95 EW 2.7 S	CMP N CMP EW CMP S		B	1	NW corner of Lee and Twin Oaks.	6,767,338.77	2,024,310.48
A3	3/9/2011	Pipe End	A3-4J	a34j	10	CIR		CMP	IMG_2993.jpg	B	1	NW corner of Lee and Twin Oaks, South side of MH.	6,767,339.53	2,024,299.11
A3	3/9/2011	Pipe End	A3-5J	a35j	15	CIR		CMP	IMG_2992.jpg	B	2	NW corner of Lee and Twin Oaks, North side of MH.	6,767,340.29	2,024,334.72
A3	1/17/2011	Inlet	A3-1F		12	CIR		CMP	IMG_0191.jpg	B	1	Donald Drive pipe end as inlet - west side.		
A3	1/17/2011	Inlet	A3-2F		12	CIR		CMP	IMG_0192.jpg	B	1	Donald Drive pipe end as inlet to SDMH - east side.		
A3	1/17/2011	Culvert	A3-3F		12	CIR		CMP	IMG_0193.jpg	B	1	Crossing at Robie Drive.		
A3	1/17/2011	Road	A3-4F						IMG_0194.jpg			Pine Drive did not find culvert.		
A3	1/17/2011	Inlet	A3-5F						IMG_0195.jpg	A	1	DI on Mariposa.		
A4	2/10/2011	MH	A4-A		60	CIR	7.3	RCP		A	1	Blossom Hill Court.		
A4	2/10/2011	MH	A4-B		60	CIR	6.6	RCP		A	1			
A4	2/10/2011	MH	A4-C		60	CIR	7.85	RCP		A	1			
A4	2/10/2011	MH	A4-D				6.4	RCP				Sunrise & Twin Oaks. Water inside, too dark to find sizes.		
B2	1/17/2011	Inlet/MH	B2-23W						IMG_5796.jpg			Side inlet (north side of Baird Wy). Could not locate MH, but believe was covered by pavement overlay.		
B2	1/17/2011	Culvert	B2-24W		18	CIR		CMP	IMG_5799.jpg	A	1	18" RCP to MH on private.		
B2	1/17/2011	Inlet	B2-25W		12	CIR					3	Half full sediment.		
B2	1/17/2011	Inlet	B2-26W								1	Clean.		
B2	1/17/2011	Inlet	B2-27W						IMG_5798.jpg			CMP standpipe type inlet, side opening. Top locked. North side of street.		

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										Physical	Clean-liness		Easting	Northing
B2	2/10/2011	Inlet	B2-A		21 N 24 S	CIR	1.98 N 3.22 S	CMP	DSN002.jpg	B	1	Baird Way. Box with grate lid.		
B2	2/10/2011	Pipe End	B2-B		12 N 12 E	CIR		CMP N HDPE E	DSN003.jpg	B	2	Baird Way. South side of Manhole that wasn't found.		
B2	2/10/2011	MH	B2-C		12 NW 12 N 24 SE 8 S 24 W	CIR	4.1 NW 5.0 N 5.1 SE 3.5 S 5.1 W	CMP		B	1			
B2	2/10/2011	MH	B2-D		18	CIR	3.85	RCP		A	1			
B2	1/17/2011	Inlet	B2-28W						IMG_5797.jpg			CMP standpipe type inlet, side opening. Top locked. South side of street.		
B2	1/17/2011	Inlet	B2-29W						IMG_5800.jpg			CMP standpipe type inlet, side openings. Top locked. North side of Scribner Ave.		
B2	1/17/2011	Outlet	B2-30W		10	CIR		PVC	IMG_5802.jpg	A	2	Sediment in bottom.		
B2	1/17/2011	Culvert/Inlet	B2-31W		12	CIR		CMP	IMG_5803.jpg	B	1	Culvert opening, no inlet.		
B2	1/17/2011	Culvert/Inlet	B2-32W		12	CIR		CMP	IMG_5804.jpg		1	Culvert opening, no inlet.		
B2	1/17/2011	Inlet	B2-33W						IMG_5801.jpg			Covered inlet??		
B3	1/17/2011	Inlet	B3-14W		12	CIR		CMP	IMG_5786.jpg	B	2	Location, North one lot of location shown.		
B3	1/17/2011	Culvert	B3-15W		15	CIR		CMP	IMG_5787.jpg, IMG_5788.jpg	A	1	New, southwest corner on Patton & Lolita.		
B3	1/17/2011	Side Inlet	B3-16W						IMG_5789.jpg			East side of Patton at corner of Patton & Lolita.		
B3	1/17/2011	Inlet	B3-17W						IMG_5790.jpg					
B3	1/17/2011	Culvert	B3-18W		18	CIR		CMP	IMG_5791.jpg, IMG_5792.jpg	A	1			
B3	1/17/2011	Culvert	B3-19W		18	CIR		STL	IMG_5792.jpg	A	1	Twin 18" stl from private.		
B3	1/17/2011	Culvert	B3-20W		18	CIR		HDPE	IMG_5793.jpg	A	1			
B3	1/17/2011	Outlet	B3-21W		42	CIR		CMP	IMG_5794.jpg			Outlet into creek, east side of bridge along Mariposa Ave.		
B3	1/17/2011	Inlet	B3-22W		12 IN, 8 OUT	CIR			IMG_5795.jpg			CMP standpipe type inlet (locked lid) drains to 2 MH, east side of Mariposa.		
B3	2/10/2011	MH	B3-A		36 or 42 S 36 (?) E	CIR	5.28	RCP				Glenn & Patton.		
B3	2/10/2011	MH	B3-B		48 N	CIR	6.11	RCP		A	1	Glenn & Patton.		
B3	2/10/2011	MH	B3-C		48	CIR	8.88	RCP				Patton Avenue, north end of SD system.		
B3	2/10/2011	MH	B3-D			CIR	5.8	RCP		A	1	Shareen & Ella.		
B3	1/17/2011	DI	B3-1F	b3-e	12	CIR	1.8	PVC E STL W	DSCN0198.jpg	B	2	DI on Mariposa.	6,766,787.25	2,021,639.92
B3	1/17/2011	MH	B3-2F	b3-f	12E 12N	CIR	4.7	RCP	DSCN0199.jpg	A	1	Manhole on Mariposa, 1' drop below outgoing pipe.	6,766,763.27	2,021,647.29

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										Physical	Clean-liness		Easting	Northing
B3	2/10/2011	MH	B3-G	b3-g								Could not open.	6,766,761.24	2,021,704.42
B3	2/10/2011	MH	B3-H	b3 h	18 N 12 W 12 S	CIR	3.9	RCP		A	1	1' drop in MH.	6,766,760.40	2,021,950.96
B3	2/10/2011	DI	B3-I									Curb inlet with grate.	6,766,792.28	2,021,947.50
B3	2/10/2011	MH	B3 -J	b3-j	12 W 18 S 18 E	CIR	5.45	RCP		A	1	Inv 1 ft lower of incoming pipe - sump?	6,766,760.04	2,022,199.17
B3	2/10/2011	MH	B3 -K	b3-k								1' drop in MH.	6,766,737.81	2,022,194.93
B3	2/10/2011	DI	B3 -L	b3-l								Curb inlet with grate.	6,766,731.66	2,022,198.22
B3	1/27/2011	Road	B3-1B						IMG_2943.jpg			Dracena at Catalpa looking E along Dracena.		
B3	1/27/2011	Road	B3-2B						IMG_2944.jpg			Catalpa Looking North.		
B3	1/27/2011	Road	B3-3B						IMG_2945.jpg			End of Catalpa Looking South.		
B3	1/27/2011	DI	B3-4B						IMG_2946.jpg			Di at end of Dracena "court", drains toward private property.		
B3	3/9/2011	Pipe End	B3-2J			CIR		VCP	IMG_2998.jpg	B	1	Open channel on property at Jesse Way		
B3	3/9/2011	Ditch	B3-2J						IMG_2999.jpg	B	1	Open channel on property at Jesse Way looking DS.		
B3	3/9/2011	Ditch	B3-2J						IMG_3000.jpg	B	1	Open channel on property at Jesse Way looking US.		
B3	3/9/2011	Ditch	B3-2J						IMG_3001.jpg	B	1	Open channel on property at Jesse Way looking DS.		
B3	3/9/2011	Culvert	B3-E							F	4	Culvert buried at Loleta Avenue.		
B4	1/27/2011	Road	B4-1B						IMG_2933.jpg			Madera Park on Wonder, Looking north, no ditches.		
B4	1/27/2011	Road	B4-2B						IMG_2934.jpg			Stanford at Wonder, looking west to Sunrise.		
B4	1/27/2011	DI	B4-3B				13"		IMG_2935.jpg			Private DI, could not open.		
B4	1/27/2011	Ditch	B4-4B						IMG_2936.jpg			Private ditch south side of Stanford.		
B4	1/27/2011	DI	B4-5B		10	CIR	16.5"	STL	IMG_2937.jpg			DI's south side of Stanford looking W. Steel on US, RCP on DS.		
B4	1/27/2011	DI	B4-5B		10	CIR	23"	RCP	IMG_2937.jpg			DI's south side of Stanford looking W. Steel on US, RCP on DS.		
B4	1/27/2011	Pipe End	B4-7B		8x18	ARCH?		CMP	IMG_2938.jpg	C	2	Inlet N side of Stanford.		
B4	1/27/2011	Pipe End	B4-8B						IMG_2939.jpg	A	1	Inlet S side of Stanford.		
B4	1/27/2011	Road	B4-9B						IMG_2940.jpg			Stanford Ave at Sunrise looking E toward Wonder.		
B4	1/27/2011	Culvert	B4-10B		12	CIR		CMP	IMG_2941.jpg	C	2	Culvert: Dracena at Sunrise looking north from S side of culvert.		

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										Physical	Clean-liness		Easting	Northing
B4	1/27/2011	Road	B4-11B						IMG_2942.jpg			Dracena at Sunrise, looking east up Dracena.		
C2	1/17/2011	Culvert	C2-1F		8			CMP	DSCN0171.jpg	C	4	Pipe end at culvert crossing on Poppy Way.		
C2	1/17/2011	Inlet	C2-2F						DSCN0172.jpg	A	3	Box inlet at Poppy Way.		
C2	1/17/2011	Channel	C2-3F						DSCN0173.jpg			View of drainage channel south of Poppy and east of Parmis.		
C2	1/17/2011	Road	C2-4F						DSCN0174.jpg			View of bend at Holly and Poppy Way.		
C2	1/17/2011	Outlet	C2-5F		18			CMP	DSCN0175.jpg	C	1	Holly bridge outlet.		
C2	1/17/2011	Creek	C2-6F						DSCN0176.jpg			View of creek from Holly bridge looking west.		
C2	1/17/2011	Inlet	C2-7F		12	CIR		RCP	DSCN0177.jpg	A	1	Pipe end at culvert on Cedar Way.		
C2	1/17/2011	Culvert	C2-8F		24	CIR		CMP	DSCN0178.jpg	A	1	Looking south at 24" CMP culvert on other side of outfall from Cedar Dr.		
C2	1/17/2011	Outfall	C2-9F		8	CIR		RCP	DSCN0179.jpg	B	1	Outfall on Cedar.		
C2	2/10/2011	MH	C2-2		24 E 18 N 18 S	CIR	5.2 INV 4.44 E 4.44 N 4.45 S	PVC E CMP N CMP S		A	1	Poppy Way and Cedar Drive.		
C2	1/17/2011	MH	C2-10F		18E 18N 12S	PVC	7.15 6.45 E 3.35 N 3.80 S		DSCN0180.jpg			SDMH on Cedar looking east with view of 2 adjacent Dis.		
C2	1/17/2011	Inlet	C2-11F						DSCN0181.jpg			Inlet in property on Cedar.		
C2	1/17/2011	Road	C2-12F						DSCN0182.jpg			View of Cedar Rd looking west.		
C2	1/17/2011	Inlet	C2-13F						DSCN0183.jpg			Grate inlet on Cedar looking east.		
C2	1/17/2011	Road	C2-14F						DSCN0184.jpg			Cripple Creek Road at supposed location of SDMH.		
C2	1/17/2011	Outfall	C2-15F		18	CIR		RCP	DSCN0185.jpg	B	1	Outfall to Creek.		
C3	1/18/2011	Inlet	C3-1F			RECT		CONC	DSCN0151.jpg	B	2	Inlet on north side Reno at Mariposa Avenue.		
C3	1/18/2011	Inlet	C3-2F		24 or 30	CIR		RCP	DSCN0152.jpg	B	3	Culvert from channel to SD on Reno.		
C3	1/18/2011	Channel	C3-2F						DSCN0153.jpg	B	2	Channel draining to SD system on Reno.		
C3	1/18/2011	Road	C3-3F						DSCN0154.jpg			View of Reno Ln looking west.		
C3	1/18/2011	Inlet	C3-4F			RECT		RCP	DSCN0155.jpg			View of inlet on south side of Reno Ln and SDMH looking west.		
C3	1/18/2011	MH	C3-5F						DSCN0156.jpg			Looking west down Antelope SDMH at Antelope and Mariposa; on east side of Mariposa in street; labeled S.		
C3	1/18/2011	Inlet	C3-6F						DSCN0157.jpg			Looking south down Mariposa at inlet and 2 SDMHs at Antelope.		
C3	1/18/2011	SDMH	C3-7F						DSCN0158.jpg			SDMH on east side of property line at Antelope and Mariposa, labeled S.		
C3	1/18/2011	Box Inlet	C3-8F						DSCN0159.jpg			Box inlet at northwest corner of Antelope and Mariposa.		

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										Physical	Clean-liness		Easting	Northing
C3	1/18/2011	Inlet	C3-9F	c33j					DSCN0160.jpg			Grate inlet on east side Watson at Antelope -- not in current mapping.	6,768,973.10	2,020,298.57
C3	1/18/2011	Inlet	C3-10F	c34j					DSCN0161.jpg			Grate inlet on west side Watson at Antelope, observed pipe in DI going south toward antelope to MH labeled S -- not in current mapping.	6,769,004.10	2,020,333.35
C3	1/18/2011	Inlet	C3-10F						DSCN0162.jpg			View of inlet looking south toward MH on Antelope.		
C3	1/18/2011	MH	C3-11F	c37j					DSCN0163.jpg			SDMH on Watson in sidewalk.	6,768,920.18	2,020,322.76
C3	3/9/2011	MH	C3-5J	c35j		CIR	2.65			A	1	Shallow MH on Antelope, Drains to east.	6,769,053.25	2,020,300.08
C3	1/18/2011	MH	C3-12F						DSCN0164.jpg			SDMH with open grate.		
C3	1/18/2011	Road	C3-13F						DSCN0165.jpg			Looking west down Watson Road toward Patton from Edward Oaks.		
C3	3/9/2011	DI	C3-8J	c38j									6,766,822.58	2,021,013.47
C3	3/9/2011	MH	C3-9J	c39j									6,766,766.12	2,020,977.17
C3	3/9/2011	MH	C3-10J	c310j									6,766,762.09	2,020,763.45
C3	3/9/2011	DI	C314F	c311j					DSCN0197.jpg			Grate inlet on east side Mariposa at Cina, with 21" CMP pipe end from drainage channel to east.	6,766,783.26	2,020,766.47
C3	3/9/2011	MH	C3 -1J		36 EW 12 NE	CIR	6.0E 5.95W 3.95NE	RCP E CMP W OTH NE		A	1	Mariposa and Antelope. Steel pipe to NE.		
C3	3/9/2011	MH	C3-2J	c32j	30 EW 12 N 18 S	CIR	3.55 THRU 2.85N 2.7' S	CMP EW CMP N RCP S	IMG_2995.jpg IMG_2996.jpg	A	1	West side of Reno, SDMH lid removed with magnets.	6,766,891.99	2,019,792.88
C3	3/9/2011	MH	C3-3	c3-3								Mariposa & Reno.	6,766,840.95	2,019,794.02
C3	3/9/2011	MH	C3-6J		24 W 10 NW 10 E 6 SE 18 NE	CIR	8.6 INV 7.7 W 4.35 NW 4.9 E 4.95 SE 6.8 NE	STL W (?) RCP NW CMP E CMP SE CMP NE	IMG_2997.jpg	A	1	Antelope Rd.		
C3	3/9/2011	MH	C3-7J		24 W 10 NW 18 N 10 NE 24 S 12 SW	CIR	7.85 W 5.55 NW 7.95 N 4.65 NE 7.85 S 4.95 SW	RCP W PVC NW PVC N PVC NE RCP S PVC SW		B	3	End of Reno - heavy sediment.		

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										Physical	Clean-liness		Easting	Northing
C3	1/18/2011	Inlet	C3-W1		10	CIR		CMP	IMG_5770.jpg	C		Culvert end (northwest corner Clearview & Watson), culvert crosses Clearview.		
C3	1/18/2011	Grate	C3-W2		10	CIR			IMG_5771.jpg	A		Inlet, northeast corner Clearview & Watson. Culvert end from C3-W1.		
C3	1/18/2011	Grate	C3-W3		10	CIR		RCP	IMG_5772.jpg	A		Grate over pipe, inside concrete basin.		
C3	1/18/2011	Grate	C3-W4		10	CIR			IMG_5773.jpg	A	3			
C3	1/18/2011	Inlet	C3-W5		10	CIR		RCP	IMG_5774.jpg	A	2			
C3	1/18/2011	Culvert	C3-W6		10	CIR		RCP	IMG_5775.jpg	A	2	D/W culvert.		
C3	1/18/2011	Culvert	C3-W7		10	CIR		CMP		A	1	D/W culvert.		
C3	1/18/2011	Culvert	C3-W8		10	CIR		RCP	IMG_5776.jpg	A	2	D/W culverts & ditch, Watson & Patton.		
C3	1/18/2011	Culvert	C3-W8		10	CIR		CMP	IMG_5777.jpg	B	1	Cross Patton.		
C3	1/18/2011	Culvert	C3-W9		12	CIR		CMP	IMG_5778.jpg IMG_5779.jpg	B	1	Culvert crossing Watson Wy, 5779 ditch btwn lots on private.		
C3	1/18/2011	Culvert	C3-W10		12	CIR		CMP	IMG_5780.jpg	B	2	Crosses Watson WY.		
C3	1/18/2011	Grate	C3-W11		10	CIR		PVC	IMG_5781.jpg	A	1	Drop inlet on Clearview Dr.		
C3	1/18/2011	Grate	C3-W12			CIR		PVC	IMG_5783.jpg	A	1	d/w ac ditch and transition to curb & gutter (Patton).		
C3	1/18/2011	Grate	C3-W13						IMG_5784.jpg					
C3	1/18/2011	Ditch	C3-W14						IMG_5785.jpg			Relative new ditch and d/w culverts along Patton south of Lolita Ave.		
C4	1/18/2011	Curb Inlet	C4-1B		12	CIR	26.5	ACP(?)	DSCN9879.JPG	B	2	Curb Inlet E side Sunrise looking North.		
C4	1/18/2011	Culvert Inlet	C4-2B		18/24 (?)	CIR/ARCH (?)		CMP	DSCN9880.JPG	B	2	Culvert Inlet, "fish mouthed".		
C4	1/18/2011	Minor Ditch	C4-3B						DSCN9881.JPG			Minor Ditch on Sunrise at Hanson Ave running South on Sunrise, looking South.		
C4	1/18/2011	Drainage	C4-4B						DSCN9882.JPG			Hanson Avenue looking West to Sunrise at grade break. Minor ditch S side Hanson, no ditch W side Hanson.		
C4	1/18/2011	Drainage	C4-5B						DSCN9883.JPG			Hanson Avenue looking East to Wonder at grade break. Minor ditch S side Hanson, no ditch W side.		
C4	1/18/2011	Private Culvert	C4-6B		8/10 (?)	CIR		STL IN, RCP OUT	DSCN9884.JPG			US end of Private Culvert at Driveway along Hanson South side ditch, looking E to Wonder.		
C4	1/18/2011	Private Culvert	C4-7B		8/10 (?)	CIR		STL IN, RCP OUT	DSCN9885.JPG			DS end of Private Culvert at Driveway along Hanson South side ditch, looking W.		
C4	1/18/2011	Inlet	C4-8B		8	CIR		CMP	DSCN9886.JPG	C	4	Culvert inlet SW intersection of Hanson/Wonder, drains to MH in intersection.		
C4	1/18/2011	inlet	C3-9B		8	CIR		CMP	DSCN9887.JPG	B	2	Culvert inlet SE intersection of Hanson/Wonder, drains to MH in intersection.		

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										Physical	Clean-liness		Easting	Northing
C4	1/18/2011	Inlet	C3-10B		8	CIR		CMP	DSCN9888.JPG	B	2	Culvert inlet NE intersection of Hanson/Wonder, drains to MH in intersection, 4-inch perf pipe drain to/from?		
C4	1/18/2011	Inlet	C4-11B		8	CIR		CMP	DSCN9889.JPG	?	?	Culvert inlet NW intersection of Hanson/Wonder, drains to MH in intersection, covered w/ bushes.		
C4	1/18/2011	SDMH	C4-12B						DSCN9890.JPG			SDMH intersection of Hanson/Wonder.		
C4	1/18/2011	SDMH	C4-13B						DSCN9891.JPG			SDMH on Wonder looking S to Hanson.		
C4	1/18/2011	Private Drain	C4-14B						DSCN9892.JPG			Private drain at 7915 Wonder.		
C4	1/18/2011	Road	C4-15B						DSCN9893.JPG			Minor Ditch on E side Wonder looking S to Hanson.		
C4	1/18/2011	Minor Ditch	C4-16B						DSCN9894.JPG			Minor Ditch on N side of Hanson looking W toward Charlene.		
C4	1/18/2011	-	C4-17B						DSCN9895.JPG			Drainage on N side of Hanson looking W to Wonder (no ditch).		
C4	1/18/2011		C4-18B		8	CIR		CMP	DSCN9896.JPG	B	2	Inlet at corner of Hanson/Charlene, drains to MH at intersection of Hanson/Charlene.		
C4	1/18/2011	SDMH	C4-19B						DSCN9897.JPG			SDMH at intersection of Hanson/Charlene.		
C4	1/18/2011	SD DI	C4-20B				2.125		DSCN9898.JPG			DI between 7931 & 7935 Hanson.		
C4	1/18/2011	Inlet	C4-21B		8	CIR		CMP	DSCN9899.JPG	A	2	Inlet, drains to MH E of intersection of Charlene/Hanson.		
C4	1/18/2011	DI	C4-22B		8	CIR	0.666666667	RCP	DSCN9900.JPG	B	2	DI for private culvert at 7935 Hanson, Drains to DI 20B.		
C4	1/18/2011	Minor Ditch	C4-23B						DSCN9901.JPG			Minor ditch on Charlene looking N toward Hanson.		
C4	1/18/2011	-	C4-24B						DSCN9902.JPG			Drainage on W side of Charlene looking N toward Hanson (no ditch).		
C4	1/18/2011	SDMH	C4-25B						DSCN9903.JPG			SDMH on Charlene, looking N toward Hanson.		
C4	1/18/2011	Private Culvert	C4-26B		12	CIR		RCP	DSCN9904.JPG			Private culvert.		
C4	1/18/2011	-	C4-27B						DSCN9905.JPG			Drainage E side of Wonder looking N toward Hanson (no ditch).		

Table 3-1. Field Data and Photo Index

Drainage System Inventory Workmap No.	Date	Item Type	ID No.	GPS Point No.	Size, in	Shape	Depth to Invert, feet	Material	Photo No.	Condition Code		Notes	Horizontal Location (CASP Zone II, NAD83)	
										Physical	Clean-liness		Easting	Northing
C4	1/18/2011	-	C4-28B						DSCN9906.JPG			Drainage E side of Wonder looking S toward Antelope (no ditch).		
C4	1/18/2011	-	C4-29B						DSCN9907.JPG			Drainage W side of Wonder looking S toward Antelope (no ditch).		
C4	1/18/2011		C4-30B						DSCN9908.JPG			Drainage W side of Wonder looking N toward Hanson (no ditch).		
C4	1/18/2011	Curb Inlet	C4-31B		10/12"	CIR	3.333333333	CMP/RCP	DSCN9909.JPG	B	2	Curb Inlet E side of Wonder draining East to Church Pkg Lot, unable to open grate to check diameter.		
C4	1/18/2011	DI	C4-32B			CIR	3		DSCN9910.JPG	A	1	Drain inlet in Church parking lot.		
C4	1/18/2011	DI	C4-33B				2.166666667		DSCN9911.JPG	B	2	Curb Inlet Church parking lot.		
C4	1/18/2011	DI	C4-34B		8	CIR	2.375	PVC	DSCN9912.JPG	B	2	Drain inlet in Church parking lot.		
C4	1/18/2011	DI	C4-35B		12	CIR	N/A ditch fed	RCP	DSCN9913.JPG	B	2	N side of Antelope.		
C4	1/18/2011	Culvert Outlet	C4-36B		12	CIR	N/A	RCP	DSCN9914.JPG	B	4	S side of Antelope.		
C4	1/18/2011	DI	C4-37B			CIR			DSCN9915.JPG			small private drain inlet, not significant.		
C4	1/18/2011	DI	C4-38B			CIR	1.291666667		DSCN9916.JPG		4	Private DI in church property, could not open grate.		
C4	1/18/2011	DI	C4-39B			CIR	4.916666667		DSCN9917.JPG	B	2	DI at Omelete Professor Pkg lot, deep did not open.		
C4	1/18/2011	DI	C4-40B		8/10"	CIR	5.416666667	ACP(?)	DSCN9918.JPG	B	2	DI at Cost U Less Insurance pkg lot.		
C4	1/18/2011	DI	C4-41B		10/12"	CIR	5.375	ACP(?)	DSCN9919.JPG	B	2	DI at Kragen Pkg Lot.		
D2	2/10/2011	MH	D2-2B		18 W 24 N 10 NE 12 SE	CIR	4.6 W 4.65 N 3.75 NE 3.65 SE	RCP W RCP N CMP NE CMP SE	DSCN9934.JPG	A	1	Pratt Avenue / Mary.		
D3	1/27/2011	Culvert	D3-1B						DSCN9933.JPG			Box culvert at Pratt (from N side of Pratt).		
D3	1/27/2011	MH	D3-2B		18 N 12 NE 12 E 12 SE	CIR	5.95 N 4.75 NE 5.75 E 4.85 SE	RCP N RCP E	DSCN9935.JPG	A	1	Mariposa at Cook, looking N.		
D3	2/10/2011	MH	D3-A		18 N&S 18 W	CIR	4.1 N&S 3.9 W	RCP		A	2	Sediment in bottom.		

Photo 3-1. Roadside Ditches and Driveway Culverts – Looking West at Watson Way from Patton Avenue

Photo 3-2. Drainage Channel in Private Backyard – Property on Jessie Way

Photo 3-3. No Roadside Ditches or Driveway Culverts – Looking West Down Loleta Way

Photo 3-4. Curb, Gutter and Inlet – Mariposa Avenue at Cina Way

3.3.2 Specific Findings

Major findings are summarized as follows:

- Roadside Ditches: It appears that the City's GIS database delineates roadside ditches wherever no curb and gutter exists. Field staff found many locations where the GIS database indicates the existence of a roadside ditch where none actually exists. An example of this condition is shown in Photo 3-3. On the Drainage System Inventory Workmaps, field staff crossed out roadside ditches in areas observed to have no roadside ditches. In these areas, runoff from the street simply sheets flows across the adjacent property.
- Piped Drainage Systems: The following piped drainage systems were found that are not included in the City's GIS database:
    - Mariposa Avenue at Loleta Avenue – A 12-inch to 18-inch concrete pipe system with four manholes is not included in the City's GIS database. The locations of these facilities were recorded with a GPS unit. Refer to Sheet B3 of the Drainage System Inventory Workmaps.
    - Mariposa Avenue at Cina Way – Manholes were observed at this location and their locations were recorded with a GPS unit. Refer to Sheet C3 of Drainage System Inventory Workmaps.
    - Watson Way at Mariposa Avenue – Drain inlets and manholes were observed from the surface and recorded on Sheet C3 of the Drainage System Inventory Workmaps. Field staff opened the receiving manhole on Antelope Road and found that the drain system flowed east. The locations of these facilities were recorded with a GPS unit.
- Physical Condition of Facilities – The existing drainage facilities that were observed in the field appear to be in reasonably good condition, with the exception of some collapsed culverts. For example, a cross culvert at Loleta Way west of Patton Avenue was completely plugged and has ceased to function. Field staff marked culverts on the Drainage System Inventory Workmaps that were not found or completely plugged. Also, the physical condition of observed facilities is recorded on Table 3-1.

It should be noted that there are limitations to the inventory work that was performed for this study. To keep the cost of the inventory to a reasonable level, many of the drainage facilities were only reviewed from surface. In those areas, if the facilities observed on the surface matched the information in the GIS database, it was assumed that the underground system in that area was also consistent with the GIS database. Without additional subsurface investigation, it is not possible to confirm that this is the case.

Also, there are many small drainage channels and storm drains that are in private property which field staff could not verify. The City's GIS maps may be inaccurate as some of these drainage facilities may have been altered or removed. For example, the City's GIS map shows a channel receiving drainage from the Pratt Avenue storm drain system (see Sheet D2 of the Drainage System Inventory Workmaps). The channel runs through a private property. A comparison with aerial maps shows a house with a pool on this parcel and no obvious open channel conveyance. Field staff could not verify the drainage facilities because they are located on private property. There are many other cases similar to this example within the project area.

The information collected during the field inventory was used to update and correct the City's GIS database. This is described in more detail in Chapter 4.

ATTACHMENT 3A

Master Field Notes